

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

Model PQ-Box 150

- ▶ **Fault detection**
- ▶ **Evaluation of voltage quality according to EN 50160 and IEC 61000-2-2 (2-4)**
- ▶ **FFT Analysis up to 10 kHz**
- ▶ **Load analysis; energy measurements**
- ▶ **Ripple control signal analysis**
- ▶ **High-performance software**



1. Application

The PQ-Box 150 is a high-performance, portable network-analyzer, power meter and transient recorder. User-friendliness was one of the main objectives of this device development.

The PQ-Box 150 has been developed for mobile operation (degree of protection IP65). It is applicable for measurements in public networks (up to 600 V CAT IV) as well as for measurements in industrial environment (up to 1000 V CAT IV).

The PQ-Box 150 meets at 100% the demands of the IEC 61000-4-30 Ed.4 (2025) standard for a class-A device:

Parameter	Class
Accuracy of voltage measurement	A
Determination of time intervals	A
Marking of measured values at events	A
Harmonics, Inter harmonics	A
Flicker	A
Frequency	A
Voltage asymmetry	A
Event recording	A
Time synchronization	A

Its compact size enables the device to be installed in small spaces like switchgear cabinets. The non-conductive housing of the box allows direct use in the immediate vicinity of current carrying conductors. Through the application-specific setting of trigger conditions, the device is very easy to handle.

To quickly identify faults, the **600 V CAT IV** PQ-Box 150 is equipped with a large number of trigger options.

A USB interface and a TCP/IP (100 Mbit/s) interface and optionally a WLAN/Wi-Fi interface are available for a fast data transfer.

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

2. Measurement functions

The PQ-Box 150 is available in different variants and with different options. All options can be unlocked later via a license code

▶ **PQ-Box 150**

- Power Analysis
- Data Logger
- Fault Detection
- Online data
- Programmable trigger for oscilloscope-recorder
- Programmable trigger for 10ms RMS recorder
- Automatic adjustment of measurement signal trigger
- Standard reports in accordance with EN 50160, IEC 61000-2-2/-2-4 for public and industrial networks

▶ **Optional "WLAN/Wifi" (S1)**

- WLAN/Wi-Fi interface for wireless communication

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

- Ripple control message of voltage and current



PQ-Box 150

Option		Basic	Basic+	Light	Expert
Data memory in Gbyte (memory optional)		32			
Sampling frequency voltage		20.48 kHz			
Sampling frequency current		20.48 kHz			
Sampling frequency transient measurement		-			
Voltage channels (resolution)		4 (24bit)			
Current channels (resolution)		4 (24bit)			
Battery run time in hours		4			
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	•	•		•
Online data	Frequency spectrum (FFT) with 5 Hz resolution up to	-	-	10 kHz	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), ...	•	•	•	•
Trigger functions (Oscilloscope / Half-cycle)	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	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	-	-	•	•
Option	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	RI
Option SI - WLAN / Wi-Fi		SI	SI	SI	SI

3. Design

Suitable for extreme measurement conditions:

- Extremely robust mechanical construction.
- Protection class IP65.
- No moving parts (fans, hard drive, etc.).
- Internal Micro-SD card storage capacity 32 GB allows several years of recording.
- Internal UPS bridges the power up to 4 hours

3.1 Evaluating measured data

Recorded data is transferred to the analyzing-PC via a high-speed USB interface or TCP/IP interface. Powerful, yet easy to use, analysis software, included in the standard delivery, which can be installed on any number of PCs.

The software provides a wide range of analysis options such as load analysis or the detection of the cause of a grid disturbance. Reports according to EN50160/IEC61000-2-2 (2-4) are automatically

generated and comprehensive online-functions are available.

Updates of the analysis software WinPQ mobil can be downloaded via Internet free of charge. It supports all PQ Boxes.

3.2 Robust power supply

The PQ-Box 150 is equipped with an extremely robust power supply unit. The power supply is designed for high noise immunity of 600V CAT IV and meets the IP65 protection class.

The PQ-Box 150 can be supplied directly via the voltage leads with energy and does not require a socket.

The following supply voltages are permitted:

Nominal input voltage	100...400 V AC 100...300 V DC
Operating input voltage	88...500 V AC 100...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 possible incorrect connection of the device. The number of occurred events, as well as the recorded time period, are shown on the display. In order to prevent tampering with the meter by strangers, a keypad lock can be turned on.

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				
I	125,25 A	102,54 A	125,24 A	23,12 A	RMS Rekorder				
				Total	Rundsteuersignale				
P	21,425 kW	-21,145 kW	22,145 kW	65,452 kW	PQ Ereignisse				
Phi	25,145 °	65,658 °	68,658 °		Transiente Ereignisse				
F	50,458 Hz								

3.5 Push buttons

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

The PQ-Box 150 can be started and operated via the internal battery without a mains supply.

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 number 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 150, without need for connected PC.



3.6 Time synchronization

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

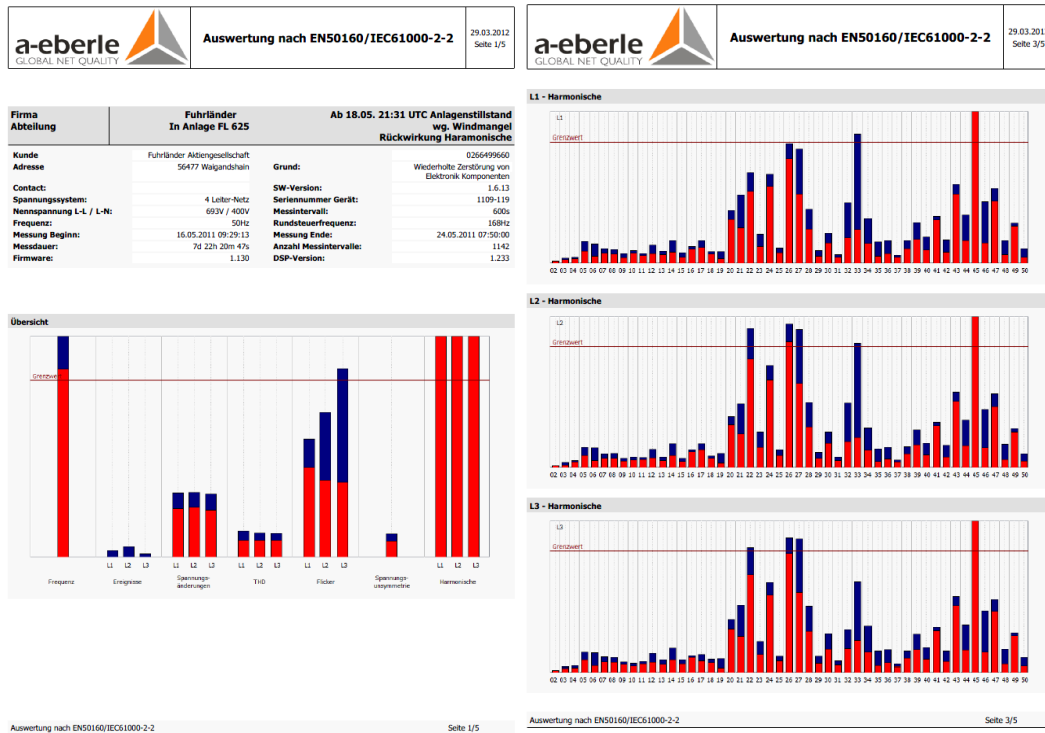
3.7 Data memory

The meter is equipped with a micro-SD card of 32 GB. This 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.

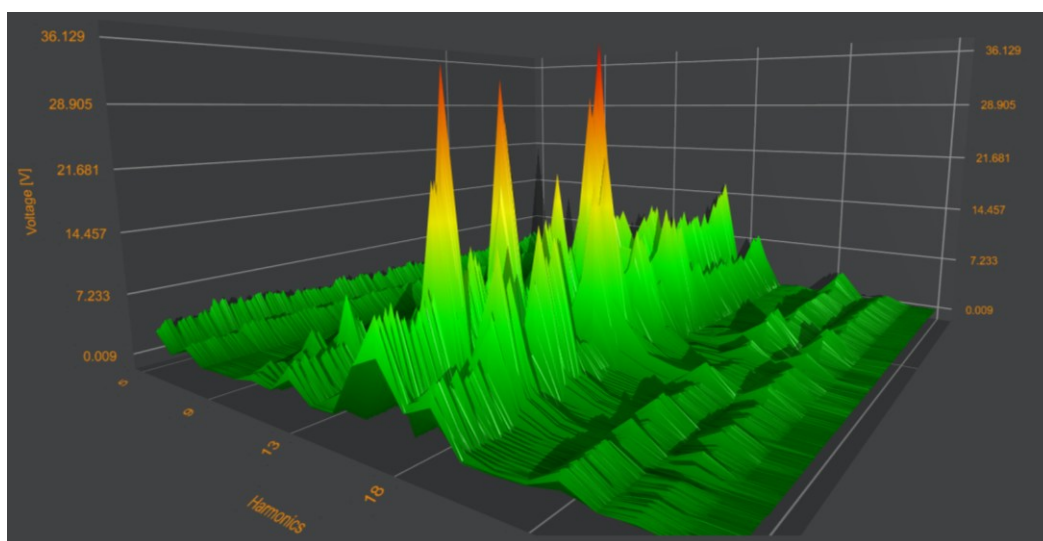
Multiple recording sessions can be recorded consecutively without having to transfer the data to a PC at the end of each recording. At the beginning of a new measurement the free memory is automatically split to reserve space for long-time measurement values and space for event records. The PQ-Box 150 manages the available memory automatically and intelligently.

4. Evaluation and statistics

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



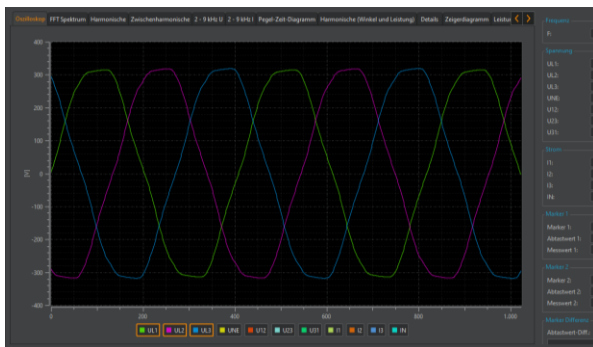
Automatic standard report



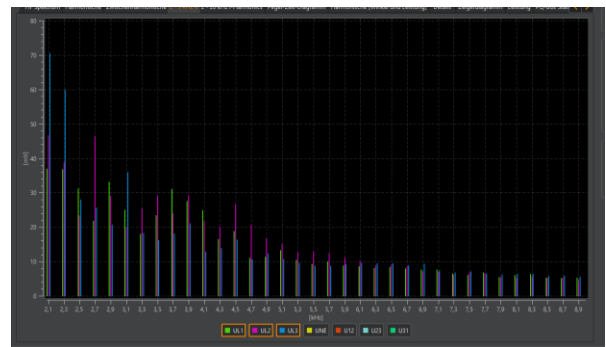
3D frequency analysis of harmonics with time and amplitude

We take care of it.

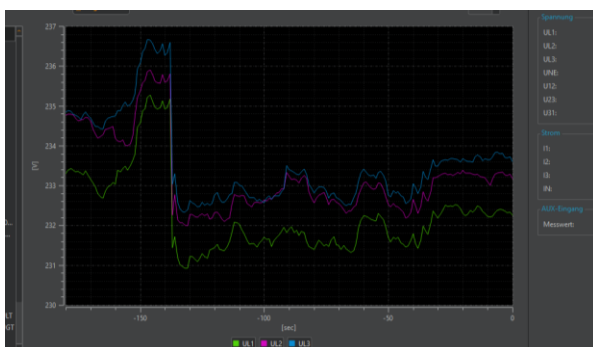
5. Online analysis software



Online oscilloscope with 20,48 kHz



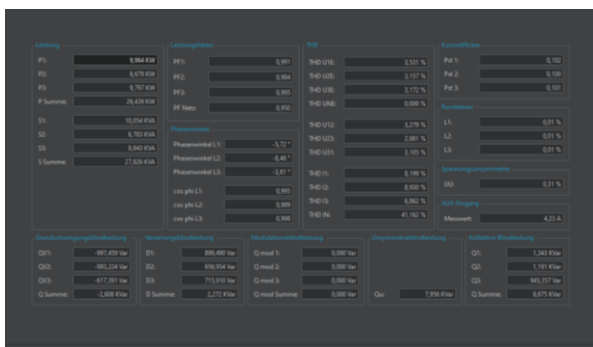
Online harmonics (voltage and current up to 9 kHz)



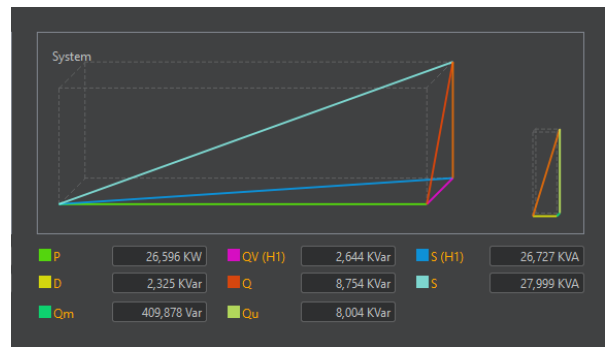
Online time level diagram



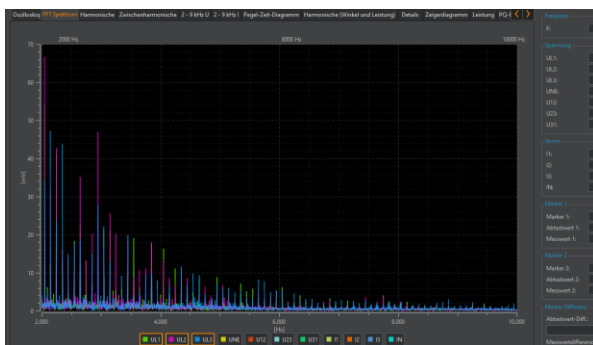
Direction and phase angle of harmonics



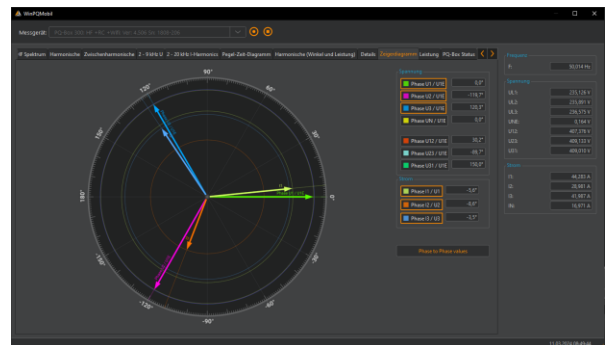
Online measured-values table



Online 3D power-cube



FFT-Analysis DC up to 10 kHz



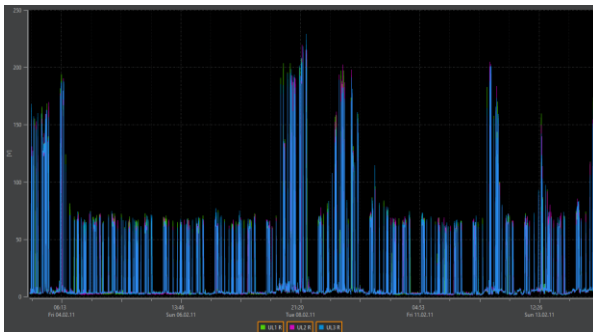
Online phasor-diagram

6. 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

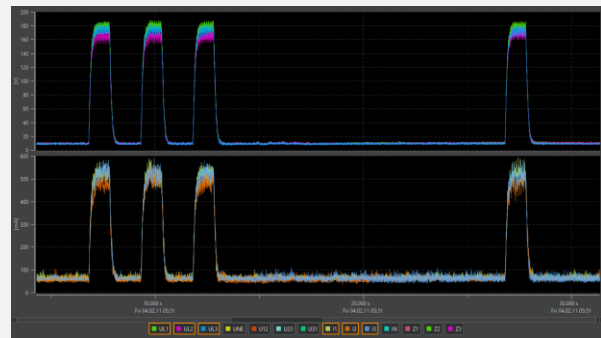
Ripple control recorder&trigger (Option R1)

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

7. Trigger functions

- Comprehensive trigger functions for voltage, current and frequency
- Programmable trigger limits
- Programmable recorders (cyclic data, oscilloscope, 10 ms half cycle, pre-event time, recording length)
- Automatic trigger selectable: the automatic trigger provides an optional but automatic intervention to each trigger condition and adjusts the trigger level to the actual network condition. Therefore, an operating error of setting the trigger level too sensitive and recording too much data is impossible
- Cross trigger function: The oscilloscope recorder triggers the half cycle recorder at the same time
- Interval trigger for fault records at fixed, repetitive intervals

8. Option „IEC 61000-4-7 - 2 kHz to 9 kHz” (B1)

This option allows a permanent frequency measurement of voltage and current in accordance with IEC 61000-4-7 part 2 in the frequency range from 2 kHz to 9 kHz, in addition to the harmonics. The bandwidth is 200 Hz.

All measured values are available in online data and as long-term data. Automated reports and statistics are created from these data.

We take care of it.

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



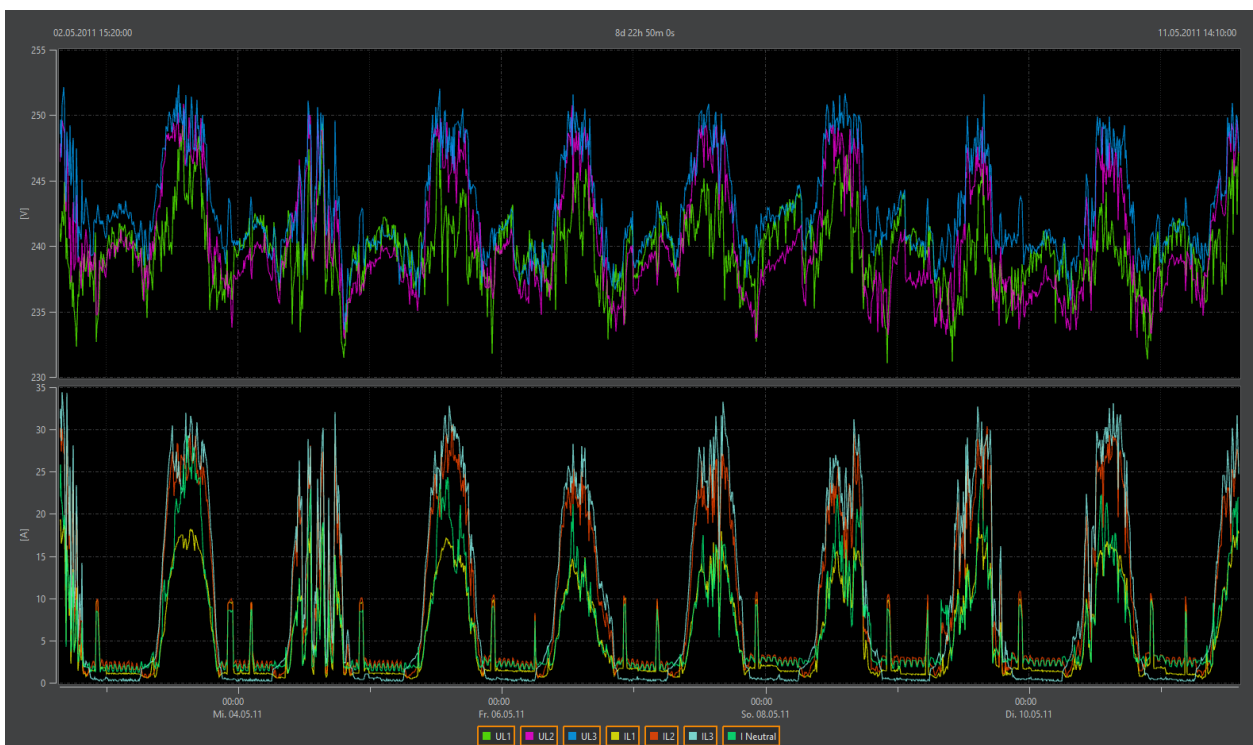
10ms half cycle record (example machine start-up)



Oscilloscope record with 20,48 kHz

10. Continuous recording

More than 3,000 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 150	
4 voltage inputs	L1, L2, L3, N (E)
Max. input voltage	L-N: 565 V AC / 800 V DC L-L: 980 V AC / 1600 V DC
Input impedance	10 MΩ, 5 pF
Measurement error	< 0,05 %
4 current inputs	L1, L2, L3, N
Max. input voltage	
- Current clamps	1000 mV
- Rogowski coils	330 mV
Input impedance	10 kΩ
Measurement error	< 0,05 %
Sampling rate	20,48 kS/s (kHz)
Synchronizing with fundamental frequency	42,5 ... 69 Hz
Measuring interval freely adjustable	1s ... 30min
Storage Capacity	32 GB (micro-SD)
Interfaces	USB 2.0 WLAN/Wi-Fi Ethernet TCP/IP 100 Mbit
Time Synchronization	DCF77 / GPS / NTP
Dimensions (H x W x D)	202 x 181 x 40 mm
Weight	1.4 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	24 bit
Temperature range	
- Operation	-20...60°C
- Storage	-30...80°C
Color display	100 x 60 mm
Battery run time in hours	4

External power supply	
Nominal input voltage	100...400 V AC 100...300 V DC
Operating input voltage	88...500 V AC 100...300 V DC
Frequency range	47...63 Hz
Insulation category	600 V CAT IV
Power consumption	< 10 VA
Output voltage	15 V DC

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. PQ-Box 150 current accessories

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

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

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

Rogowski clamp length = 400 mm;

Diameter = 125 mm; Rogowski clamp head = 8,3 mm

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: 20 A

Frequency range: 40 Hz to 20 kHz

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

Current range: 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 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. 4 mm connectors

Current range 60 A / 600 A (two ranges)

- **Current-shunt 2A: Ident-No.: 111.7055**

Measurement of AC- and DC-currents. Current range = 2 A / 200 mV output signal

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

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

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

Cable extension 5 m for current clamps or Rogowski coils.

13. 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 32 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 plugs for voltage (internal power fuse 50 kA) 5 pcs. Dolphin clips - Hard case for PQ-Box 150 and accessories - Power supply AC/DC - Evaluation software WinPQ mobil	PQ-Box 150
PQ-Box 150 versions - PQ-Box 150 Basic - PQ-Box 150 Basic+ - PQ-Box 150 Light - PQ-Box 150 Expert	B3 B2 B0 B1
Option - WLAN / Wi-Fi interface - Ripple control analysis	S1 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, 1.8 m length	111.7032
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, 4 GByte industry-standard	900.9099.4
Replacement battery pack	570.0011



PQ-Box 150, hard case and accessories

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 99
E-Mail: info@a-eberle.de

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

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PQ-Box 150 Information



WinPQ mobil Software



Video-Tutorials PQ-Box & WinPQ mobil

