PQM4000
Class A DIN 192x144 power quality analyzer for CTs

- 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
- USB host port for data transfer
- Integrated GPS for accurate timing
- High resolution TFT display with capacitive touch
- Internal rechargeable backup battery
- Certified according to **IEC/EN 61000-4-30:2015 Ed.3**, Class A for voltage characteristics

Certified to Ed. 3 standard

» 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 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 for external standard CTs with 1 or 5A 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 an 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 to grant an accurate current measurement.
- Continuous monitoring of the power quality and Class A certified measurements for voltage 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

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» 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.
- 4th current channel dedicated for Neutral current measurement: the current measuring range (CT primary and secondary) can be programmed together with the main three-phase channels.
- 5th current channel reserved for Earth Leackage 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 version).
- Display of daily demand graphic with programmable power limit to monitor overconsumption (only DMD version).
- Voltage Even & Odd harmonic distortion parameters (only ENH version).
- Current Total, Even & Odd demand distortion parameters (only ENH 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.
- Measurement of additional power quality parameters, such as K Factor.

Recordings & data storage

- Voltage event recording (sags, swells, interruptions) with storage of ½c RMS values and waveforms.
- Sag/swell recording on 4th voltage channel with storage of ½c RMS values and waveforms.
- Rapid Voltage Changes measurement and event recording.
- Power frequency variation monitoring and recording with ½c 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 version).
- Overcurrent recording on three-phase current channels with storage of ½c 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 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 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 ½c 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.
- 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 fimware.

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.

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» Technical drawing (mm)

183

143

191

135

190
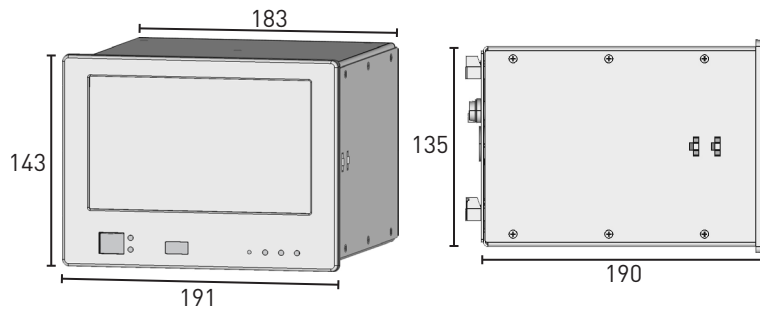
Front part (LxH): 191x143 mm (3U)

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	Real time	Events	Logging	Analog outputs	Digital outputs
Voltages (ULN, ULL, U4N, U4L)	•	•	•	✓	✓	M	✓	A
System Voltage (U∑)	•	•	•	✓		M	✓	A
Phase Sequence	•	•	•	✓		M		
System Frequency (F)	•	•	•	✓	✓	M	✓	A
Currents (IL)	•	•	•	✓	✓	M	✓	A
Line 4 Current, Earth Leakage, System Current (I4, I5, I∑)	•	•	•	✓		M	✓	A
Powers (PL, P∑, SL, S∑, QL, Q∑)	•	•	•	✓		M	✓	A
Power Factors (TPFL, TPF∑, DPFL)	•	•	•	✓		M	✓	A
Voltage Symmetrical Components (*U0, U1, U2*)	•	•	•	✓		M	✓	A
Voltage Unbalance Ratios (*u0, u2*)	•	•	•	✓	✓	M		
Voltage Underdeviations (UdevULN, UdevULL)	•	•	•	✓		M	✓	A
Voltage Overdeviations (OdevULN, OdevULL)	•	•	•	✓		M	✓	A
Short Term Flickers (PstL)	•	•	•	✓		M		
Long Term Flickers (PltL)	•	•	•	✓	✓	M		

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PARAMETERS	VERSIONS			APPLICATIONS				
	BASIC	DMD	ENH	Real time	Events	Logging	Analog outputs	Digital outputs
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, I∑DMD)		●		✓		D		A
Active Power Demands (+PLDMD, -PLDMD, +P∑DMD, -P∑DMD)		●		✓		D		A
Reactive Power Demands (+QLDMD, -QLDMD, +Q∑DMD, -Q∑DMD)		●		✓		D		A
Apparent Power Demands (+SLDMD, -SLDMD, +S∑DMD, -S∑DMD)		●		✓		D		A
True Power Factor Demands (+TPFLDMD, -TPFLDMD, +TPF∑DMD, -TPF∑DMD)		●		✓		D		A
Current Demand MAX (ILDMDMAX, I4DMDMAX, I5DMDMAX, I∑DMDMAX)		●		S				
Active Power Demand MAX (+PLDMDMAX, -PLDMDMAX, +P∑DMDMAX, -P∑DMDMAX)		●		S				
Reactive Power Demand MAX (+QLDMDMAX, -QLDMDMAX, +Q∑DMDMAX, -Q∑DMDMAX)		●		S				
Apparent Power Demand MAX (+SLDMDMAX, -SLDMDMAX, +S∑DMDMAX, -S∑DMDMAX)		●		S				
True Power Factor Demand MAX (+TPFLDMDMAX, -TPFLDMDMAX, +TPF∑DMDMAX, -TPF∑DMDMAX)		●		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

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» Specifications

POWER SUPPLY	
Auxiliary power voltage:	100...240 VAC 50/60 Hz / 65...250 VDC
Auxiliary power consumption:	15 W
Fuse:	250 VAC / 500 mA T type delayed; 35 A breaking capacity
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
Input impedance (for direct voltage inputs):	›6 MΩ
CT inputs:	max 7 A RMS
CT burden:	0.04 VA
Current input crest factor:	3
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:	Class 0.5S, 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:	1 SMA female connector
Protocols:	HTTP, HTTPS, FTP, SFTP, NTP, NMEA, Modbus RTU/TCP, WPA

RTC SYNCHRONISATION	
Synchronisation system:	NTP and/or GPS

ENVIRONMENTAL CONDITIONS	
Installation and use code:	PQI-A-FI1
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
Installation & use:	Internal

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
Pollution degree:	2 (EN 61010-1)
Protection degree:	IP40 front panel, IP20 rear
Protection against mechanical impacts:	IK06

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ORDER CODE	VERSION			POWER SUPPLY	COMMUNICATION				GPS FOR SYNCHRO	MEMORY	I/O		
	BASIC	DMD	ENH	100…240VAC / 65…250VDC	ETHERNET	RS485 read-only	WIFI	USB	Integrated	16GB	DI	DO	AO
FOR CTs (not included)													
1301.0002.0001	●			●	●	●	●	●	●	●	●	●	●
1301.0004.0001		●		●	●	●	●	●	●	●	●	●	●
1301.0005.0001			●	●	●	●	●	●	●	●	●	●	●

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).
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

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