We take care of it.

a-eberle

Mobile Power Quality Analyzers from A. Eberle – Extremely robust and reliable

PQ-Box 50, PQ-Box 150, PQ-Box 200 and PQ-Box 300

- Fault detection
- Data logger for AC-, DC- and mixed signals (Voltage, Current and Power)
- Evaluation of voltage quality according to EN50160, IEC61000-2-2 and IEC61000-2-4
- Permanent frequency analysis up to 170 kHz
- Fully compliant to IEC61000-4-30 Ed. 3, IEC62586-1 and IEC62586-2 Ed. 2 for Class A devices
- Load studies and energy assessment
- Ripple control signal analysis
- Transient analysis

Power Quality

Power Quality in Focus

The increasing spread of switched-mode power-electronics is causing grid reactions in higher frequency ranges.

The switching frequencies of these devices are depending on their rated power. In the range of 30 kW up to 1 MW, frequencies between 2.5 kHz and 8 kHz are applied. At power levels lower than 30 kW, the operating frequency is often much higher. For example, the switching frequency of PV inverters or charging stations of electric vehicles usually lies much higher than 10 kHz. Thus, as a result of the increasing number of switched-mode power-electronics, grid disturbances in the range of 2 kHz to 150 kHz will be steadily increasing.

The PQ-Box family consists of powerful and portable power quality analyzers and transient recorders. Practical and user-friendly operation was in the focus of its development.

In order to trace the grid disturbance fast and properly, the devices provide a wide range of triggering options.

All PQ-Boxes fulfill the requirements and standards according to IEC61000-4-30 Ed.3, IEC62586-1 and IEC62586-2 Ed.2 for Class A devices.

PQ-Box 50 – the extremely universal quality analyzer

Analog input AC/DC	16 Bit A/D converters, sampling frequency 20.48 kHz, FFT-analysis from DC to 10 kHz
Memory	1 GB
Interfaces	USB, WLAN / Wifi
UPS	Integrated – supply up to 2 hours
Protection class	600 V CAT IV
Dimensions	220 x 110 x 40 mm
Power supply	Via measurement cable 88 V ... 500 V AC or 100 V ... 300 V DC

PQ-Box 150 – the allrounder

Analog input AC/DC	24 Bit A/D converters, sampling frequency 20.48 kHz, Frequency analysis
Memory	4 GB standard; SD-Card extendable to 32 GB
Interfaces	USB 2.0, Ethernet TCP/IP, WLAN / Wifi Interface, RS232 (DCF or GPS Clock)
UPS	Integrated – supply up to 4 hours
Protection class	600 V CAT IV / 1000 V CAT III
Dimensions and weight	202 x 181 x 40 mm and 1.0 kg
Power supply	IP65, AC 100 - 440 V; DC 100 - 300 V; 600 V CAT IV
Option B1 IEC61000-4-7 (200 Hz grouping)	2 kHz to 9 kHz recording of voltage and current

PQ-Box 200 – the tool for PQ experts

Analog input AC/DC	24 Bit A/D converters, sampling frequency 40.96 kHz, Frequency analysis from DC to 20 kHz
Free analog input	For the connection of a 5th current clamp (e.g. for PE current measurement) or a temperature probe
Binary input	Record trigger via external AC- or DC-signal (12 - 250 V)
Transients card	4 MHz, range ± 5 kV
Memory	4 GB standard; SD-Card extendable to 32 GB
Interfaces	USB 2.0, Ethernet TCP/IP, WLAN / Wifi Interface, RS232 (DCF or GPS Clock)
UPS	Integrated – supply up to 3.5 hours

PQ-Box 300 – the high frequency tool

Analog input AC/DC	24 Bit A/D converters
Voltage	Sampling rate 409.6 kHz, frequency analysis up to 170 kHz
Current	Sampling rate 40,96 kHz, frequency analysis up to 20 kHz
Free analog input	For the connection of a 5th current clamp (e.g. for PE current measurement) or a temperature probe
Binary input	Record trigger via external AC- or DC-signal (12 - 250 V)
Frequency analysis	Adjustable 200 Hz / 2 kHz frequency bands up to 170 kHz
Transient recorder	Sampling rate 409.6 kHz
Memory	8 GB standard; SD-Card extendable to 32 GB
Interfaces	USB 2.0, Ethernet TCP/IP, WLAN / Wifi Interface, RS232 (DCF or GPS Clock)
IEC61000-4-30 Ed. 3	Class A (prepared for IEC61000-4-3 Ed. 4)
UPS	Integrated – supply up to 3.5 hours

PQ-Box in practical use

All mobile power quality analyzers fulfill protection class IP65 and can be used in harsh environments. Furthermore, the PQ-Boxes can operate in a temperature range of - 20°C to + 60°C.

Measurement

With **PQ-Box 50**, the following sampling intervals can be recorded (unlimited number of values):

- n x sec values (1 sec to 30 min freely selectable)
- 10 sec frequency
- 10/15/30 min power values
- 2 h long-term flicker

The **PQ-Boxes 150, 200** und **300** can record the following sampling intervals (unlimited number of values):

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

Wide-range power supply

The PQ-Boxes do not need an extra power socket for operation. The power can be directly supplied via measurement cables.

- The following voltage ranges are possible:
  100 V to 440 V AC or 100 V to 400 V DC
- The power supply of **PQ-Box 50** is integrated into the device.
- The **PQ-Boxes 150, 200** and **300** are equipped with an external and extremely robust wide-range power supply, which is designed for electrostatical immunity according to 600 V CAT IV and fulfills protection class IP65. Thus, these devices can be supplied via measurement cables and do not need an extra power socket.

Time synchronization

For the correlation of measurement data from different devices, an external time synchronization can be useful. For this purpose, radio clocks for GPS- and DCF77 signals are provided. The PQ-Boxes automatically identify the connected external radio clocks.

# High-quality analysis software **WinPQ mobil**

Characteristics

- Extensive analysis options like load studies or tracing of grid disorders
- Automatic reports according to determined or freely chosen threshold settings
- Comprehensive templates for all common standards in low, medium und high voltage grids as well as industrial grids included
- Online analysis
- Free updates for firmware and analysis software
- **WinPQ mobil** supports the whole unit family **PQ-Box 50, 100, 150, 200** and **300**

Automatic generation of standard reports

With just one click, detailed reports in PDF format can be created. All thresholds according to standards like EN50160, IEC61000-2-2 or IEC61000-2-4 (industrial standard) are already included as templates.

Between 2.800 and 4.200 measurement values (depending on the device) are permanently recorded by the power quality analyzers. All values are based on half-period measurements.
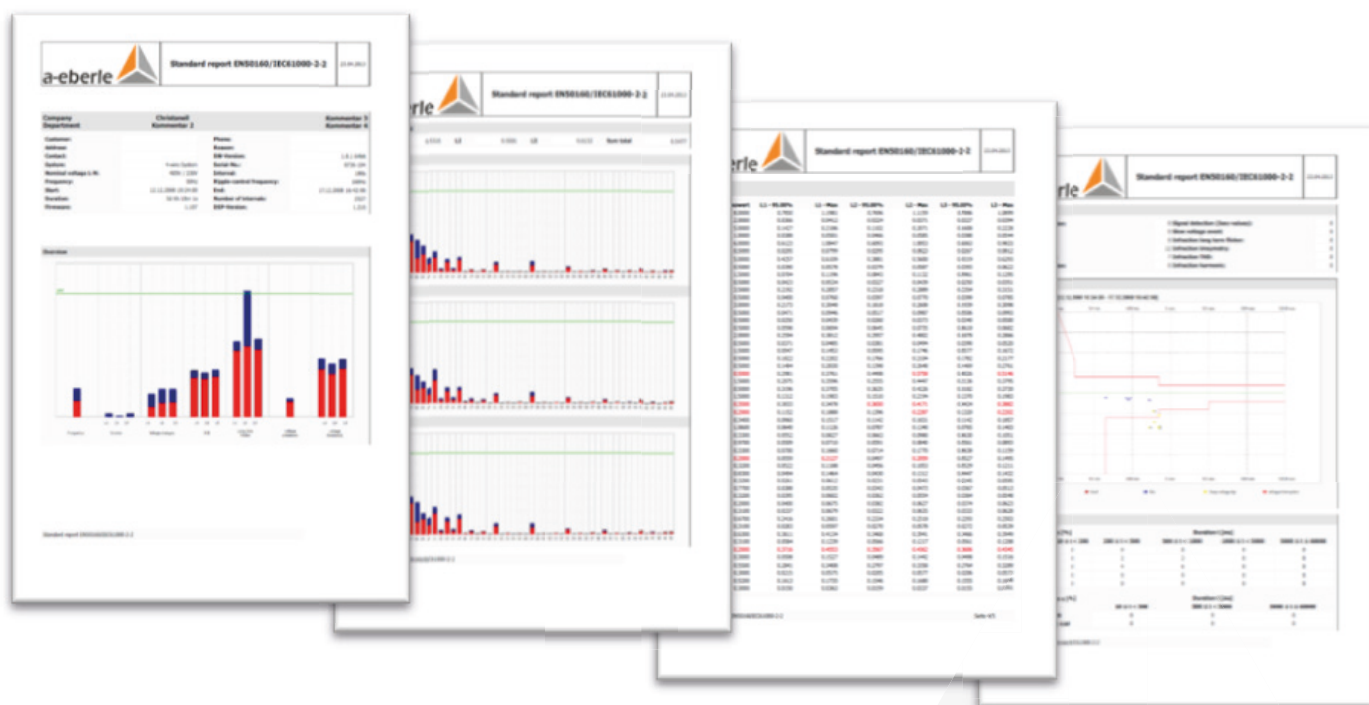
# PQ-Box App for Android & iOS application

Online measurement data & parameterisation of all PQ-Boxes through WLAN/Wifi interface

All PQ-Boxes with integrated WLAN / Wifi interface can be accessed wirelessly through the free PQ-Box App for Android and iOS operating systems. A wide variety of online screens is available. All measuring devices can easily be parameterised via smartphone for example.
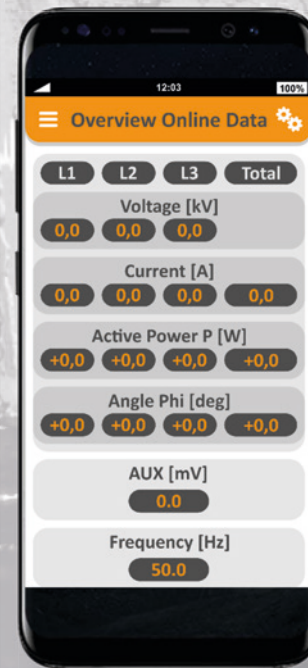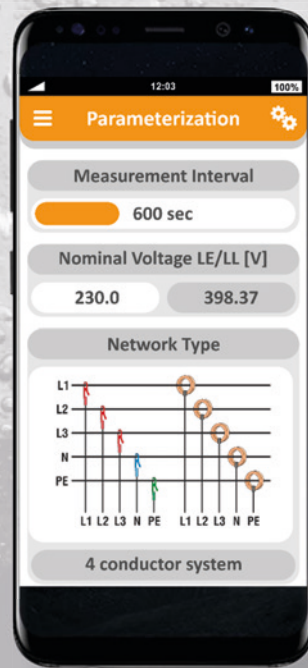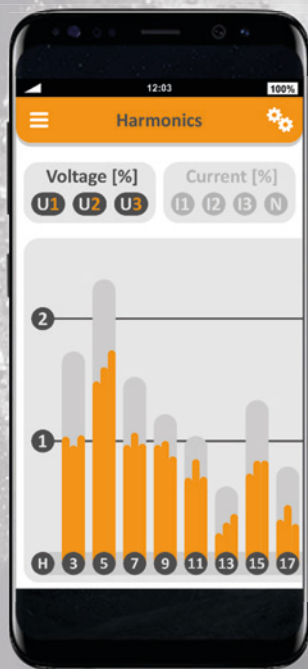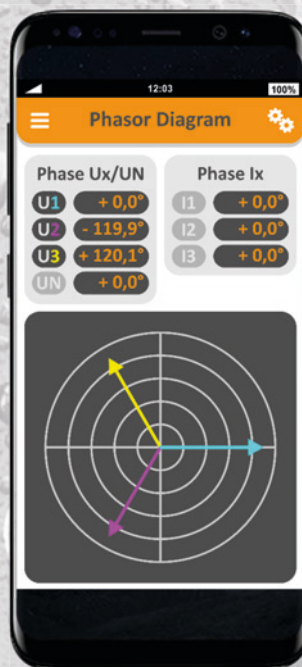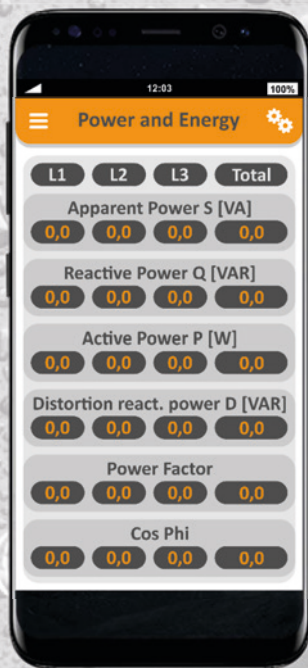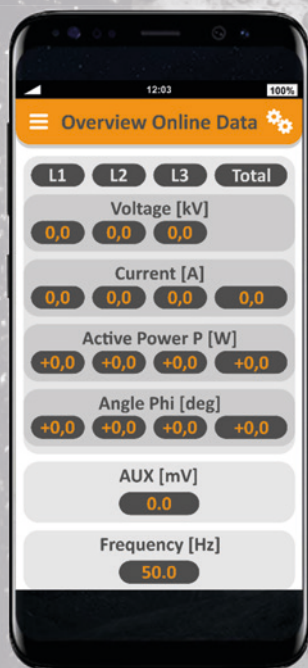
Extreme-values of voltage and current in millisecond-timestamps

Oscilloscope recorder – Extremely high resolution due to 24 Bit A/D converters at the input of all voltage and current channels

3D representation of the voltage level of frequencies up to 170 kHz (PQ-Box 300)

Frequency analysis, online and offline, up to 170 kHz (depending on the used device type)

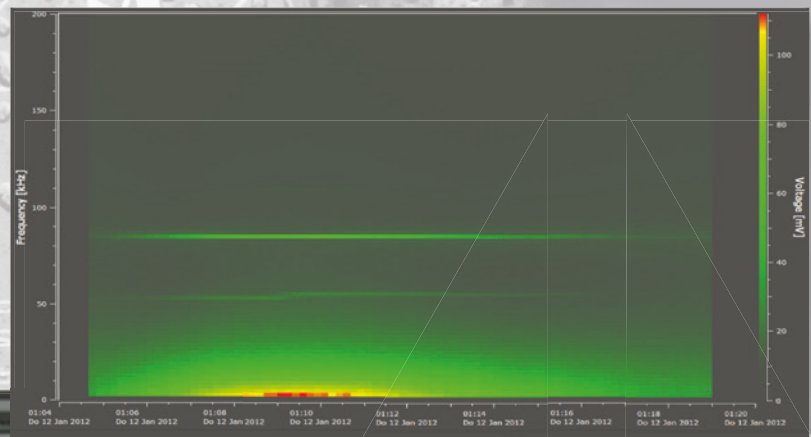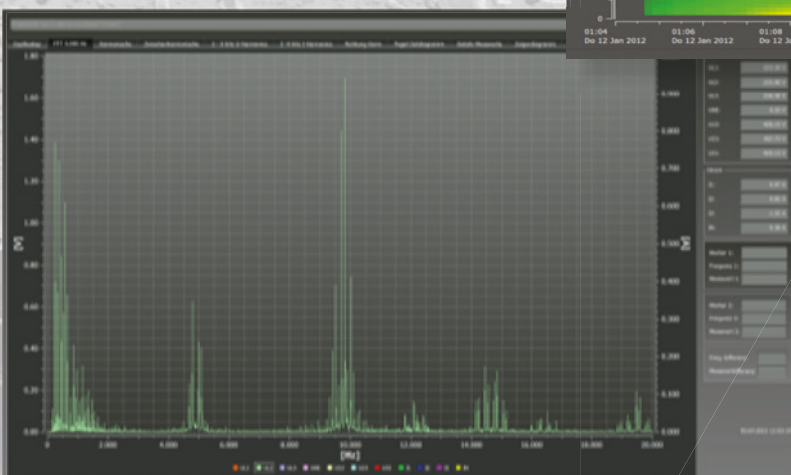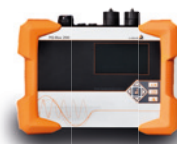| Type Network Analyzer	PQ-Box 50			PQ-Box 150				PQ-Box 200		PQ-Box 300
Option	Basic	Light	Expert	Basic	Basic+	Light	Expert	T0	T1	HF
Data memory in Gbyte (memory optional)	1	1	1	4 (32)	4 (32)	4 (32)	4 (32)	4 (32)	4 (32)	8 (32)
Sampling frequency voltage	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	40,96 kHz	40,96 kHz	409,60 kHz
Sampling frequency current	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	40,96 kHz	40,96 kHz	40,96 kHz
Sampling frequency transient measurement	–	–	–	–	–	–	–	–	4 MHz	409,60 kHz
Input voltage (resolution)	4 (16-bit)	4 (16-bit)	4 (16-bit)	4 (24-bit)	4 (24-bit)	4 (24-bit)	4 (24-bit)	4 (24-bit)	4 (24-bit)	4 (24-bit)
Input current (resolution)	4 (16-bit)	4 (16-bit)	4 (16-bit)	4 (24-bit)	4 (24-bit)	4 (24-bit)	4 (24-bit)	5 (24-bit)	5 (24-bit)	5 (24-bit)
Bridging energy failure	1,5 h	1,5 h	1,5 h	4,0 h	4,0 h	4,0 h	4,0 h	4,0 h	3,5 h	3,5 h
IP protection	IP65	IP65	IP65	IP65	IP65	IP65	IP65	IP65	IP65	IP65
Analog input (1000 mV)	–	–	–	–	–	–	–	•	•	•
Binary input (0 - 250 V AC/DC)	–	–	–	–	–	–	–	•	•	•
Evaluation according to: EN50160 (2016) / IEC 61000-2-2 (2018) /IEC 61000-2-12/IEC 61000-2-4 (Class 1; 2; 3)/NRS048 /IEEE 519/VDE AR-4105	–	•	•	–	•	•	•	•	•	•
Recording free interval 1 sec to 30 min	•	•	•	•	•	•	•	•	•	•
Recording 200 ms interval & 3 sec interval parallel to free interval	–	–	•	–	–	•	•	•	•	•
Voltage, Current: ½ periode min. max. average	•	•	•	•	•	•	•	•	•	•
Power: P, Q, S, PF, cos phi, sin phi, tan phi	•	•	•	•	•	•	•	•	•	•
Distortion-, fundamental reactive-, modulation- and unbalance power	•	•	•	•	•	•	•	•	•	•
Energy: P, Q, P+, P-, Q+, Q-	•	•	•	•	•	•	•	•	•	•
Flicker (Pst, Plt, Pinst)	–	•	•	–	•	•	•	•	•	•
Unbalanced voltage, current; positive sequence/ negative sequence	–	•	•	•	•	•	•	•	•	•
Voltage harmonics according IEC 61000-4-30 Ed. 3 Class A - to 50.	–	•	•	–	•	•	•	•	•	•
Voltage harmonics extreme values 2. to 50. (200 ms RMS)	–	–	•	–	–	•	•	•	•	•
Phase angle of voltage and current harmonics	–	–	•	–	–	•	•	•	•	•
Voltage harmonics 200 Hz frequency bands - 2 kHz to 9 kHz (IEC 61000-4-7)	–	–	–	–	–	–	•	•	•	•
Voltage Supraharmonics 2 kHz - 170 kHz (200 Hz / 2 kHz frequency bands)	–	–	–	–	–	–	–	–	–	•
Current harmonics 2. to 50.	–	•	•	–	•	•	•	•	•	•
Current harmonics extreme values 2. to 50. (200 ms RMS)	–	–	•	–	–	•	•	•	•	•
Current harmonics 200 Hz frequency bands 2 kHz to 9 kHz (IEC 61000-4-7)	–	–	–	–	–	–	•	•	•	•
Phase angle of current harmonics according fundamental of voltage	–	–	•	–	–	•	•	•	•	•
THD U and I ; PWHD U and I ; PHC	•	•	•	•	•	•	•	•	•	•
Frequency spectrum with 5 Hz resolution up to	–	–	10 kHz	–	–	10 kHz	10 kHz	20 kHz	20 kHz	170 kHz
Ripple control signal 100 Hz to 5 kHz (200 ms RMS max value)	–	–	•	–	–	•	•	•	•	•
Frequency, 10 sec, average-. min.- max-value	•	•	•	•	•	•	•	•	•	•
10/15/30 min interval P, Q, S, D, cos(φ), sin(φ), tan(φ) add to other interval	•	•	•	•	•	•	•	•	•	•
Online mode										
Oscilloscope recorder - sampling frequency	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	20,48 kHz	40,96 kHz	40,96 kHz	409,60 kHz
Power triangle 3D of active-, reactive, apparent power and distortion	•	•	•	•	•	•	•	•	•	•
Voltage harmonics and current harmonics	–	•	•	–	•	•	•	•	•	•
Online spectrum analysis	–	–	DC to 10 kHz	–	DC to 10 kHz	DC to 10 kHz	DC to 10 kHz	DC to 20 kHz	DC to 20 kHz	DC to 200 kHz
Voltage harmonics, current harmonics 200 Hz frequency band-2 kHz to 9 kHz	–	–	–	–	–	–	•	•	•	•
Supraharmonics up to 200 kHz (200 Hz or 2 kHz frequency band)	–	–	–	–	–	–	–	–	–	•
Direction of harmonics and phase angle of current harmonics	–	–	•	–	–	•	•	•	•	•
Triggerfunctions (Oscilloscope & ½ Periode RMS recorder)										
Manual trigger via button	–	–	–	–	•	•	•	•	•	•
RMS level trigger (U, I)	–	–	•	–	•	•	•	•	•	•
RMS jump trigger (U, I)	–	–	•	–	•	•	•	•	•	•
½ periode frequency trigger (level; df/dt)	–	–	–	–	•	•	•	•	•	•
Phase shift trigger	–	–	•	–	•	•	•	•	•	•
Envelope trigger	–	–	•	–	•	•	•	•	•	•
Interval-trigger, automatic trigger	–	–	•	–	•	•	•	•	•	•
Trigger on binary input (0 - 250 V AC/DC signal; threshold 10 V)	–	–	–	–	–	–	–	•	•	•
Option R1 Ripple signal voltage and current recorder 100 Hz to 3 kHz	R1	R1	R1	R1	R1	R1	R1	R1	R1	R1
Option S1 WLAN / Wifi interface	•	•	•	S1	S1	S1	S1	S1	S1	S1