

Network Analyzer / Transient Recorder

Model PQ-Box 200

- ▶ **Fault detection**
- ▶ **Evaluation of power quality according to EN 50160, IEC 61000-2-2/-2-4, IEEE 519, ...**
- ▶ **FFT Analysis up to 20 kHz**
- ▶ **Load analysis; energy measurements**
- ▶ **Transient analysis up to 4 MHz (± 5 kV)**
- ▶ **Ripple control signal analysis**
- ▶ **High-quality Software for all PQ-Boxes**



1. Application

The PQ-Box 200 is a high-performance, portable network-analyser, power meter and transient recorder. User-friendliness was one of the main objectives of the device development.

The PQ-Box 200 has been developed for mobile operation (degree of protection IP65); it is applicable for measurements in public networks (CAT IV) as well as for measurements in industrial environment up to 690V measurement voltage.

The PQ-Box 200 meets 100 % of the demands of the IEC 61000-4-30 Ed. 3 standard for a class-A device:

Parameter	Class
Accuracy of voltage measurement	A
Determination of time intervals	A
Flagging of measured values at events	A
Harmonics, interharmonics	A
Flicker	A
Frequency	A
Voltage unbalance	A
Event recording	A
Time synchronisation	A

Its compact dimension enables the device to be installed in small-sized spaces and switchgear cabinets. The non-conductive housing of the box allows the direct use in the immediate vicinity of current carrying conductors. Through the application-specific

setting of trigger conditions, the device is very easy to operate.

To quickly identify the cause of a grid disturbance, the PQ-Box 200 is equipped with many trigger options.

An USB 2.0 interface and a TCP/IP interface are available for a quick data transfer.

In the case of a supply interruption the integrated UPS continues the operation up to 4 hours.

2. Measurement functions

The PQ-Box 200 is optionally available with Transient measuring circuit board.

▶ **PQ-Box 200**

- Power Analysis
- Data Logger
- Fault Detection
- Online data
- Programmable Trigger for oscilloscope recorder
- Programmable Trigger for 10ms RMS recorder
- Automatic adjustment of the trigger to the measurement signal
- Standard Reports according to EN 50160, IEC 61000 2-2/-2-4, IEEE 519, ...

▶ **Optional 'Transient measuring circuit board' (T1)**

- Programmable sampling frequency of the transient circuit board (200 kHz, 500 kHz, 1 MHz, 2 MHz, 4 Mhz)
- Upgradeable
- Measurement range of transient voltage is ± 5 kV

▶ **Optional 'Ripple control recorder' (R1)**

- Ripple control telegram of voltage and current

We take care of it.

Measurement / Functions	
PQ-Box 200	
Automatic event detection and evaluation standards for: EN 50160 / IEC 61000-2-2 / IEC 61000-2-12 / IEC 61000-2-4 (Class 1; 2; 3) / NRS 048 / IEEE 519 / IEC 61000-4-30 Ed. 3 class A / IEC 61000-4-7 / IEC 61000-4-15	
Continuous recording with user defined interval 1 s ... 30 min (>3.600 parameters)	
Voltage: min. max. average	
Current: min. max. average	
Power: P, Q, S, PF, cos phi, sin phi, tan phi	
Distortion power D	
Energy: P, Q, P+, P-, Q+, Q-	
Flicker (P_{st} , P_{lt} , P_{inst})	
Unbalance of voltage, current (positive-, negative-, and zero-sequence)	
Voltage harmonics according to EN 61000-4-30 Class A	up to 50 th
Voltage harmonics 200Hz frequency bands (IEC 61000-4-7)	2 kHz to 20 kHz
Current harmonics	up to 50 th
Current harmonics 200Hz frequency bands (IEC 61000-4-7)	2 kHz to 20 kHz
Phase-angle of voltage and current harmonics	up to 50 th
THD voltage, current; PWhd, PhC	
FFT calculation of voltages and currents	DC up to 20 kHz
Ripple control signal	100 Hz ... 3 kHz
Frequency	
15/30 min interval – P, Q, S, D, cos phi, sin phi ...	
Online mode for direct reading:	
Oscilloscope recorder	40.96 kHz
3D power triangle for active, reactive, apparent power and distortion power	
Voltage, current harmonics	DC up to 20kHz
Interharmonics (U, I)	DC up to 20kHz
Direction of harmonics & phase angle of harmonics	
Triggerfunctions	
Manual trigger via push button	
RMS level trigger (U, I)	
RMS jump trigger (U, I)	
Phase shift trigger	
Envelope trigger	
Automatic trigger	
Trigger on binary input (0 – 250V AC/DC range with 10V threshold)	
Option ripple signal voltage recorder – Option R1	100 Hz ... 3.7 kHz
Transient recorder (200 kHz; 500 kHz; 1 MHz; 2 MHz; 4 Mhz) – Option T1	4 MHz

3. Design

Suitable for extreme measurement conditions:

- Extremely robust mechanical construction.
- Protection class IP65.
- No moving parts (fans, hard drive).
- Storage can be extended by SD card from the user with up to 32 GB (permitting several years recording).
- Internal UPS bridges the power up to 4 hours

3.1 Evaluating measured data

The following measuring intervals can be recorded simultaneously by PQ-Box 200:

- 200 ms values
- 3 sec values
- N sec values (1 sec to 30 min selectable)
- 10/15/30min power interval

Recorded data is transferred to the analyzing-PC via a high-speed USB interface, TCP/IP interface or via optional WLAN interface.

Powerful, easy to use analysis software is included in the delivery and can be installed on any number of PCs.

3.2 Power Supply

PQ-Box 200 is equipped by an extremely robust power supply unit. The power supply is designed for high noise immunity according to 600 V CAT IV standards and fulfils protection class IP65.

The device may be supplied with electrical energy directly via measurement cables, so there is no need for a power socket.

The following supply voltages are permitted:

- 100 V to 400 V AC
- 100 V to 300 V DC.

3.3 Device Connections



We take care of it.

3.4 Color display

The display of the device provides information about the correct connection of measuring cables and current clamps and indicates online-data of voltage, current, THD and power. Red readings warn of a possible incorrect connection of the device. The number of occurred events as well as the recorded time are shown on the display. In order to prevent tampering with the meter by unauthorized persons, a password protection can lock the display functions and interfaces.

Aufnahme  0d 12:50:45 890 Mb / 796 Mb					Aufnahme  0d 12:50:45 890 Mb / 796 Mb				
	L1	L2	L3	Total	Rekorder				Anzahl
U	222,45 V	241,12 V	231,12 V	1,25 V	Oszilloskoprekorder				54
I	125,25 A	102,54 A	125,24 A	23,12 A	RMS Rekorder				125
				Total	Rundsteuersignale				14
P	21,425 kW	-21,145 kW	22,145 kW	65,452 kW	PQ Ereignisse				458
Phi	25,145 °	65,658 °	68,658 °		Transiente Ereignisse				25
F	50,458 Hz								

3.5 Push buttons

Using the Start/Stop-button the measurement is started or stopped. Any number of measurements can be recorded consecutively, without the need to read out prior recorded data.

The button “manual trigger” enables a “snapshot” of the measured system to be taken with the oscilloscope event recorder and 10ms RMS recorder.

By “scrolling”, a variety of measurement data is indicated on the display. So, the correct connection of the device can be tested.

The button “setup” allows the user to modify, for example, configurations for current- or voltage transformer, the measuring interval or the nominal voltage, directly at the PQ-Box 200, without need for connected PC.

3.6 Time synchronization

While the units feature high accuracy clocks (Class A), where required, the time of different PQ-Box devices can be synchronized via their GPS/DCF77 interface.

3.7 Binary input

One digital input for an external trigger signal is available via two 4mm sockets. This starts Oscilloscope recorders 10ms RMS recorder or Transient recorder. AC/DC signals up to 230 V may be applied with the recorder being set to trigger by a rising or falling edge. The switching threshold is set at 10 V.

3.8 Analog input

An analog input 1 V (AC/DC) is designed for connection of external sensors such as a 5th Clamp for PE flows, a DC current probe or a temperature sensor. The measured signal is freely scalable with the evaluation software and the measurement units can be set arbitrarily.

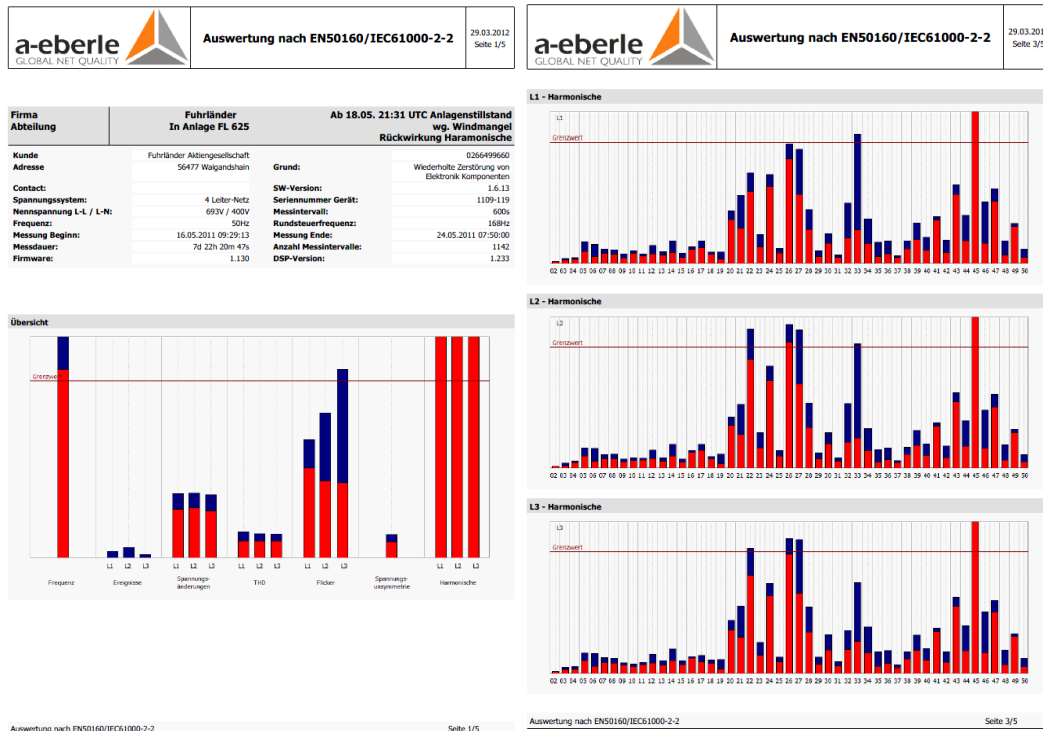
3.9 Data memory

The meter is equipped with a micro-SD card of 8 GB and can use micro-SD memory cards up to 32Gbyte. While 8 GB of memory is sufficient for several months of recording per EN 50160 procedures, the additional memory capability provides for longer term measurements, or for special high speed recording application. The additional SD card can be changed easily by the operator, providing another method for data to be taken from site.

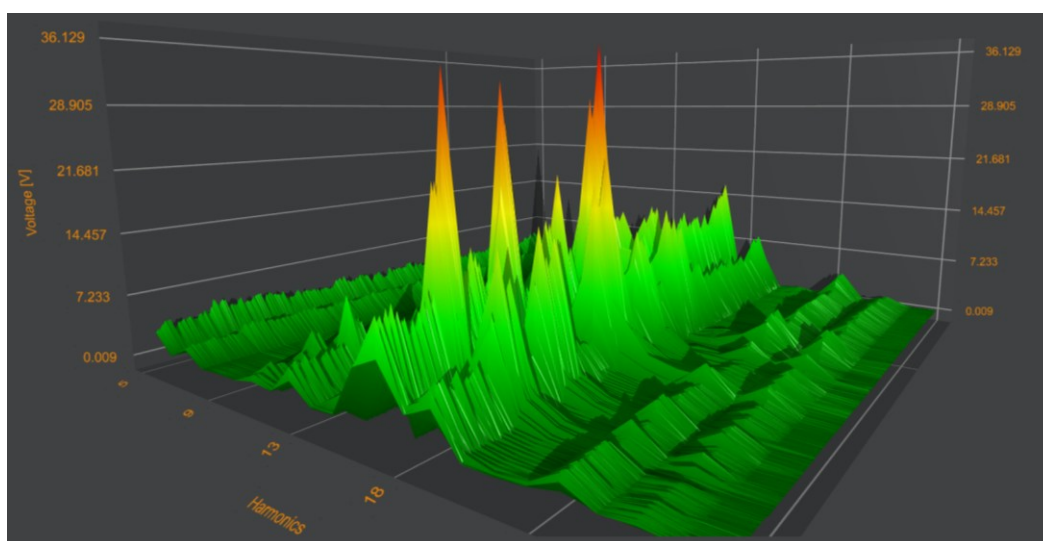
Multiple recording sessions can be recorded consecutively without having to transfer the data to a PC at the end of each recording. At the beginning of a new measurement the free memory is automatically split to reserve space for long-time measurement values and space for event records. The PQ-Box 200 manages the available memory automatically and intelligently.

4. Evaluation and statistics

- Automated reporting in accordance with EN 50160 / IEC 61000-2-2 / -2-12 (public networks), IEC 61000-2-4 (industrial networks), NRS 048, IEEE 519,... or self-defined limits
- Overview of the power quality statistics
- Bar chart provides automatic summary of relevant harmonic
- Company logo in the report and as well as main text fields can be customized



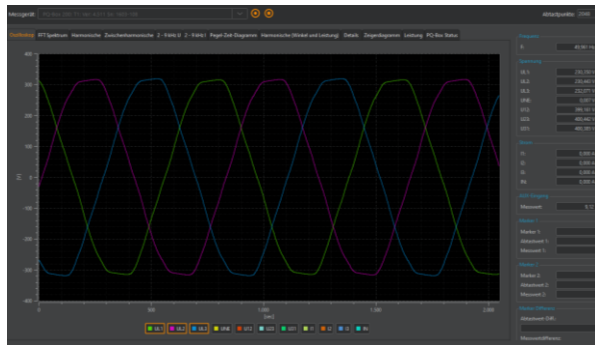
Automatic standard report



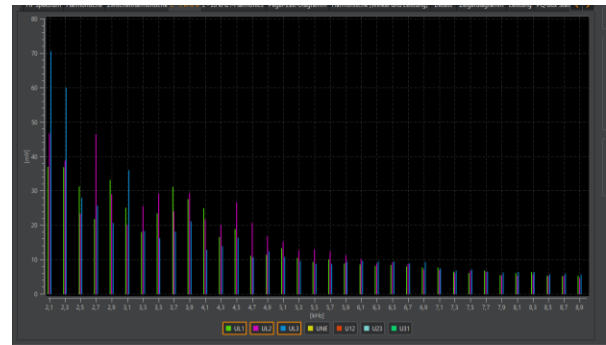
3D frequency analysis of harmonics with time and amplitude

We take care of it.

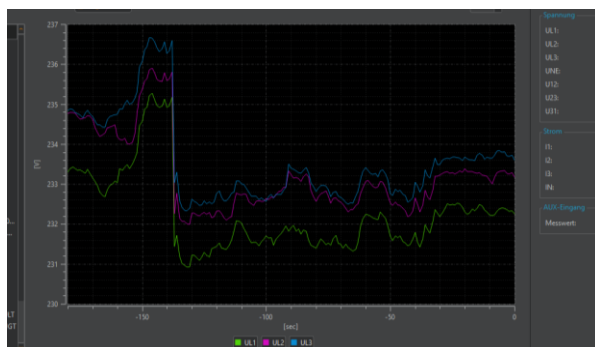
5. Online analysis software



Online oscilloscope with 40.96 kHz



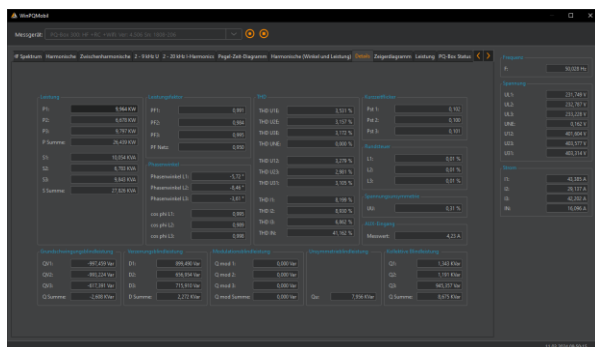
Harmonics (voltage and current up to 20 kHz)



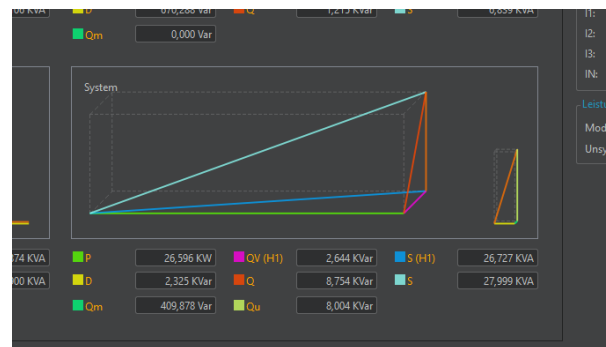
Online time level diagram



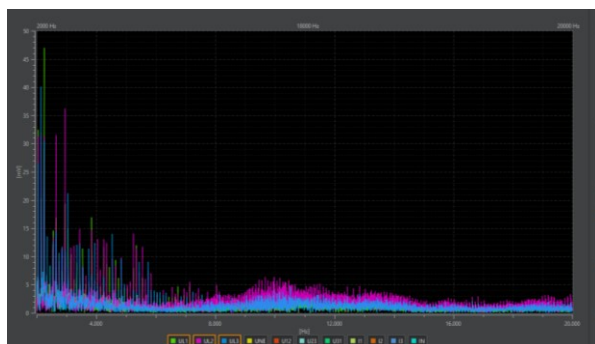
Direction and phase angle of harmonics



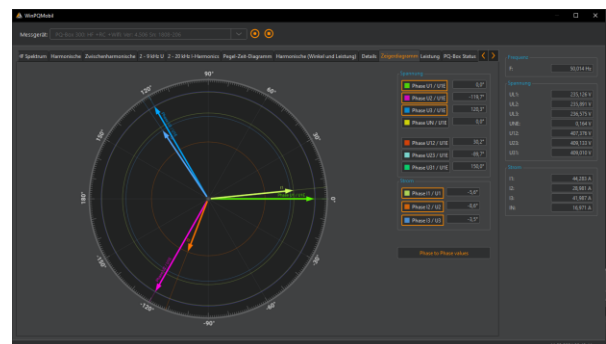
Online measured-values table



Online power-cube



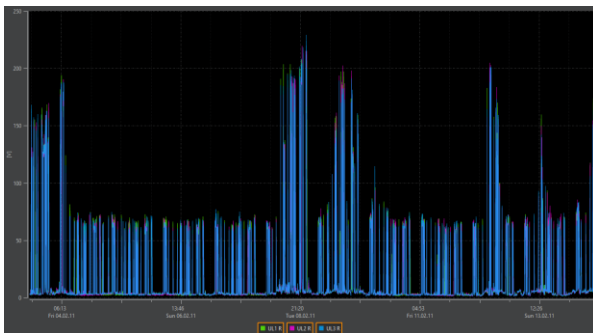
FFT-Analysis DC up to 20 kHz



Online phasor-diagram

6. Analysis of ripple control signals

- Recording an adjustable frequency of 100 Hz to 3 kHz.
- Review of ripple control signals (amplitude, pulse pattern)
- Ripple control signal levels are measured with permanent records.
- The pulse recorder is suitable for evaluation of the ripple control pulse pattern.



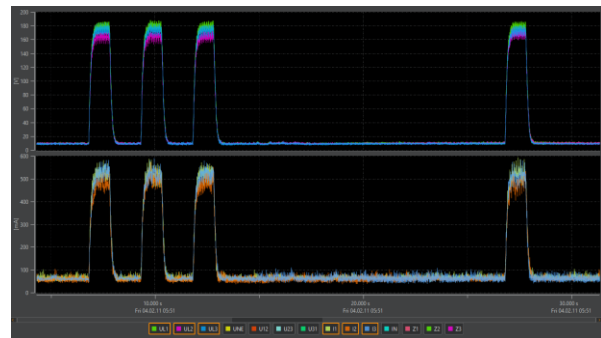
Ripple control level over a few days

Ripple control signal - trigger (Option)

In addition to the ripple control level measurement, using this function it is possible to trigger to a ripple control frequency. The complete message is displayed and disturbances in the signal form can be analyzed.

The following parameters can be set:

- Triggering threshold
- Length of recording
- Ripple control frequency
- Bandwidth of the filter curve



Ripple control telegram of voltage and current

7. Trigger functions

PQ-Box 200 provides many trigger functions for voltage, current and frequency (upper and lower thresholds, RMS step, envelope trigger and phase shift).

- Programmable trigger thresholds
- Programmable recording duration, pre/post time and hysteresis
- Automatic trigger selectable (in case of incorrect parameterization, Trigger values are automatically adjusted by automatic trigger; thereby memory overflow is excluded).
- External trigger by a signal via binary input
- Cross trigger function: The transient recorder can trigger the oscilloscope and RMS recorder

8. Transient circuit board (Option)

The Transient circuit board can either run at 200 kHz, 500 kHz, 1 MHz; 2 MHz or 4 Mhz sampling rate. The measuring range for transient voltages is ± 5 kV. Four voltage channels are recorded: U1E, U2E, U3E and UNE. The Transient circuit board allows high speed transients to be capture with high speed and resolution. The record length of the transient can be set between 16 ms and 320 ms.

We take care of it.

9. Fault records captured with Oscilloscope and 10ms RMS recorders



10 ms RMS record up to 600 s (machine start-up)

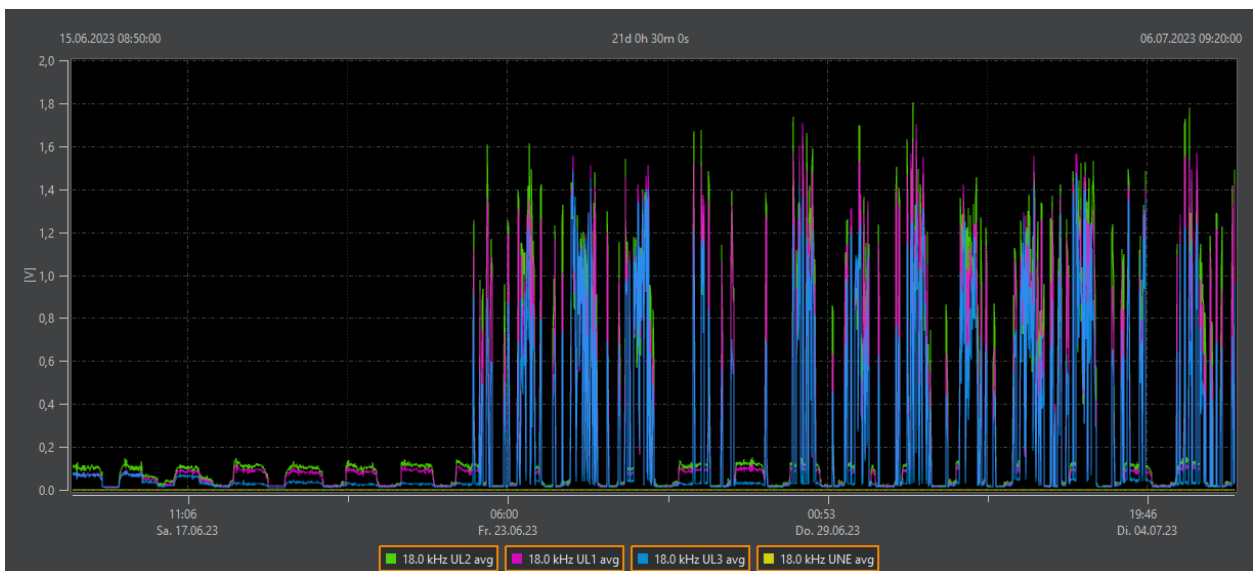


Oscilloscope record up to 4000 ms

10. Continuous recording

More than 3.600 measurement values are recorded continuously at each measurement, which can be evaluated by the software. The following measurement intervals can be recorded **simultaneously**:

- 200 ms values
- 3 sec values
- 10 sec frequency
- N sec values (1 sec to 30 min freely selectable)
- 10/15/30 min power values
- 2 h Long term flicker values



Supraharmonics at 18 kHz

10.1 Technical data

PQ-Box 200 (4U/4I)	
4 voltage inputs (TRMS):	L1, L2, L3, N, PE
Maximum input voltage:	565 V AC/800 V DC L-N 980 V AC/1380 V DC L-L 10 MΩ impedance
4 current inputs (TRMS):	1000 mV input for mini clamp and 330 mV for Rogowski current probes 10 kΩ impedance
AUX input:	1 V AC / 1.4 V DC 10 MΩ impedance
Synchronization to fundamental frequency:	45 Hz to 65 Hz
Measurement intervals:	adjustable from 1 sec to 30 minutes
Data memory:	8 GB standard Up to 32 GByte SD card (optional)
Interfaces:	USB 2.0
Time synchronization:	DCF77 or GPS radio clock
Dimensions:	242 x 181 x 50 mm
Weight:	2.5 kg
Degree of protection:	IP 65
IEC 61000-4-30:	Class A
Accuracy:	< 0.05 %
Insulation class:	CAT III / 600V, CAT IV / 300V
Insulation test	Impulse voltage 6 kV 5 sec 5.4 kV rms 1 min 3.6 kV rms
A/D converter:	24 Bit
Temperature range:	Operation: -20° 60°C Storage: -30° 80°C
Color display:	100 x 60 mm

PQ-Box 200 (4U/4I)

Power supply via external power supply unit (600 V CAT IV):	100 V...400 V AC or 100 V...300 V DC 15 V DC Output 47 Hz to 63 Hz
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The battery provides continuous measurement in case of external power supply failure, for up to 4 hours (3.5 hours for option T1)

EMC

CE-conformity	
● Immunity	
— EN 61326	
— EN 61000-6-2	
● Emitted interference	
— EN 61326	
— EN 61000-6-4	
ESD	
— IEC 61000-4-2	8 kV / 16 kV
— IEC 60 255-22-2	
Electromagnetic fields	
— IEC 61000-4-3	10 V/m
— IEC 60 255-22-3	
Burst	
— IEC 61000-4-4	4 kV / 2 kV
— IEC 60 255-22-4	
Surge	
— IEC 61000-4-5	2 kV / 1 kV
HF conducted disturbances	
— IEC 61000-4-6	10 V, 150 kHz ... 80 MHz
Voltage dips	
— IEC 61000-4-11	100% 1 min
Emitted interference:	
● Housing at a distance of 10 m	30...230 MHz, 40 dB 230...1000 MHz, 47 dB
● AC supply connection at a distance of 10 m	0.15...0.5 MHz, 79 dB 0.5...5 MHz, 73 dB 5...30 MHz, 73 dB

We take care of it.

11. Current measurement accessories

- Standard accessories are automatically recognized by the PQ-Box
- The conversion factor is automatically adjusted for the connected accessory

● Rogowski current clamp 4~: Ident-No. 111.7001

Current range: 5 A to 3000 A RMS; Accuracy: 1 %

Rogowski clamp length = 610 mm;

Diameter = 194 mm; Rogowski clamp head = 9.9 mm

Frequency range: 10 Hz to 20 kHz

● Rogowski current clamp 4~: Ident-No. 111.7006

Current range: 10 A to 6000 A RMS; Accuracy: 1 %

Rogowski clamp length = 910 mm;

Diameter = 290 mm; Rogowski clamp head = 9.9 mm

Frequency range: 10 Hz to 20 kHz

● Mini- Rogowski current clamp 4~: Ident-No. 111.7030

Current range: 2 A to 1500 A RMS; Accuracy: 1%

Rogowski clamp length = 400 mm;

Diameter = 125 mm; Rogowski clamp head = 8.3mm

Frequency range: 10 Hz to 20 kHz

The MU-metal clamp is especially applicable for small current measurements on secondary transformers in medium- and high-voltage networks. High accuracy and small angle errors are combined.

● Mu-Metal Current clamps 3~: Ident-No. 111.7003

Current range: 10 mA to 20 A

Frequency range: 40 Hz to 20 kHz

● Mu-Metal Current clamps 4~: Ident-No. 111.7015

Current range: 10 mA to 20 A/200 A AC RMS (two ranges)

Frequency range: 40 Hz to 20 kHz

● Mu-Metal Current clamps 0...5 A 1~: Ident-No. 111.7043

Current range: 5 mA to 5 A AC RMS

Frequency range: 40 Hz to 20 kHz

Free current adapter set necessary

● AC/DC Current clamp 1~: Ident-No. 111.7020

AC/DC hall sensor clamp. Set with power supply and 2 pcs. 4mm connectors

Current range 60 A/600 A (two ranges)

● Free Adapter set for connecting 4 clamps: Ident-No.: 111.7004

Adapter set for connecting 4 clamps or shunt with 4mm connectors

● Current clamp cable extension: Ident-No.: 111.7025

Cable extension 5 m for current clamps or Rogowski coils.

12. Order details

CHARACTERISTICS	CODE
Fault recorder and network analyzer according to DIN EN 50160 and IEC 61000-3-40 class A Mobile power-quality-network analyzer and power-meter for low-, medium- and high voltage networks according to DIN EN-50160/IEC 61000-4-30 class A 8 GB micro-SD card memory - Slot for SD memory card 1 GB to 32 GB - USB 2.0 and TCP/IP interface - RS232 interface to connect radio clock or GPS clock - Color Display - IP65 rated enclosure - Uninterruptible power supply - USB- and TCP/IP cable set - Connection cable with 4 mm banana plus for voltage (phase connections fused) 5 pcs. Dolphin clips - Hardcase for PQ-Box 200 and accessories - Power supply 15V DC - Evaluation software	PQ-Box 200
Option - Transient measuring circuit board - Ripple control analysis	T1 R1
Operating manual and display language - German - English - French - Spanish - Italian - Dutch - Czech - Russian - Polish	G1 G2 G3 G4 G5 G6 G7 G8 G9
ACCESSOIRES	IDENT-NO.
Network adapter connector socket for 1 ~; 4 mm safety plugs	582.0511
Kensington lock - Lock for PQ-Box 200, 1.8 m length	111.7032
Temperature sensor, air temperature -20...80°C	111.7041
Combination sensor for lighting 0-1400W/m2 and temperature -30...70°C	111.7040
Kit of magnetic voltage taps	111.7008
DCF 77 radio-controlled clock	111.9024.01
GPS radio clock (230 V – RS 232)	111.9024.47
SD memory card, 8 GByte industry-standard	900.9099.4
Replacement battery pack	570.0011



PQ-Box 200, Case, Current Clamps

A. Eberle GmbH & Co. KG

Frankenstraße 160
D-90461 Nuernberg

Tel.: +49 (0) 911 / 62 81 08-0
Fax: +49 (0) 911 / 62 81 08 96
E-Mail: info@a-eberle.de

<http://www.a-eberle.de>

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PQ-Box 200
Information



WinPQ mobil
Software



Video-Tutorials
PQ-Box & WinPQ mobil

