

<b>TRANSIENT RECORDER</b>	<b>CLASS A</b>
OPTION	IEC 61000-4-30
<b>GPS</b>	<b>EVENTS</b>
OPTION	
<b>GSM</b>	<b>CAT III</b>
OPTION	600 V
<b>TOUCH SCREEN</b>	<b>IP30</b>

## Stationary, modular, comprehensive

### Description

Stationary meter designed to measure and record power supply parameters for compliance with standards and applicable laws, and with the ability to verify preset terms of a power sale/purchase contract.

Made in class A. Designed to be mounted on a DIN rail (with the possibility of mounting on a wall in a cabinet). Modular design allows adding new modules to expand the capabilities of the meter. The instrument allows measurements in 50 Hz, 60 Hz and 400 Hz\* networks.

### Features

- Full class A according to IEC 61000-4-30, confirmed by a certificate from an accredited laboratory
- Voltage inputs L1, L2, L3, N, E (5 terminals)
- L1, L2, L3, N, E currents (5 current transformers)
- Built-in current transformers 5 A (**optional: 1 A\***), possibility of indirect measurements with calculation results for the primary side (**optional: version with external current transformers\***)
- Operation in 50 Hz, 60 Hz networks, operation in 400 Hz\* networks
- Recording of voltage and current events along with waveforms
- Measurement of more than 4,000 parameters
- 24-bit analog-to-digital converter
- Basic sampling rate of 80 kHz
- Conducted emissions monitoring in the 2...150 kHz band
- Two LAN ports, including one with the option of powering the meter with PoE (Power over Ethernet)
- Power supply 85...264 V AC (120...300 V DC), built-in rechargeable battery
- 8 GB memory (microSD card)
- USB port for meter updates and data exchange
- Two binary inputs, two relay outputs, two RS-485 ports
- Relay output to monitoring analyzer operation (Watchdog)
- 1-wire input for external temperature sensors
- 2.4" touch screen
- DIN rail or wall mounting
- Expansion bus allowing connection of various external modules (e.g. GPS, LTE)
- Built-in web server for programming the meter, reading current data, viewing the list of recorded events with oscillogram/RMS display
- Time synchronization with the reference via NTP servers, IRIG-B (via built-in RS-485)
- **Optional GPS module\***
- Measurement category CAT III 600 V (IV 300 V) for voltage inputs
- Measurement category CAT III 300 V for current inputs
- Possibility of sealing current and voltage inputs

	I [A]	THDI [%]
L1	1.1900	14.52
L2	1.5700	13.22
L3	0.9102	10.58
N	0.0008	>999.9
E	2.9712	0.00

\* coming soon

## Additional features

### Standard transmission protocols

- Modbus TCP/IP
- Modbus RTU
- IEC 61850
- PQdif

### Web interface (webservice)

- Access to the interface from any web browser

## Modularity

The instrument can be expanded with additional communication protocols and physical and software functionality.

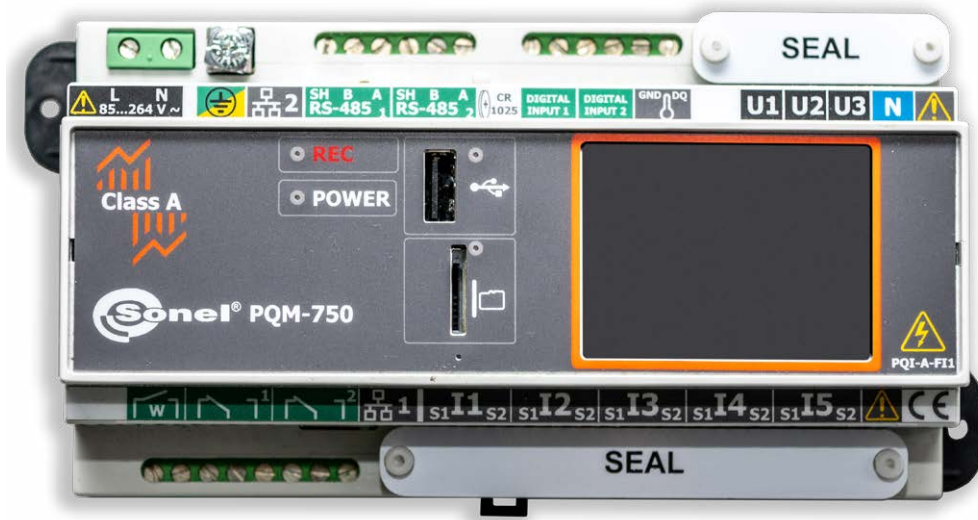
### Additional internal modules\*

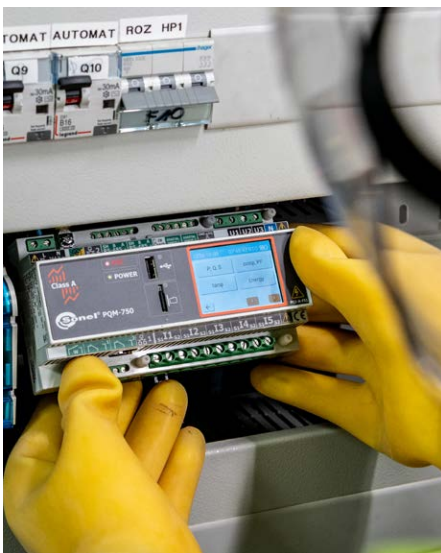
- Transient module
- SSR relay module
- 18...60 V DC power supply unit

### Additional external modules\*

- LTE GSM module
- GPS module with IRIG-B output
- I/O module
- LCD 7" touch panel for full operation of the analyzer at the mounting location

\* coming soon





## Measured parameters

Built-in software (web interface – webservice) allows you to configure the device and view actual data. It allows measurement of the following parameters.

- Phase RMS voltage **U** for L1, L2, L3+N/PE
- Phase-to-phase RMS voltages **U** for **L12, L23, L31**
- RMS currents **I** of all phases + N + PE
- Crest factor **CF** of voltages and currents
- Network frequency **f** for L1
- Active power **P** for L1, L2, L3
- Active power **P1 (separated 50 Hz)** for L1, L2, L3
- Reactive power **Q** for L1, L2, L3
- Reactive power **Q1 (separated 50 Hz)** for L1, L2, L3
- Apparent power **S** for L1, L2, L3
- Apparent power **S1 (separated 50 Hz)** for L1, L2, L3
- Three-phase total power **P<sub>3F</sub>, Q<sub>3F</sub>, S<sub>3F</sub>**
- Three-phase total power **P1<sub>3F</sub>, Q1<sub>3F</sub>, S1<sub>3F</sub>**
- **cosφ** for L1, L2, L3, **cosφ<sub>3F</sub>**
- Power factor **PF** for L1, L2, L3, **PF<sub>3F</sub>**
- **tgφ** for L1, L2, L3, **tgφ<sub>3F</sub>**
- Distortion power **D** for L1, L2, L3
- Three-phase total distortion power **D<sub>3F</sub>**
- Distortion power factor **DPF** for L1, L2, L3
- Shape of phase voltages and currents for events
- Phase diagrams for currents and voltages
- Active energy for L1, L2, L3 – taken **E<sub>p+</sub>** or given **E<sub>p-</sub>**.
- Three-phase active energy – drawn **E<sub>p3F+</sub>** or given **E<sub>p3F-</sub>**.
- Inductive reactive energy for L1, L2, L3 for consumption – **E<sub>QL+</sub>**
- Capacitive reactive energy for L1, L2, L3 for consumption – **E<sub>QC+</sub>**
- Three-phase reactive energy for consumption – inductive **E<sub>QL3F+</sub>** and capacitive **E<sub>QC3F+</sub>**
- Apparent energy for L1, L2, L3 – **E<sub>s</sub>**
- Three-phase apparent energy **E<sub>s3F</sub>**
- Harmonics **h<sub>n</sub>** to 256<sup>th</sup> in current and voltage
- Interharmonics up to 256th in current and voltage
- Angles between current and voltage harmonics
- Monitoring of 2...150 kHz bandwidth
- **U<sub>DC</sub>** phase voltage components
- Shares of harmonic currents and voltages in relation to RMS value (%) – **h<sub>nR</sub>**
- Shares of harmonic currents and voltages in relation to the fundamental harmonic **h<sub>1</sub>** (%) – **h<sub>nF</sub>**
- **THD<sub>R</sub>** for voltages and currents calculated against RMS value (%)
- **THD<sub>F</sub>** for voltages and currents calculated relative to the fundamental harmonic (%)
- **TID<sub>R</sub>** for voltages and currents calculated against RMS value (%)
- **TID<sub>F</sub>** for voltages and currents calculated relative to the fundamental harmonic (%)
- Active and reactive harmonic powers
- **K-factor** for **I<sub>1</sub>, I<sub>2</sub>, I<sub>3</sub>, I<sub>N</sub>**
- **Factor K** (Europe)
- Symmetrical voltage components: zero **U<sub>0</sub>**, direct **U<sub>1</sub>**, inverse **U<sub>2</sub>**
- Symmetrical components of current: zero **I<sub>0</sub>**, direct **I<sub>1</sub>**, inverse **I<sub>2</sub>**
- Short-term light flicker factor **P<sub>st</sub>**
- Long-term light flicker factor **P<sub>lt</sub>**
- Voltage unbalance
- Current unbalance
- Transients U up to 6000 V
- Ripple control signals
- Temperatures: Tw (analyzer internals), Tz1...Tz4 (1-wire)

# Parameters

Parameter	Measuring range	Max. resolution	Accuracy
<b>Alternating voltage (TRMS)</b> $U_{L-L,MAX} = 2000 \text{ V}$ for $U_{L-E,MAX} = 1000 \text{ V}$	0.0...1000.0 V	4 significant digits	$\pm 0.1\% U_{din}$
<b>Crest Factor</b>			
Voltage	1.0...6.5 (1.65 for voltage of 690 V)	0.01	$\pm 5\%$
Current	1.00...10.00	0.01	$\pm 5\%$
<b>Alternating current (TRMS)</b>	0...20 A	4 significant digits	$\pm 0.2\%$
<b>Frequency</b>	40.000...70.000 Hz	0.001 Hz	$\pm 0.01 \text{ Hz}$
<b>Active power</b> IEC 62053-22 class 0,2S	depending on voltage and current ratio	4 significant digits	$\pm 0.2\%$
<b>Reactive power</b> IEC 62053-24 class 0,5S	depending on voltage and current ratio	4 significant digits	$\pm 0.5\%$
<b>Apparent power</b>	depending on voltage and current ratio	4 significant digits	$\pm 0.2\%$
<b>Active energy</b> IEC 62053-22 class 0,2S	depending on voltage and current ratio	4 significant digits	$\pm 0.2\%$
<b>Reactive energy</b> IEC 62053-24 class 0,5S	depending on voltage and current ratio	4 significant digits	$\pm 0.5\%$
<b>Apparent energy</b>	depending on voltage and current ratio	4 significant digits	$\pm 0.2\%$
<b>cos<math>\phi</math> and power factor (PF)</b>	-1.000...1.000	0.001	0.05
<b>tan<math>\phi</math></b>	-10.000...10.000	0.001	depends on error of active and reactive power
<b>Harmonics and interharmonics</b>			
Voltage	DC, 0...256	4 significant digits	$\pm 0.05\% U_{din}$ for m.v. < 1% $U_{din}$ $\pm 5\%$ m.v. for m.v. $\geq 1\% U_{din}$
Current	0...256	4 significant digits	$\pm 0.15\% I_{rin}$ for m.v. < 3% $I_{rin}$ $\pm 5\%$ m.v. for m.v. $\geq 3\% I_{rin}$
<b>THD-F</b>			
Voltage	0...20%	0.01%	$\pm 0.3\%$ (absolute error)
Current	0...100%	0.01%	$\pm 0.3\%$ (absolute error)
<b>Active and reactive power of harmonics</b>	depending on voltage and current ratio	4 significant digits	—
<b>Angle between current and voltage harmonics</b>	-180.0...+180.0°	0.1°	$\leq 0.05^\circ$ for $n = 1$ $\leq 1^\circ$ for $2 \leq n \leq 60$ at $f_{nom} = 50 \text{ Hz}$ $\leq 4^\circ$ for $61 \leq n \leq 256$ at $f_{nom} = 50 \text{ Hz}$
<b>K-Factor</b>	1.0...50.0	0.01	$\pm 10\%$
<b>Flicker index</b>	0.20...10.00	0.01	$\pm 5\%$
<b>Unbalance factor</b>			
Voltage and current	0.0...20.0%	0.1%	$\pm 0.15\%$ (absolute error)
<b>Measurement of control signals</b>			
Voltage	up to $15\% U_{din}$ at $f_R = 5...30000 \text{ Hz}$	4 significant digits	unspecified for <1% $U_{din}$ $\pm 0.15\%$ for $1...3\% U_{din}$ $\pm 5\%$ for $3...15\% U_{din}$
<b>Emissions in band</b>			
2...9 kHz	a single frequency that is multiple of 200 Hz	0.01 V	$\pm 0.1\% U_{din}$ for m.v. < 2% $U_{din}$ $\pm 5\%$ m.v. for m.v. $\geq 2\% U_{din}$
8...150 kHz	a single frequency that is multiple of 2 kHz	0.01 V	$\pm(5\% + 0.1 \text{ V})$

m.v. – measured value

## Standards

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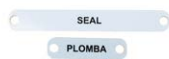
Made in class A of the IEC 61000-4-30 standard, the instrument is compliant:

- Product standards:
  - » **IEC 62586-1** – Power quality measurement in power supply systems – Part 1: Power quality instruments (PQI)
  - » **IEC 62586-2** – Power quality measurement in power supply systems – Part 2: Functional tests and uncertainty requirements
- Standards for measuring network parameters:
  - » **IEC 61000-4-30** – Electromagnetic compatibility (EMC) – Testing and measurement techniques – Power quality measurement methods
  - » **IEC 61000-4-7** – Electromagnetic compatibility (EMC) – Testing and Measurement Techniques – General Guide on Harmonics and Interharmonics Measurements and Instrumentation for Power Supply Systems and Equipment Connected thereto
  - » **IEC 61000-4-15** – Electromagnetic compatibility (EMC) – Testing and Measurement Techniques – Flickermeter – Functional and Design Specifications
  - » **EN 50160** – Voltage characteristics of electricity supplied by public electricity networks
- Safety standards:
  - » **IEC 61010-1** – Safety requirements for electrical equipment for measurement control and laboratory use. Part 1: General requirements
  - » **IEC 61010-2-030** – Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: Particular requirements for equipment having testing or measuring circuits
- Standards for electromagnetic compatibility:
  - » **EN 55032** – Electromagnetic compatibility of multimedia equipment – Emission Requirements
  - » **IEC 61000-6-5** – Electromagnetic compatibility (EMC) – Part 6-5: Generic standards – Immunity for equipment used in power station and substation environment



## Standard accessories

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**Seal for voltage and current terminals (set of 2 pcs.)**

WAPOZPLOKPL



**Fork terminal for grounding terminal**

WAZACWID



**8 GB microSD card**

WAPOZMSD8



**Wall mounting kit**

WAPOZUCH17



**LAN network cable, shielded, 1.5 m**

WAPRZRJ451X5EKR



**Factory calibration certificate**

## Optional accessories

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Additional communication protocols\*

Internal transient module\*

Internal SSR relay module\*

Internal 18...60 V DC power supply unit\*

External GPS module with external antenna\*

External GSM LTE module with external antenna\*

External module of additional inputs/outputs\*

External 7" LCD touch panel\*

Calibration certificate with accreditation

\* coming soon