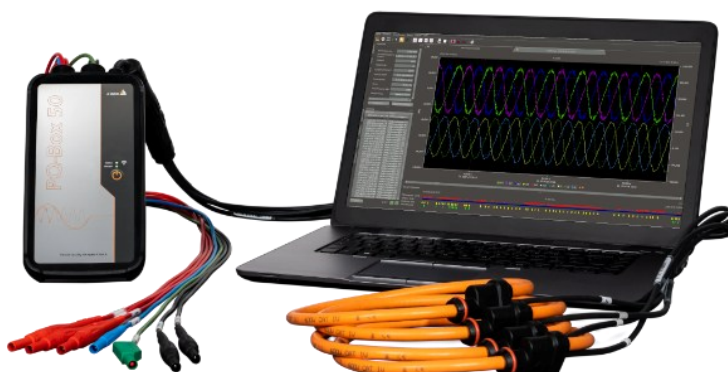


Network Analyzer for Low-, Medium- and High-Voltage Networks

Model PQ-Box 50

- ▶ Load Analysis, Energy Measurement
- ▶ Evaluation of Voltage Quality according to EN 50160 and IEC 61000-2-2 /2-4
- ▶ Fault Recorder Functions
- ▶ Ripple Control Signal Analysis
- ▶ Ripple Control Frequency Measurement



1. Application

The PQ-Box 50 is a powerful, portable Power Quality Analyser for testing the quality of supply according to EN 50160 / IEC 61000-2-2 /2-4 as well as a high-precision power meter e.g. for energy audits according to ISO 50001. The aim was to develop a very compact, robust and easy to use measuring instrument with integrated power supply. The power supply of the power analyser is connected directly via measuring lines.

The PQ-Box 50 has been developed for mobile operation (protection class IP65) and is suitable for measurements in public networks (600V CAT IV) as well as for measurements in industrial environments up to 690 V operating voltage.

The very small dimensions allow installation in small enclosures and control cabinets, even directly next to voltage conducting components. The device is very easy to handle due to the application-specific presetting of all trigger conditions.

The device is equipped with a large number of trigger options in order to quickly locate the cause of mains disturbances.

A fast WLAN and a USB interface are available for data transmission. In the event of a power failure, the built-in, integrated UPS takes over.

Modern power quality analyzers operate according to the IEC 62586 standard, which describes the complete product characteristic of a power quality analyzer. This standard defines not only intended use, the EMC environment, the environmental conditions, but also the exact measurement methods IEC 61000-4-30 - Class A, in order to create a comparable basis for the user.

Devices from different manufacturers that work according to this standard must provide the same

measurement results. According to IEC 62586, the PQ-Box 50 smart is a device of the **PQI-A-PO-H**

Power Quality Interface – Class A – Portable Measurement Device for Outdoor operation in Harsh EMC environments

The PQ-Box 50 meets therefore the full requirements of IEC 61000-4-30 Ed.4 (2025) for Class A measuring instruments for 100% of the parameters.

Parameter IEC 61000-4-30 Ed. 4	Class
Power frequency	A
Magnitude of the Supply Voltage	A
Flicker	A
Supply voltage dips and swells	A
Voltage interruptions	A
Supply voltage unbalance	A
Voltage harmonics	A
Voltage interharmonics	A
Mains signaling voltage	A
Underdeviation and overdeviation	A
Measurement aggregation intervals	A
Time-clock uncertainty	A
Flagging	A
Transient influence quantities	A

2. Measurement functions

The PQ-50 Box is available in different versions:

▶ **PQ-Box 50 basic (B0)**

The device is suitable for performance analyses for energy audits according to ISO 50001, as a data logger for troubleshooting and for online measurements.

▶ **PQ-Box 50 light (B1)**

This version is equipped with manual trigger option for oscilloscope and half-cycle RMS records. Standard evaluations according to EN 50160, IEC 61000-2-2/2-4 for public and industrial power systems are automatically generated.

▶ **PQ-Box 50 expert (B2)**

This version is additionally equipped with comprehensive trigger functions for oscilloscope and half-cycle RMS records.

▶ **Option “Ripple Control Signals” (R1)**

Using this function, triggering to ripple control signaling in the network is possible. These signals can be evaluated by means of software as fast RMS values for voltages and currents.

Each variant can be upgraded afterwards via a license (option).

Depending on the license, the PQ-Box 50 can record over 4,000 different measured values in a continuous recording: voltage, current, frequency, power, energy consumption, unbalance, flicker, harmonics and inter-harmonics. Without limiting the number of parameters, the measurement interval for permanent recording can be set to a minimum of one second.



PQ-Box 50

Option		Basic	Light	Expert
Data memory in Gbyte (memory optional)			1	
Sampling frequency voltage			20.48 kHz	
Sampling frequency current			20.48 kHz	
Sampling frequency transient measurement			-	
Voltage channels (resolution)			4 (16bit)	
Current channels (resolution)			4 (16bit)	
Battery run time in hours			2	
IP protection			IP65	
Analog AUX input (1000 mV)		-	-	-
Binary input (0 - 250 V AC/DC)		-	-	-
Evaluation according to EN50160, IEC 61000-2-2 / 2-12 / 2-4, IEEE519, ...		-	•	•
Recording free measuring interval 1 s to 30 min	Recording 200 ms interval and 3 s interval parallel to free interval	-	-	•
	Voltage: average, half-cycle min and max	•	•	•
	Current: average, half-cycle min and max	•	•	•
	Current transients (I Peak)	-	-	•
	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 to IEC 61000-4-30 Ed. 4 Class A – up to 50th	-	•	•
	Voltage harmonics extreme values 2nd to 50th (200 ms RMS)	-	-	•
	Phase angle of voltage and current harmonics	-	-	•
	Voltage Supraharmonics 200 Hz frequency bands (IEC 61000-4-7)	-	-	2-9 kHz
	Current harmonics 2nd to 50th	-	•	•
	Current harmonics extreme values 2nd to 50th (200ms RMS)	-	-	•
	Current Supraharmonics 200 Hz frequency bands (IEC 61000-4-7)	-	-	2-9 kHz
	Active, Reactive and Apparent Power and Phase Angle of Harmonics	-	-	•
	THD-U and THD-I, PWHD-U and PWHD-I, PHC, TDD	•	•	•
	Frequency spectrum (FFT) with 5 Hz resolution up to	-	-	10 kHz
	Ripple control signal 100 Hz to 3 kHz (200ms RMS max value)	-	-	•
	Frequency, 10 sec, average-, min.- max-value	•	•	•
10/15/30 min interval P, Q, S, D, cos(phi), sin(phi), tan(phi), ...		•	•	•
Online data	Oscilloscope mode - sampling frequency		20.48 kHz	
	Power triangle 3D of active-, reactive, apparent power and distortion	•	•	•
	Voltage harmonics and current harmonics	-	•	•
	Spectrum analysis from 0 Hz to...	-	-	10 kHz
	Voltage harmonics and current harmonics (200 Hz bands)	-	-	2-9 kHz
	Voltage supraharmonics up to 160 kHz (200 Hz bands)	-	-	-
Trigger functions (Oscilloscope / Half-cycle)	Direction of harmonics and phase angle of current harmonics	-	-	•
	Manual trigger via button	-	-	-
	RMS level trigger (Voltage and Current)	-	-	•
	RMS step trigger (Voltage and Current)	-	-	•
	Frequency trigger: under-threshold, over-threshold, change	-	-	•
	Phase shift trigger	-	-	•
	Envelope trigger	-	-	•
	Interval-trigger, automatic trigger	-	-	•
	Trigger on AUX input (differential current, temperature, etc.)	-	-	-
	Trigger on binary input (0 - 250 V AC/DC signal; threshold 10V)	-	-	-
Option RI - Ripple control signal recorder (U,I,Z,Phi) 100 Hz to 3 kHz		RI	RI	RI
Option SI - WLAN / Wi-Fi		•	•	•

3. Design

The robust mechanical design and the IP65 protection class, as well as the fact that there are no rotating parts such as fans or hard disks, make the device suitable for the toughest field use.

The PQ-Box 50 is equipped with a large memory of one GByte. In this way, measured values can be stored for long periods of up to one year without any leaks. In the event of a power failure, an internal UPS bypasses the power supply of the power analyzer for two hours.

No separate socket is required for the power supply - The power supply of the measuring instrument can be tapped directly via the measuring leads.

3.1 Evaluating measured data

Recorded data is transferred to the analyzing-PC via a high-speed WLAN/Wi-Fi or USB interface. The practice-oriented analysis software is included in delivery and can be installed on any number of PCs.

The software provides a wide range of analysis options such as load analyses or the detection of the cause of a grid disturbance. Reports according to EN 50160/IEC 61000-2-2 (2-4) are automatically generated and comprehensive online-functions are available.

Updates of the analysis software can be downloaded via internet free of charge (www.a-eberte.de).

3.2 Device connections



3.3 LED PQ-Box 50



Using the Start/Stop-button the measurement is started or stopped. Any number of measurements can be recorded consecutively, without reading out the device in between.

The WLAN symbol shows the status of the WLAN interface.

3.4 Time synchronization

In order to synchronize measurement data of different devices, time synchronization is essential. For this purpose, the PQ-Box 50 can be synchronized to NTP network with the WLAN interface.

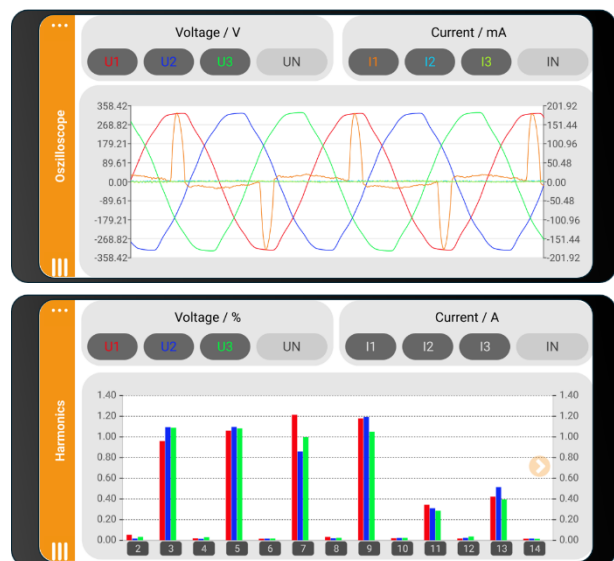
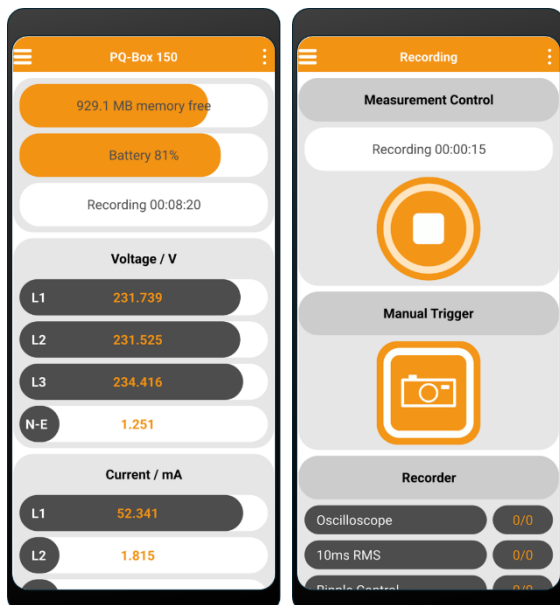
3.5 Memory

The available memory (1 GByte) is organized automatically and smart by the device. Numbers of measurements can be recorded consecutively without having rerecorded the data to a PC.

At the beginning of a new measurement, the free memory is split reasonably for long-time measurement values and recordings.

4. PQ-Box App

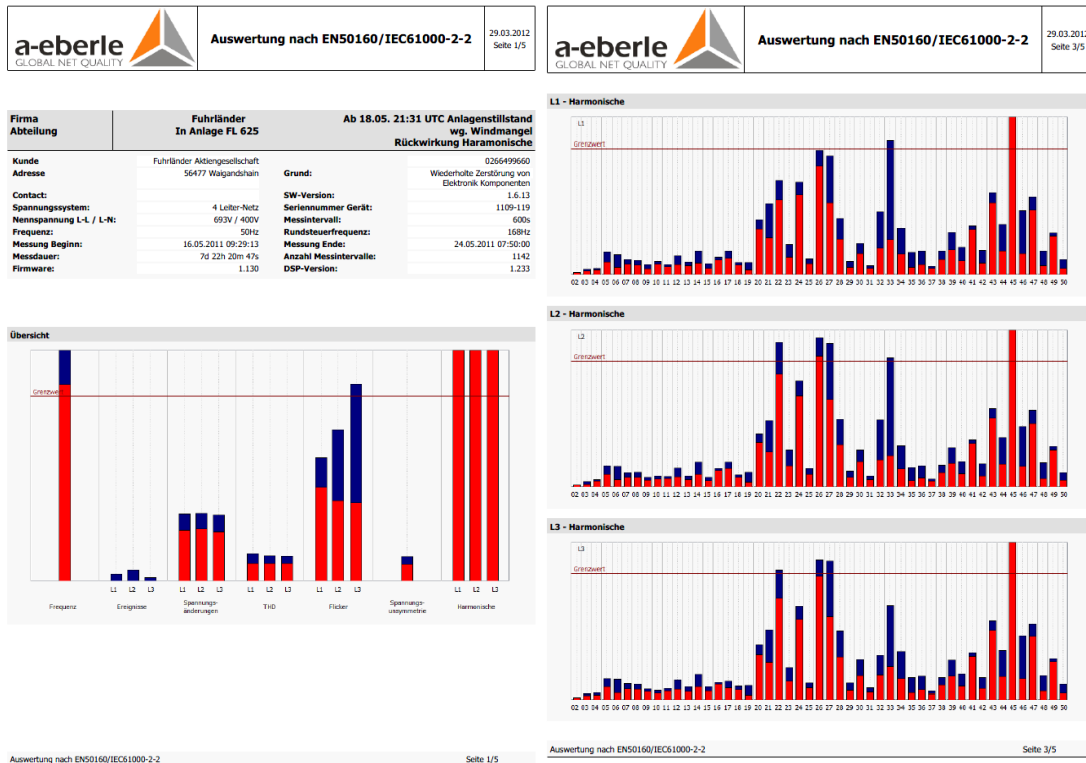
Using the PQ-Box App for Android or iOS operation systems, all measurement values can be displayed on any type of mobile phone. The PQ-Box App provides information about the correct connection of measuring cables and current clamps and indicates online-data of voltage, current, THD and power.



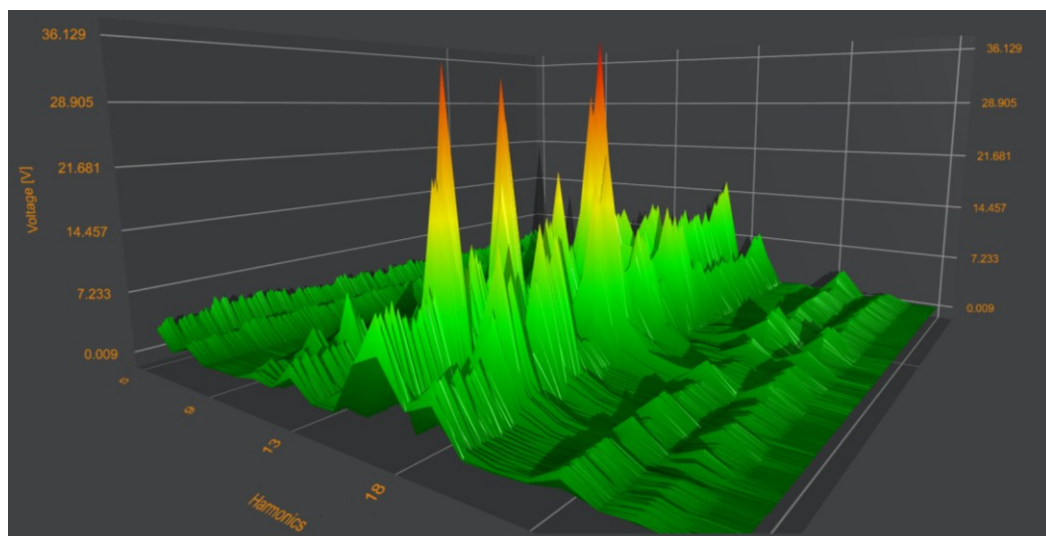
With the setup function of PQ-Box App, many settings of the PQ-Box 50 can be changed without a PC. For example measuring interval, nominal voltage, network type,...

5. Standard evaluation and statistics (Version B1/B2)

- Overview of the power quality statistics. Bar charts provide automatic summary of relevant measures.
- Automated reporting according to EN 50160 / IEC 61000-4-15 / IEC 61000-4-7 / IEC 61000-2-2 / -2-12 (public networks), IEC 61000-2-4 (industrial networks), NRS 048, IEEE 519, or your customized limits.
- Company logo in the report and as well as main text fields can be customized.



Automatic standard report

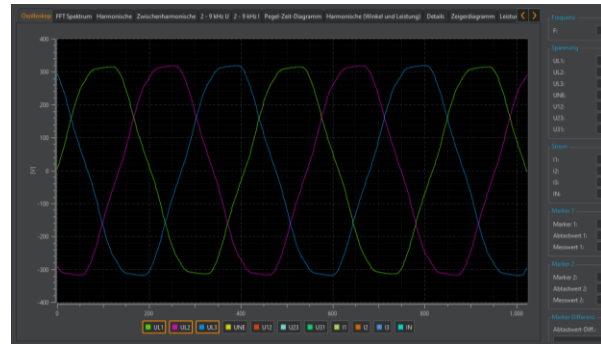


3D frequency analysis of harmonics with time and amplitude

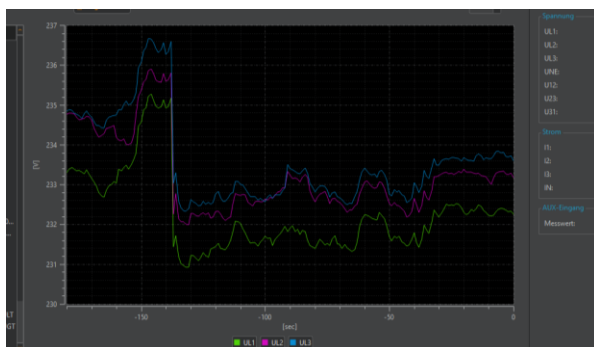
6. Online analysis-software

A comprehensive online analysis-software depicts the actual waveform of the current- and voltage signals as well as harmonics and interharmonics from DC to 10.000 Hz.

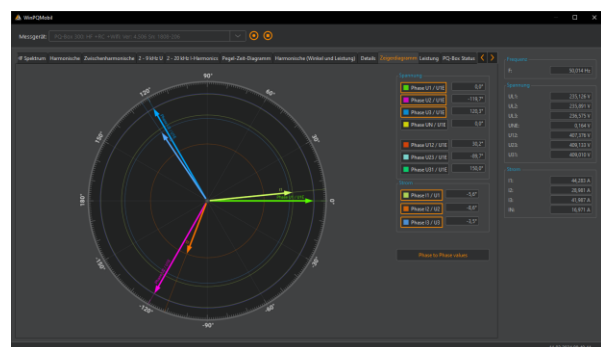
The power flow direction of the harmonics at the measuring point as well as the actual power values (active power, reactive power, distorted reactive power, cos-phi, phase angle, power factor) are displayed.



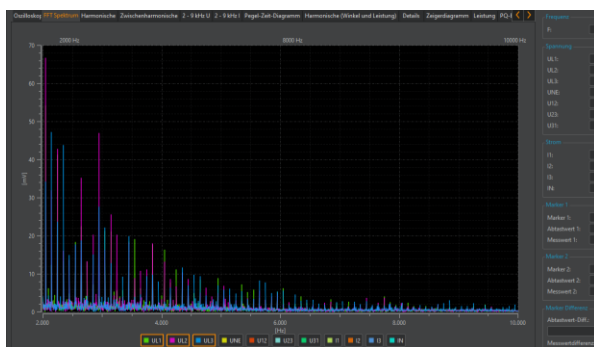
Online oscilloscope-recorder with 20,48 kHz



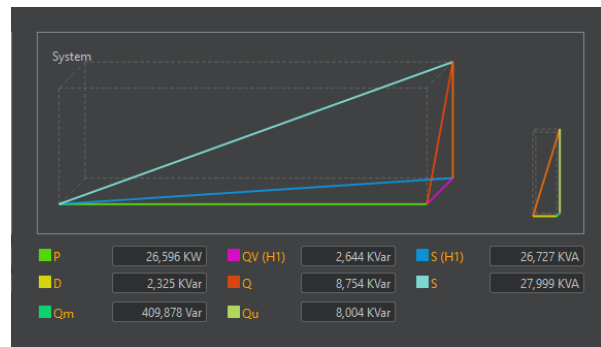
Online time level diagram



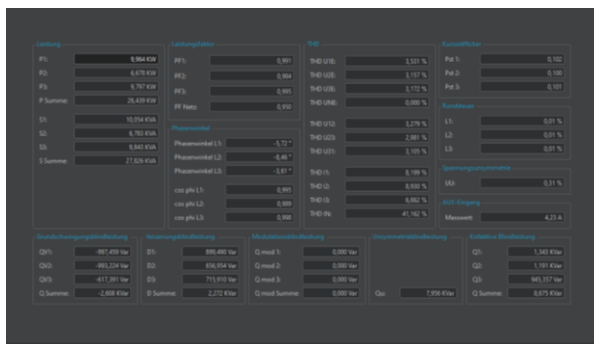
Online phasor diagram



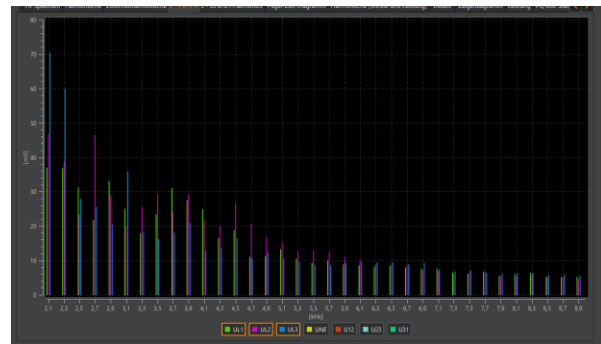
FFT-Analysis DC up to 10.000 Hz



Online power-cube



Online measured-values table



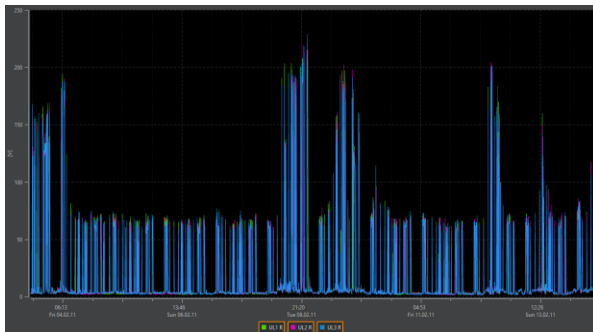
Spectrum voltage and current harmonics up to 9kHz

7. Analysis of ripple control signals

Basic functions:

- Recording an adjustable frequency of 100 Hz to 3.7 kHz
- Review of ripple control signals (amplitude, pulse pattern)
- Ripple control signal levels are measured with permanent records

The ripple control recorder (Option R1) is suitable for recording and evaluating the ripple control pulse pattern.



Ripple control level over a few days

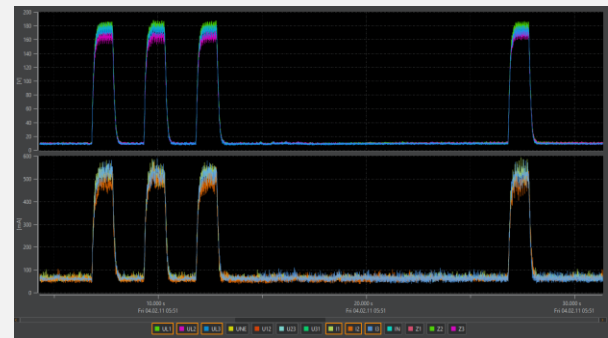
Ripple control recorder&trigger (Option R1)

In addition to the ripple control level measurement, using this function it is possible to trigger to a ripple control frequency. Voltages and currents are recorded up to 210 seconds length.

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

8. Trigger functions

The version "PQ-Box 50 expert" offers comprehensive trigger functions. Triggering thresholds, length of recording and pre-event history of the record can be freely adjusted by the user. If the automatic trigger is activated, an autonomous intervention to each trigger condition and its adjustment to the actual network condition is made by the device. Therefore, an operating error of the trigger setting is impossible.

Trigger conditions for voltage (phase to phase; phase to neutral; neutral to earth)

- Lower/upper threshold
- Voltage step
- Wave shape trigger
- Phase angle step
- Lower/upper threshold frequency
- Frequency step

Trigger conditions for current (L1, L2, L3, neutral)

- Lower/upper threshold
- Current step

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



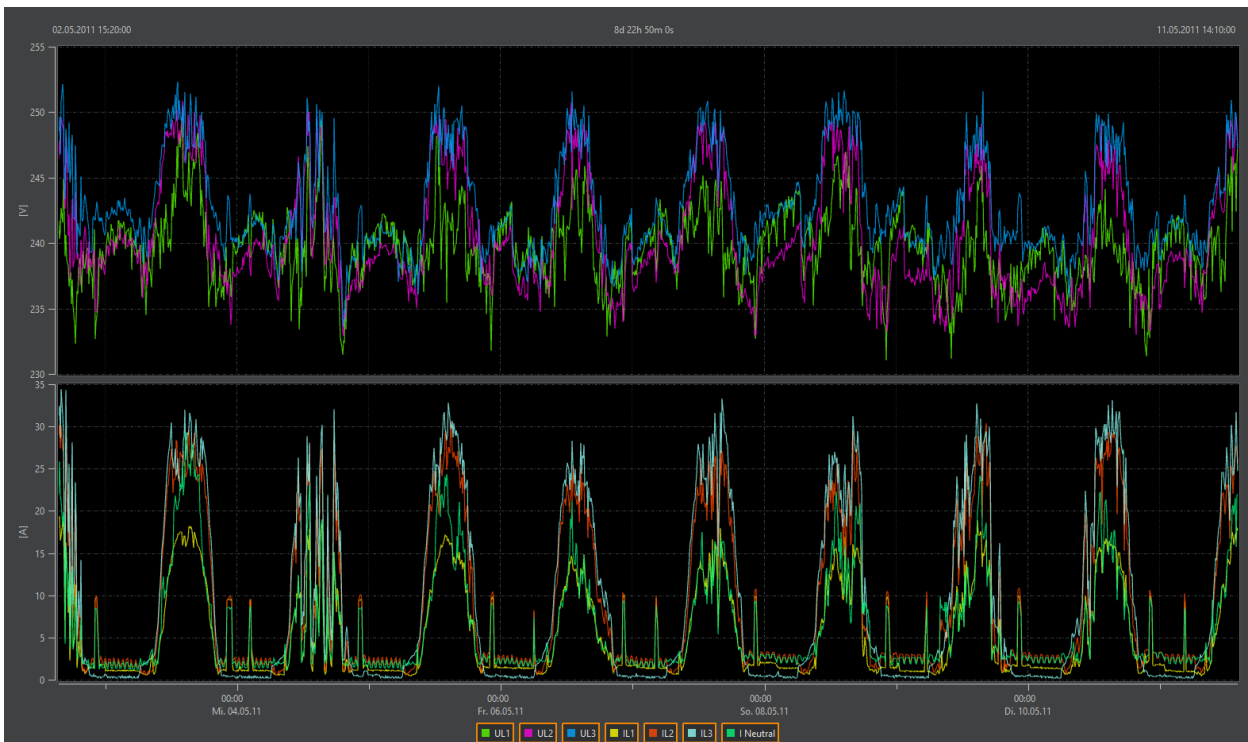
10 ms half cycle record (example machine start-up)



Oscilloscope record with 20.48 kHz

10. Continuous recording

More than 4,000 measurement values are continuously recorded in each measurement. They can be set in relation to each other in the software.



Voltage, current 3-phase + neutral

11. Technical data

PQ-Box 50	
4 voltage inputs	L1, L2, L3, N (E)
Max. input voltage	L-N: 600 V AC / 848 V DC L-L: 980 V AC / 1696 V DC
Input impedance	1,2 MΩ
Measurement error	< 0,1 %
4 current inputs	L1, L2, L3, N
Max. input voltage	
- Current clamps	1000 mV
- Rogowski coils	330 mV
Input impedance	10 kΩ
Measurement error	< 0,1 %
Sampling rate	20,48 kS/s (kHz)
Synchronizing with fundamental frequency	42,5 ... 69 Hz
Measuring interval freely adjustable	1s ... 30min
Storage Capacity	1 GB
Interfaces	USB 2.0 WLAN / WiFi
Time Synchronization	NTP
Dimensions (H x W x D)	220 x 110 x 40 mm
Weight	1 kg
Protection Rating	IP65
IEC 61000-4-30 Ed.4	Class A
Insulation Category	600 V CAT IV
Insulation test	
- impulse:	12,8 kV
- 5s rms:	7,4 kV
A/D converter	16 bit
Temperature range	
- Operation	-20...45°C
- Storage	-30...80°C
Battery run time in hours	2

Internal power supply	
Nominal input voltage	100...400 V AC 100...250 V DC
Operating input voltage	100...440 V AC 100...250 V DC
Frequency range	47...63 Hz
Insulation category	440 V CAT IV
Power consumption	< 8 VA

Electromagnetic Compatibility	
Immunity (CE-Conformity)	EN 61326 EN 61000-6-2
ESD	8 kV / 16 kV
- IEC 61000-4-2	
- IEC 60 255-22-2	
Electromagn. fields	10 V/m
- IEC 61000-4-3	
- IEC 60 255-22-3	
Burst	4 kV / 2 kV
- IEC 61000-4-4	
- IEC 60 255-22-4	
Surge	2 kV / 1 kV
- IEC 61000-4-5	
HF conducted	10 V
- IEC 61000-4-6	150 kHz ... 80 MHz
Magnetic fields	1000 A/m
- IEC 61000-4-8	
Voltage dips	100 % 1min
- IEC 61000-4-11	
Emission (CE-Conformity)	EN 61326 EN 61000-6-4
Housig at a distance of 10m	30...230 MHz, 40 dB 230...1000 MHz, 47 dB
AC power connection at a distance of 10m	0,15...0,5 MHz, 79 dB 0,5...5 MHz, 73 dB 5...30 MHz, 73 dB

12. Order details

When ordering please note:

- Only one of the identifiers with the same capital letter may be selected.
- If the capital letters of the identifier are followed by the number 9, additional information in plain text is required.
- If the capital letters of the identifier follow only zeros, this identifier is not required in the order specification.

CHARACTERISTICS	CODE
Fault recorder and network analyzer according to DIN EN 50160 and IEC 61000-3-40 class A ● 1 GB flash memory ● WLAN/Wi-Fi; USB interface ● IP65 ● Uninterruptible power supply ● USB cable ● 4 Voltage connecting cable with internal power fuse 50kA ● 2 power supply cables with internal power fuse ● 5 Dolphin Clips ● 2 connectors for connecting the power supply leads with the test leads ● Hard case for current clamps and measurement cables incl. analysis software	PQ-Box 50
Version ● PQ-Box 50 (4U/4I) basic ● PQ-Box 50 (4U/4I) light ● PQ-Box 50 (4U/4I) expert ● Option ripple control recorder	B0 B1 B2 R1
Operating manual and display ● German ● English ● French ● Spanish ● Italian ● Polish	G1 G2 G3 G4 G5 G9
ACCESSOIRES	IDENT-NO.
● Power socket adapter, with intl. plugs; 4 mm safety connectors; 250 V; CAT II / 16 A	582.0509
● Set of magnetic voltage taps	111.7008

13. Accessories for current measurement

A. Eberle standard accessories are automatically recognized by the PQ-Box and can be found in the catalog.



Overview of accessories:

www.a-eberle.com/pqmobil-accessories



Accessories catalog + data sheets:

www.a-eberle.de/pq-box-accessories



PQ-Box 50, hard case and current sensors



PQ-Box 50 Information



WinPQ mobil Software



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Video-Tutorials PQ-Box & WinPQ mobil

