a-eberle

Operating Manual

Network Analyzer
PQ-Box 150

Available user manuals:

- Operating manual PQ-Box 150 Hardware (this print version)
- Operating manual WinPQ mobil Software (available as PDF download from our homepage via www.a-eberle.de or via WinPQ mobil software --> Help)

GB

Note:

Please note that this operating manual cannot describe the latest version of the device in all cases. For example, if you download a more recent firmware version from the internet, the following description may no longer be accurate in every point.

In this case, either contact us directly or refer to the most recent version of the operating manual, available on our website (www.a-eberle.de).

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1. User Guidance

1.1 Target group

The User Manual is intended for skilled technicians as well trained and certified operators.

The contents of this User Manual must be accessible to people tasked with the installation and operation of the system.

1.2 Warnings

Structure of the warnings

Warnings are structured as follows:

⚠ SIGNAL WORD	**Nature and source of the danger.** Consequences of non-compliance. ● Actions to avoid the danger.

Types of warnings

Warnings are distinguished by the type of danger they are warning against:

⚠ DANGER!	Warns of imminent danger that can result in death or serious injuries if not avoided.

⚠ WARNING!	Warns of a potentially dangerous situation that can result in death or serious injuries when not avoided.

⚠ CAUTION!	Warns of a potentially dangerous situation that can result in fairly serious or minor injuries when not avoided.

NOTICE:	Warns of a potentially dangerous situation that if not avoided could result in material or environmental damage.

1.3 Tips

Tips on the appropriate device use and recommendations.

1.4 Other Symbols

Instructions

Structure of instructions:

✋ Guidance for an action.

→ Indication of an outcome, if necessary.

Lists

Structure of unnumbered lists:

- List level 1
  - List level 2

Structure of numbered lists:

1) List level 1
2) List level 1
   1. List level 2
   2. List level 2

1.5 Applicable documentation

For the safe and correct use of the product, observe the additional documentation that is delivered with the system as well as the relevant standards and laws.

1.6 Keeping

Keep the user manual, including the supplied documentation, readily accessible near the system.

1.7 Updated documentation

The most recent versions of the documents can be obtained at https://www.a-eberle.de/de/downloads.

2. Safety Instructions

2.1 Safety instructions

✋ Follow the operating instructions.

✋ Keep the operating instructions with the device.

✋ Ensure that the device is operated only in a perfect condition.

✋ Never open the device.

✋ When opening the battery compartment, disconnect the power supply.

✋ Ensure that only qualified personnel operate the device.

✋ Connect the device only as specified.

✋ Ensure that the device is operated only in the original condition.

✋ Connect the device only with recommended accessories.

✋ Ensure that the device is not operated outside the design limits. (See the technical data)

✋ Ensure that the original accessories are not operated outside the design limits.

✋ For measurements in short circuit resistant systems, ensure that voltage taps with integrated fuses are used.

✋ Do not use the device in environments where explosive gases, dust or fumes occur.

✋ Clean the device only with commercially available cleaning agents.

⚠ DANGER!	**Danger to life due to electric shock!** If the device is used in a way not specified by the equipment producer, the device protection will be impaired. ✋ Observe safety instructions

2.2 Meaning of the symbols used on the device

Nature and source of the danger! Read the safety instructions inside the manual!

Voltage ground

USB-interface

TCP-IP interface

CE marking guarantees compliance with the European directives and regulations regarding EMC

The unit is fully protected by double or reinforced insulation.

IP65

6X = Protection against dust

Protection against water **X5** = Protection against water jets from any angle

AC voltage

DC voltage

30V

Maximum allowed RMS voltage against earth potential

CAT IV

Category IV

3. Scope of Delivery/Order Codes PQ-Box 150

3.1 Scope of Delivery

- PQ-Box 150
- User Manual
- Case
- 3 red dolphin clips, 1 blue dolphin clip, 1 green dolphin clip
- 3 high-load fuses integrated in voltage leads
- USB cable, Ethernet cable
- AC socket adapter with country-specific adapters
- Wide range power supply with 2 x 4 mm safety plugs and integrated high-load fuses
- 2 pcs. 4mm safety connectors (to staple power supply and voltage leads to one dolphin clip)

3.2 Order Codes

The following device options are available for the PQ-Box 150 device and can be activated at any time via a license code.

▶ **Optional “WLAN-Wifi” (S1)**

-WLAN-Wifi interface for wireless communication with PQ-Box 150.

With a licence code, the PQ-Box 150 can be upgraded with option S1

▶ **Optional “Ripple control recorder” (R1)**

- Used for triggering and recording ripple control signals for voltages and currents.

With a licence code, the PQ-Box 150 can be upgraded with ripple control recorder.

Network Analyzer	PQ-Box 150			
Option	**Basic**	**Basic+**	**Light**	**Expert**
Measurement functions				
Voltage: ½ periode min. max. average	x	x	x	x
Current: ½ periode min. max. average	x	x	x	x
Power: P, Q, S, PF, cos phi, sin phi, tan phi	x	x	x	x
Distortion-, fundamental reactive-, modulation- and unbalance power	x	x	x	x
Energie: P, Q, P+, P-, Q+, Q-	x	x	x	x
Flicker (Pst, Plt, Pinst)		x	x	x
Unbalanced voltage, current; positive sequence/ negative sequence/		x	x	x
Voltage harmonics according IEC 61000-4-30 Ed. 3 Class A - bis 50.		x	x	x
Voltage harmonics extreme values 2. bis 50. (200ms RMS)		-	x	x
Phase angle of voltage harmonics		-	x	x
Voltage harmonics 200Hz frequency bands - 2 kHz bis 9 kHz		-	-	x
Supraharmonics 2 kHz to 170 kHz (200Hz / 2kHz frequency bands)		x	x	x
Current harmonics 2. bis 50.		-	x	x
Current harmonics extreme values 2. to 50. (200ms RMS)		-	-	x
Current harmonics 200 Hz Frequenzbänder 2 kHz bis 9 kHz		-	x	x
Phase angle of current harmonics according fundamental of voltage		-	x	x
P, Q, S, cos phi of harmonics	x	x	x	x
THD U and I ; PWHD U and I ; PHC	-	-	10kHz	
Frequency spectrum with 5Hz resolution up to:			x	x
Ripple control signal 100 Hz to 5 kHz (200ms RMS max value)	x	x	x	x
10/15/30 min interval P, Q, S, D, cos phi, sin phi *(additional to other intervals)*	x	x	x	x
Online mode				
Oscilloscope recorder - sampling frequency	20,46kHz			
Power triangle 3D of active-, reactive, apparent power and distortion	x	x	x	x
Voltage harmonics and current harmonics		x	x	x
Interharmonic groups (U, I)		x	x	x
Voltage harmonics and current harmonics 200 Hz frequency band - 2 kHz bis 9 kHz		-	-	x
Supraharmonics up to 170kHz (200Hz or 2kHz frequency band)		-	x	x
Triggerfunctions (Oscilloscope & ½ Periode RMS recorder)				
Manual trigger via button	-	x	x	x
RMS level trigger (U, I)	-	x	x	x
RMS jump trigger (U, I)	-	x	x	x
½ periode frequency trigger (level; df/dt)	-	-	x	x
Phase shift trigger	-	-	x	x
Envelope trigger	-	-	x	x
Interval-trigger	-	-	x	x
Automatic-trigger	-	-	x	x

With a licence code, the PQ-Box 150 can be upgraded from lower version to a higher version.

3.3 Technical data PQ-Box 150

4 voltage inputs (TRMS): Maximum input voltage: Input Impedance:	L1, L2, L3, N, PE 565V AC/800V DC L-N 980V AC L-L 1600V DC L-L 10 MΩ impedance
4 current inputs (AC/DC): Impedance:	1000 mV-input for Rogowski 330mV for current clamps 10 kΩ
Sampling frequency:	20,48 kHz
Synchronisation fundamental frequency:	45 Hz bis 65 Hz
Measurement intervall:	Free from 1 sec to 30 min
Memory Mikro-SD card (industrie standard):	4 GByte standard Optional bis 32 GByte
Interface:	USB 2.0 TCP/IP 100Mbit
Time synchronisation:	DCF77 or GPS clock (RS232)
Abmessungen:	202 x 181 x 40 mm
Weight:	1,0 kg
IP protection:	IP 65
IEC 61000-4-30 (Ed. 3):	Klasse A
Accuracy voltage and current input:	< 0,1%
Category:	CAT IV / 600V
Overvoltage	Pulse voltage = 12,8 kV 5 sec = 7,4 kV rms
A/D converter:	24 Bit
Temperature:	Funktion: -20° ….60°C Storage:-30°….80°C
TFT-display:	100 x 60 mm
Power supply:	15V / < 10VA

Measurement quantity	Error limits according IEC 61000-4-30, Class A
Fundamental oscillation: r.m.s.	±0.1% of U_{din} over 10% ~ 150% of U_{din}
Fundamental oscillation: Phase	± 0.15° over 50% ~ 150% of U_{din} over f_{nom} ±15%
2nd ... 50th harmonic	±5% of display over U_m = 1% ~ 16% of U_{din} ±0.05% of U_{din} over U_m < 1% of U_{din}
2nd .... 49th interharmonic	±5% of display over U_m = 1% ~ 16% of U_{din} ±0.05% of U_{din} over U_m < 1% of U_{din}
Frequency	± 5mHz over f_{nom} ±15% (f_{nom} = 50 Hz / 60 Hz)
Flicker, Pst, Plt	±5% of display over 0.02% ~ 20% of ΔU / U
Dip residual voltage	±0.2% of U_{din} over 10% ~ 100% of U_{din}
Dip duration	±20 ms over 10% ~ 100% of U_{din}
Swell residual voltage	±0.2% of U_{din} over 100% ~ 150% of U_{din}
Swell duration	±20 ms over 100% ~ 150% of U_{din}
Interruption duration	±20 ms over 1% ~ 100% of U_{din}
Voltage asymmetry	±0.15% over 1% ~ 5% of display
Ripple control voltage	±5% of display over U_m = 3% ~ 15% of U_{din} ±0.15% of U_{din} over U_m = 1% ~ 3% of U_{din}

4. External power supply

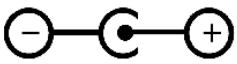
4.1 Requirement external power supply

Maximum power consumption incl. Backlight PQ-Box 150	Output power supply: Voltage: 15V DC Current: 0,58A

⚠ **CAUTION!**	**Device protection** In order not to reduce the device protection class and surge strength of the network analyzer, the following requirements must be met by the external power supply. If these details are reduced, so the entire PQ-Box is reduced to this lower requirement.

IP protection	IP 65
Temperature	Function: -20° ….60°C Storage: -30°….70°C
Overvoltage category	EN61010-1 600V / CAT IV
surge	12kV 1,2/50 ysec
AC voltage	7,4kV 5 sec

Polarity of the external voltage supply with 15V DC



4.2 External power supply

Scope of Delivery PQ-Box 150:

- AC socket adapter with country-specific adapters (582.0509)
- Wide range power supply with safety plugs and integrated high-load fuses (111.7069)
- 2 pcs. 4mm safety connectors (582.2037)

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 can be supplied with energy directly at the measurement place and does not require a socket. The following voltage ranges for the power supply are possible: 100V to 440V AC or 100V to 300V DC.

In fuse carrier only 6.3mm x 32mm, 3 A, F, fuses are allowed, with a shut-off value of 50kA. Only fuses with the identical data must be used.

Suggestion: SIBA, Part.no. 7009463; 3AF

With two short adapter cables, the user has the option to staple the wide range power supply and the voltage leads the network analyzer to one dolphin clip.

Socket adapter with 4 mm safety banana plugs for voltage Measurement or connection of the wide range power supply at a socket.

⚠ CAUTION!	**Damage to power supply due to under- or overvoltage**
	✋ supply device only with 100-440 V AC voltage. ✋ supply device only with 100-300 V DC voltage. ✋ do not supply the device directly from highly disturbed voltages. (for. example, a frequency inverter output / caution at high transients or high sampling frequency)

5. Accessories for current measurement

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

5.1.1 Rogowski current clamps

- **Rogowski current clamp 4~: Ident-No. 111.7001**
- **Rogowski current clamp 4~: Ident-No. 111.7006**

Model 111.7001/6

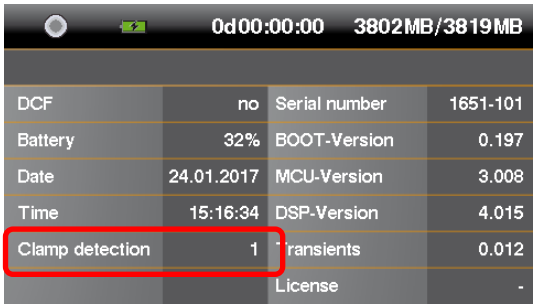
Model	**111.7001 Pro Flex 3000 4~**	**111.7006 Pro Flex 6000 4~**
Current range	3,000 A AC RMS	6,000 A AC RMS
Measurement range	0-3300 A AC RMS	0-6,600 A AC RMS
Output voltage	85 mV / 1000 A	42.5 mV / 1000 A
Frequency range	10 Hz to 20 kHz	10 Hz to 20 kHz
Isolation voltage type	600 V AC / DC CAT IV	600 V AC / DC CAT IV
Accuracy **(20 °; 50 Hz)**	<50 A/0.1 % of the full scale value 50-3000 A/1.5 % of the measured value	<100 A/0.1 % of the full scale value 100-6000 A/1.5 % of the measured value
Angle error **(45-65 Hz)**	<50 A/2.5 ° 50-3000 A/1 °	<100 A/2.5 ° 100-6000 A/1 °
Position accuracy	<50 A/0.2 % of the full scale value 50-3000 A/1.5% of the measured value	<100 A/0.1 % of the full scale value 100-6000 A/1.5% of the measured value
Long Rogowski coils	610 mm	910mm
Diameter clamp head	9,9mm	9,9mm

- **Mini- Rogowski current clamp 4~: Ident-No. 111.7085**

Current range: 500A RMS; Accuracy: 1%
Rogowski clamp length = 220mm;
Diameter = 70mm; Rogowski clamp head = 6mm
Frequency range: 10Hz to 50kHz

Automatic current clamp factor detection.

In this example the PQ-Box set the clamp factor to 1



5.1.2 Current clamps

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 Mini-Current clamps 3~: Ident-No. 111.7003**

Current range: 10mA to 20A

Frequency range: 40Hz to 20kHz

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

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

Frequency range: 40Hz to 20kHz

Model 111.7015

Measurement range	**20 A measurement range**	**200A measurement range**
Current range	20 A AC RMS	200 A AC RMS
Measurement range	100 mA to 20 A RMS	1 A to 200 A RMS
Output voltage	10 mV/A	1 mV/A
Frequency range	40 Hz to 20 kHz	40 Hz to 20 kHz
Isolation voltage type	600 V AC	600 V AC
Accuracy	100 mA- 10 A/1.5 % of the measured value 10-20 A/1 % of the measured value >20 A/1% of the measured value	10-40 A/<2 % of the measured value 40-100 A/<1.5 % of the measured value 100-200 A/<1 % of the measured value
Angle error	100 mA- 10 A/2 ° 10-20 A/2° >20 A/2°	10-40 A/<2 ° 40-100 A/<1.5 ° 100-200 A/<1 °

200 A Measurement range (111.7015)

Adjustment of the power converter factor to x10. For the clamp with two ranges the automatic factor detection of the PQ-Box does not work for the second.

▶ Mu-Metal Mini-Current clamp 0…5A 1~: Ident-No. 111.7043

Current range: 5mA to 5A AC RMS

Frequency range: 40Hz to 20kHz

Free current adapter set necessary

▶ AC/DC Current clamp 1~: Ident-No. 111.7094

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

Current range 60A/600A (two ranges)

Model 111.7094

Measurement range	**AC/DC 60 A**	**AC/DC 600 A**
Current range	60 A DC / 40A AC RMS	600 A DC / 400A AC RMS
Measurement range	200 mA to 60 A RMS	600 A RMS
Output voltage	10 mV/A	1 mV/A
Frequency range	DC to 10 kHz	DC to 10 kHz
Isolation voltage type		
Accuracy	0.5-40 A/<1.5 % +5 mV 40-60 A/1.5 %	0.5-100 A/<1.5 % +1 mV 100-400 A/<2 % 400-600 A(DC only)/<2.5 %
Angle error	10-20 A/<3 ° 20-40 A/<2.2 °	10-300 A/<2.2 ° 300-400 A/<1.5 °

600 A Measurement range (AC/DC)

Adjustment of the power converter factor to x10

5.1.3 Accessories for current measurement

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

Adapter set for connecting 4 clamps or shunt with 4mm connectors. 2m length

Power conversion factor

Current conversion correction factor; the default is 1 A/10 mV

Example:

If you use a current clamp with a 500 A to 500 mV range, it is necessary to change the CT ratio in the setup of the device to “10x”.

⚠ CAUTION!	**Damage to the device from external current clamps**
	✋ Do not use clamps with A or mA output
	✋ Avoid input voltages at the current inputs greater than 30 V

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

Cable extension 5 m for current clamps or Rogowski coils.

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

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

6. Intended use

The product is exclusively for the measurement and evaluation of voltages and currents. The current inputs are mV-inputs.
✋ Observe safety instructions
✋ Ensure that the device is not operated above the rated data

7. Description

The Network Analyzers PQ-Box 150 & 200 are suitable for analysis in low, medium and high-voltage networks. They meet all the requirements of the measurement equipment standard IEC61000-4-30 Ed. 3 class A.

Functions:

→ Voltage quality measurements according to EN50160, IEC61000-2-2 and IEC61000-2-4 for low and medium voltage networks

→ Fault recorder functions

→ Load analyses; energy measurements

→ Ripple control signal analysis

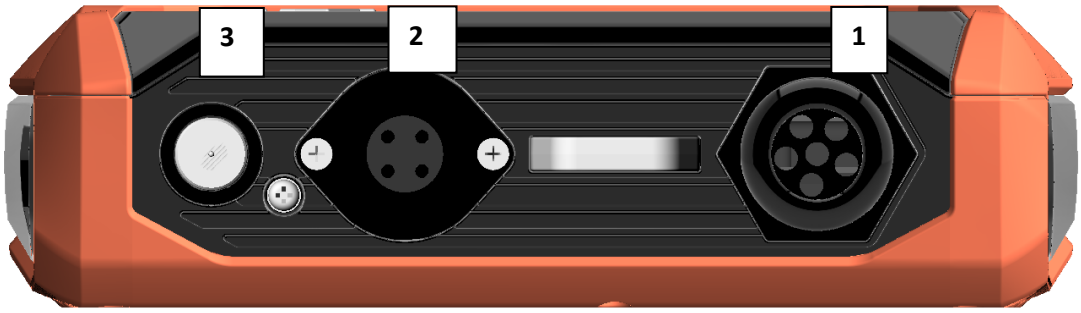
→ Transient analysis

8. Hardware PQ-Box 150

8.1 PQ-Box 150 Hardware

8.1.1 Overview PQ-Box 150

Top panel view



1) Securely connected voltage inputs

   L1 (red + label L1)
   L2 (red + label L2)
   L3 (red + label L3)
   N (blue + label N)
   Measurement ground (green + label E)

⚠ **DANGER!**	**Danger to life due to electric shock!** The maximum voltage of the blade (green) must not exceed the requirement of 600V against earth ✋ Ensure that the device is not operated above the rated data

⚠ **CAUTION!**	**Damage to measurement voltage with overvoltage** ✋ Connect device to maximum DC voltage of 565V AC / 800V DC L-N. ✋ Connect device to maximum AC voltage of 980V AC / 1380V DC L-L.

2) Current clamp connection (7-pin plug)
3) 15 V DC power supply

Front panel - keypad

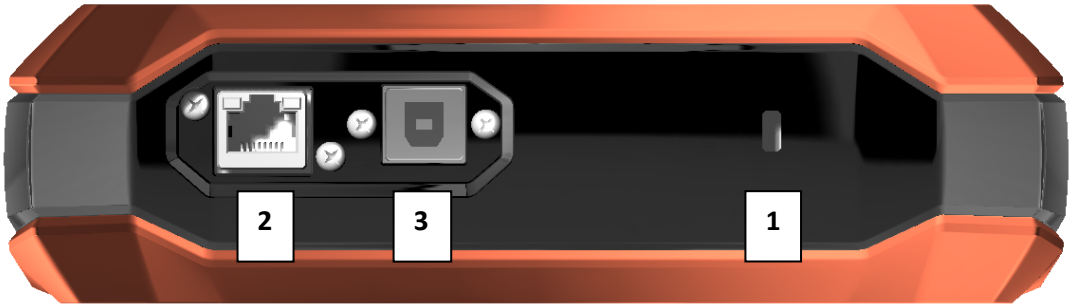
Measurement Start / Stop

Manual trigger

Setup

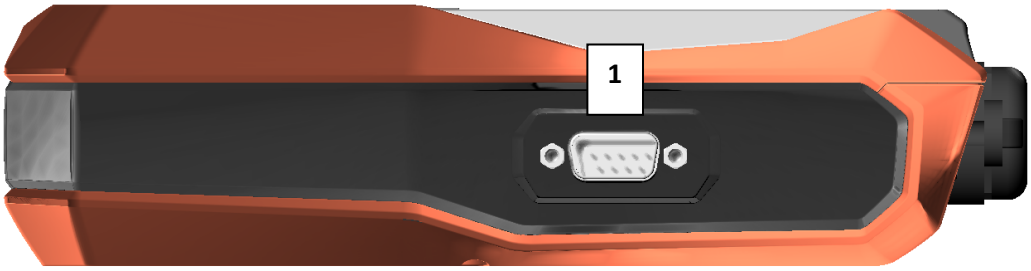
Panel with 5 keys for scrolling and changing setup parameters

Bottom view



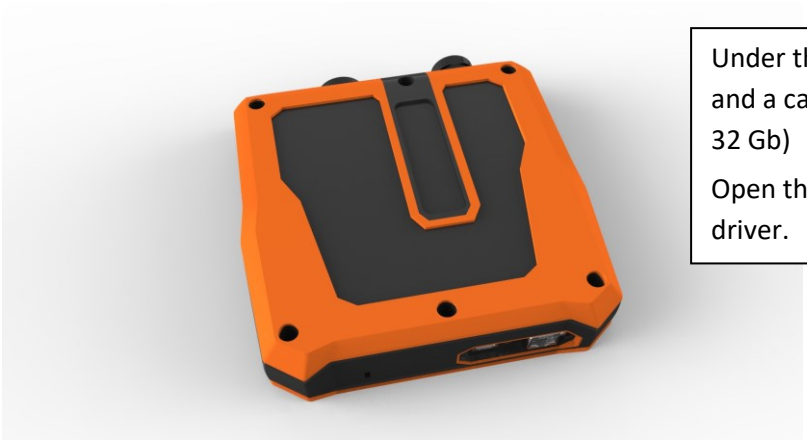
1) Kensington lock
2) TCP/IP interface
3) USB 2.0 interface

Side view



1) RS232 interface – for connecting a DCF77 or GPS radio clock

Rear view



Under the cover you find a battery pack and a card slot for a micro SD card (1 Gb to 32 Gb)

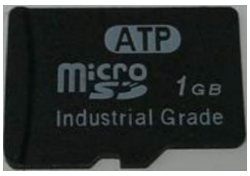
Open the screws with a torx (TX15) screw driver.

9. Battery management and micro SD card

9.1 Micro SD card

To replace the microSD card, please note the following:

- The PQ-Box 150 support microSD cards up to a maximum size of 32 GB.
- We recommend the use of an industrial grade micro-SD card.



- Insert the micro SD card into the appropriate slot in the correct direction. The correct direction is defined by a notch on the microSD card.

9.2 Accumulator

The PQ-Box 150 are equipped with a lithium-ion battery and intelligent charging electronic.
The aim is to achieve a long battery life time. At 80% capacity, the PQ-Box can run approximately 6 hours without mains supply.
The Li-ion battery is first charged to 100% when the threshold (75%) is reached. This has a very positive effect on the total life time of the batteries.
Aging: At high temperature and the battery is full, the cell oxidation developed particularly rapidly. This condition may occur, f. e. in notebooks when the battery is fully charged and at the same time, the device is in operation. The optimal charge level is between 50% and 80% during storage.

- Charging stops when exceeding a battery temperature of 50 ° C
- Start charging only when the battery temperature is less than 45 ° C
- Warning Battery capacity below 7%
- PQ-Box shutdown when battery capacity <5%

▶ **Display state of charge battery:**

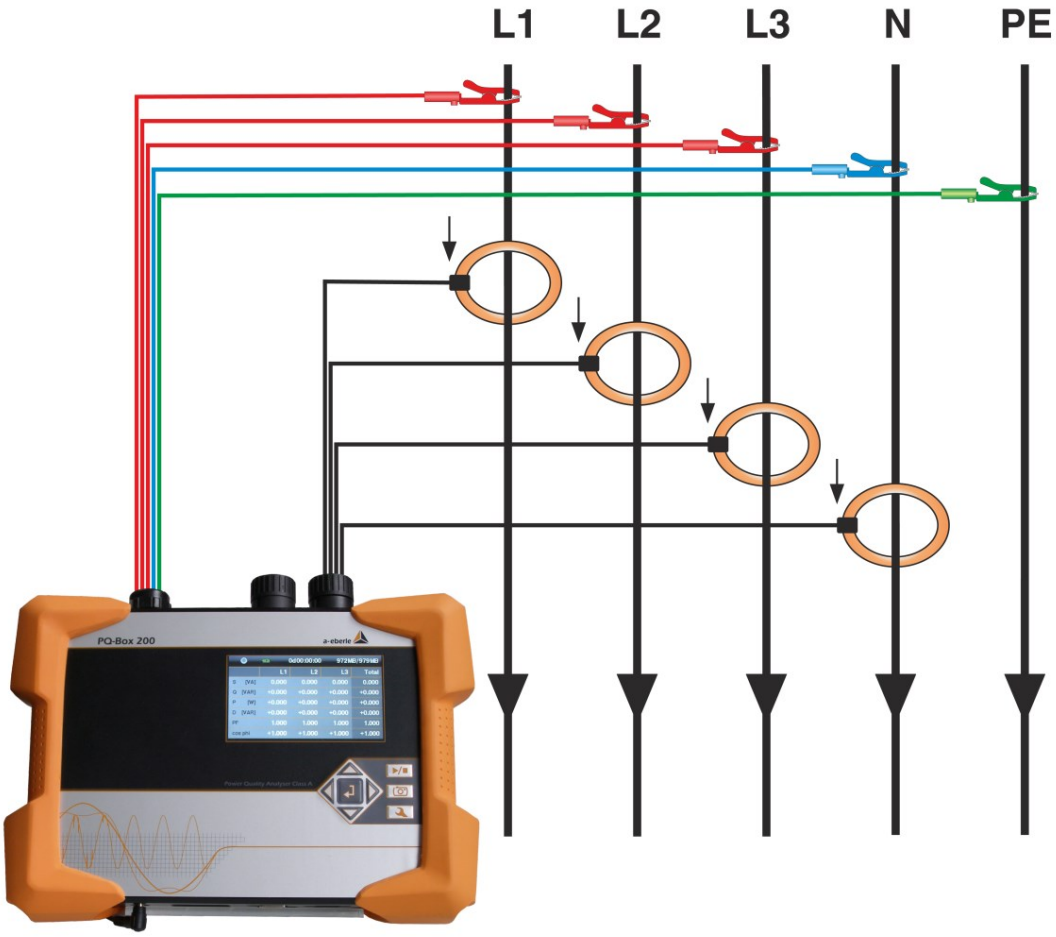
state of charge >= 100% --> four green bars
state of charge >= 75% --> three green bars
state of charge >= 40% --> two green bars
state of charge >= 20% --> one red bar
state of charge < 20% --> empty

We recommend storing the battery of the PQ-Box at 15 ° C with a charge of 60% - this is a compromise between accelerated aging and self-discharge. The battery of the PQ-Box should be recharged to approximately 55-75% every six months, due to the natural self-discharge, in order to ensure a long-term service life.

10. Network connection PQ-Box 150

10.1.1 Direct connection to a 3-phase low voltage network

Connection in a 3-phase 4-wire AC network

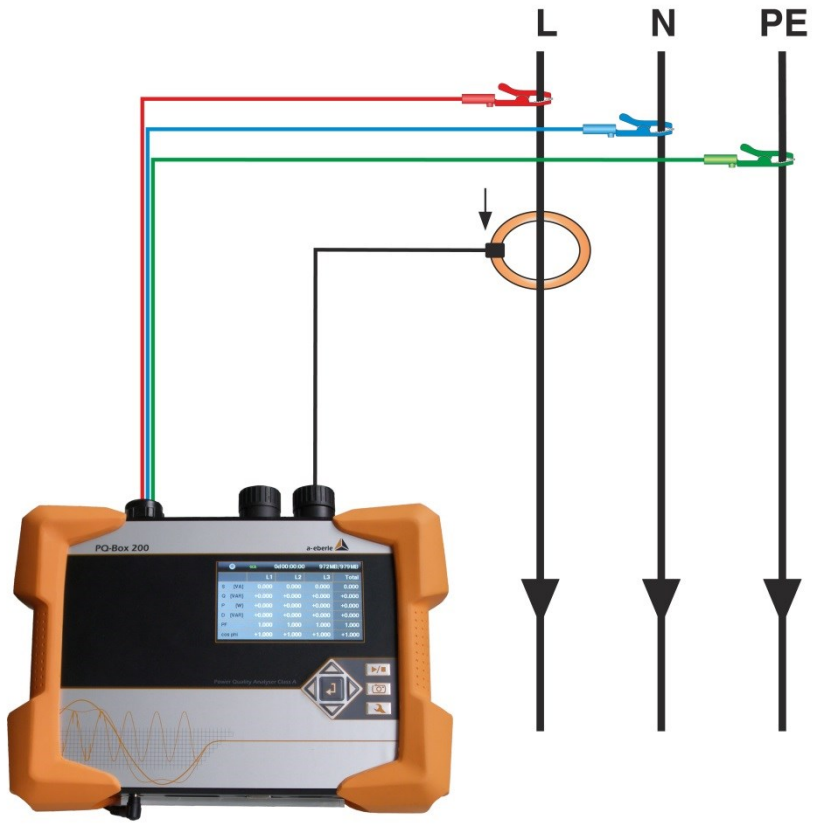


Voltage connection

- Ensure that voltage measurement cable PE is connected for every measurement.
- If no PE connection is available, connect E and N together.
- Ensure that switching (4-wire) is selected. (Setting via display or software)

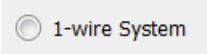
10.1.2 Connection to a single-phase low voltage network

Connection for single-phase measurements



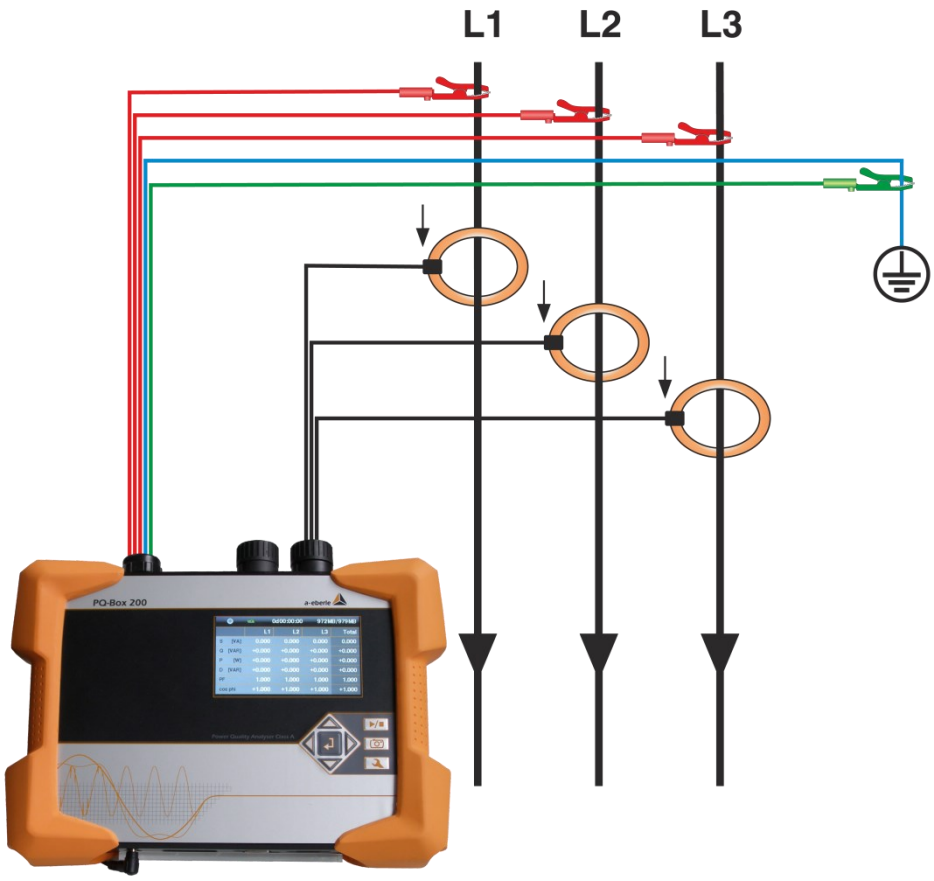
Voltage connection

- Ensure that voltage measurement cable E is connected for every measurement.
- If no PE connection is available, connect E and N together.
- Ensure that switching “1-wire system” is selected. (Setting via display or software)



- Not necessary to connect phases L2 and L3 for voltage and currents in single phase measurement.

10.1.3 Connection to an isolated network



Connections

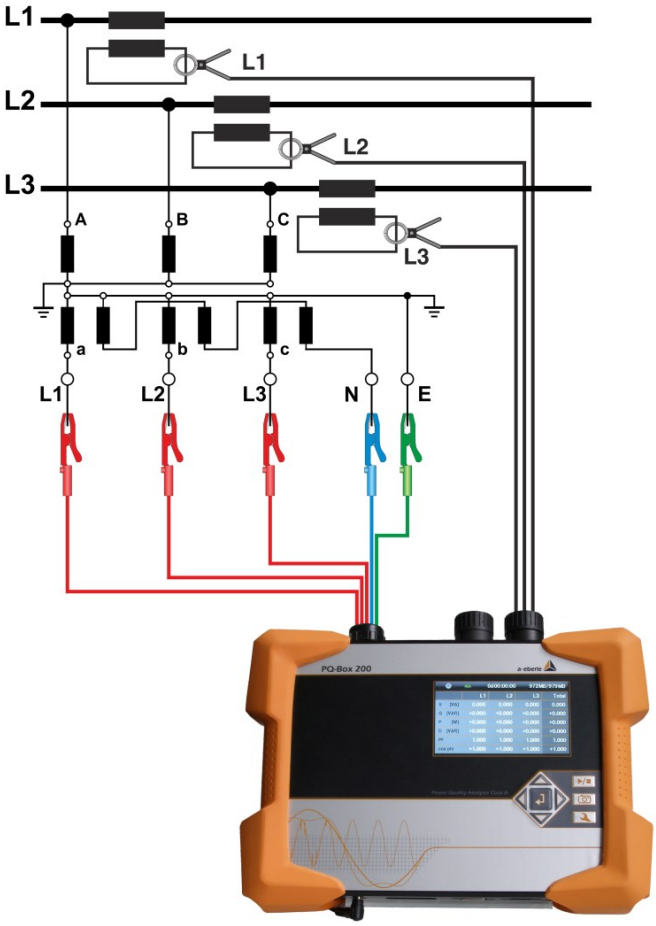
- Connect terminals E and N together and connect it to a ground potential.
- Ensure that switching (3-wire) is selected. (Setting via display or software)

The input impedance of a measuring input is 10 mega ohms.

If the high-resistance ground connection is not desired, it is also possible to interconnect the terminals E and N and to hang open. (No connection to any ground)

In 3-wire connection the 4th voltage channel and the 4th current channel will be calculated from the device. (Voltage Neutral to Ground and current of the star point)

10.1.4 Connection to secondary transformer



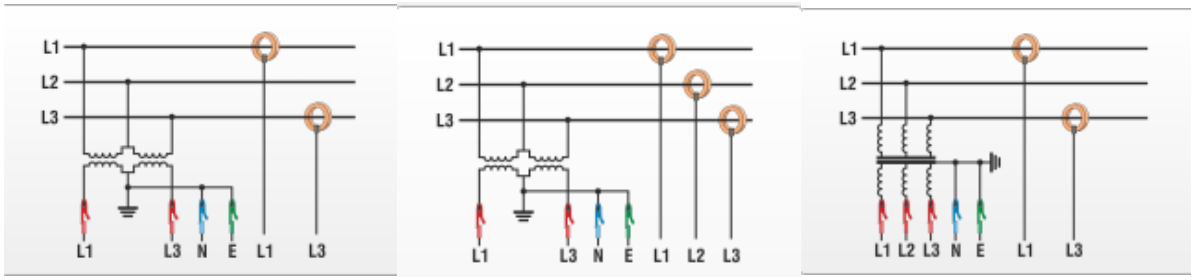
Connections

- Ensure that voltage measurement cable E is connected for every measurement.
- If no PE connection is available, connect E and N together.
- Ensure that switching (3-wire) is selected. (Setting via display or software)
- Set the voltage transformer ratio
- Enter the nominal conductor-conductor voltage
- Set the current transformer ratio

In 3-wire connection the 4th voltage channel and the 4th current channel will be calculated from the device. (Voltage Neutral to Ground and current of the star point)

Special circuit types

Configurations such as a V connection or aron connection can be parameterized.



- V connection (parameterization through the evaluation software or device setup)
- Aron connection (parameterization through the evaluation software or device set-up)

Isolated networks

Connections

✋ Connect voltage measurement conductors E and N to ground

✋ If this is not desired in the plant due to isolation monitoring, the E and N connections can be connected together and remain free without connection.

✋ Ensure that switching (3-wire) is selected.

✋ Set the voltage transformer ratio

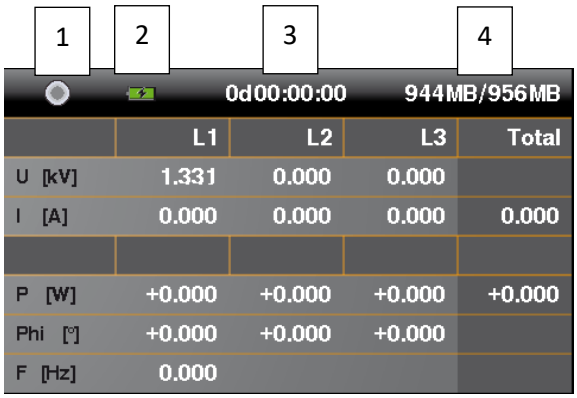
✋ Enter the nominal conductor-conductor voltage

✋ Set the current transformer ratio

11. Display

✋ Pressing the right and left arrows on the directional pad changes the page of the Display.

Display page 1



1) Recording "On" is indicated by a flashing red light
2) Display state of charge battery
   state of charge >= 100% --> four green bars
   state of charge >= 75% --> three green bars
   state of charge >= 40% --> two green bars
   state of charge >= 20% --> one red bar
   state of charge < 20% --> empty
3) Current recording duration
4) Free space for recording / SD card size

Display page 2

→ Display of the ½ period extreme values Imax, Umin, Umax over the entire recording period

Display page 3

0d00:00:00				701MB/952MB
Recorder				Count
Oscilloscope Rec.				0
RMS Recorder				0
Signal voltage				0
PQ events				0
Transient Events				0

→ Display the number of PQ events and fault recorder during the current measurement

Display page 4

0d00:00:00				944MB/956MB
	L1	L2	L3	Total
S [VA]	0.000	0.000	0.000	0.000
Q [VAR]	+0.000	+0.000	+0.000	+0.000
P [W]	+0.000	+0.000	+0.000	+0.000
D [VAR]	+0.000	+0.000	+0.000	+0.000
PF	1.000	1.000	1.000	1.000
cos phi	+1.000	+1.000	+1.000	+1.000

→ Display of the apparent, active and reactive power with sign prefix (individual phases and total performance)

Display page 5

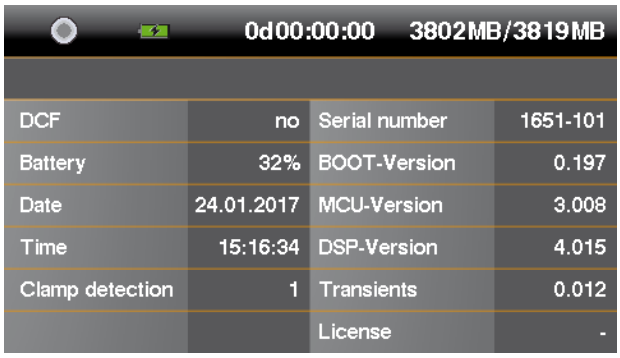
0d00:00:00				944MB/956MB
	L1	L2	L3	N
THD [k%]	2.408	0.000	0.000	0.000
THD I [%]	0.000	0.000	0.000	0.000
	L12	L23	L31	
U [kV]	1.337	0.000	1.337	
Ep [Wh]	−0.000	0.000	0.000	−0.000
Eq[VARh]	0.000	0.000	0.000	0.000

→ Display of the current and voltage THD (individual phases, neutral conductor)

→ Display of the conductor-conductor voltages

→ On the last two lines, the active and reactive power are displayed from the start of the measurement.

Display page 6



→ Date, time, version, current firmware version and time synchronization display.

→ After changing display pages once more, display page 1 appears again.

Graphic display PQ-Box

With the keypad by pressing, "up" or "down" you get into the graphic screens.

Graphic display 1: Phasor diagram voltage and current

.

Scroll to the right or to the left with the keypad to reach the oscilloscope pictures.

Graphic display 2: oscilloscope voltage and current
Graphic display 3: oscilloscope voltage
Graphic display 4: oscilloscope current

With the “Enter” key it is possible to get back to the value view.

11.1 Starting a measurement

✋ Press the key to stop or start measuring.

- Recording "On" is indicated by a flashing red light

For a positive display of the active power

Ensure that the arrows on the current clamps point towards the consumer.

11.2 Manual Trigger

✋ Press the key to set manual trigger.

→ Store the current voltages and currents with:

- Oscilloscope recorder
- 10ms RMS recorder
- Transient recorder (only PQ-Box 200 with option Transient)

The recording length and sampling frequency from transient measurement depends on the recorder configuration selected in the software.

Example 3/4:

4 fault records were triggered while 3 fault records been stored on the SD card.

1) The number of the Oscilloscope record increases by 1.

2) The number of the RMS record increases by 1.

Example:

To evaluate the network perturbation of a consumer in the network:

✋ Before starting the consumer, activate manual trigger.

✋ After starting the consumer, activate manual trigger.

It is possible to compare all the images in the software. The images provide information about the cause of the network perturbations

11.3 Time synchronisation using the RS232 interface

→ The RS232 interface is equipped as standard for a DCF77 or GPS receiver connection.

- Automatic synchronisation of the measurement equipment after connecting receivers. If synchronisation is lost, the PQ-Box 200 runs with an internal quartz clock.

- A detected external clock is shown on the equipment display on display page 5.

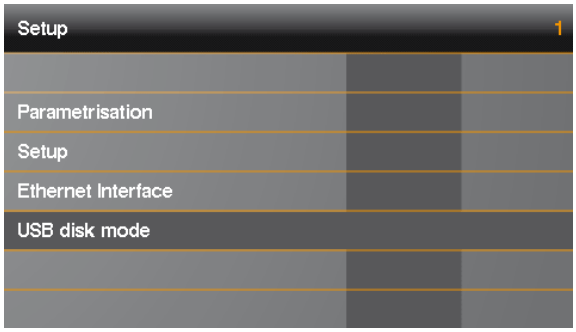
Please start the measurement only after the initial synchronization is completed (this may take a few minutes depending on the GPS signal strength).

11.4 PQ-Box 150 Setup

Press the key to open Setup.

Press this key again to exit the Setup Menu.

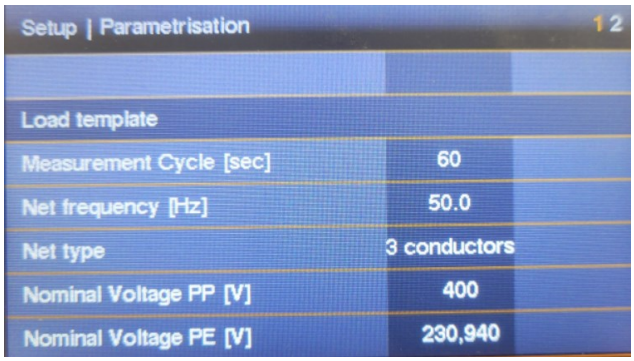
→ Display page changes to the Main Menu.



1) Change the network data parameters (measurement interval, nominal voltage, conversion factors)
2) Basic equipment settings (display language, date, time)
3) TCP-IP interface settings
4) Change USB interface of PQ-Box to mass storage (very fast USB data transfer to PC)

   For the transfer of very large measurement files from the PQ-Box to the PC via a USB connection, we recommend the "USB mass storage" setting. With this function, the PQ-Box registers itself as a storage medium on the PC and large measurement data can be transmitted much more quickly.

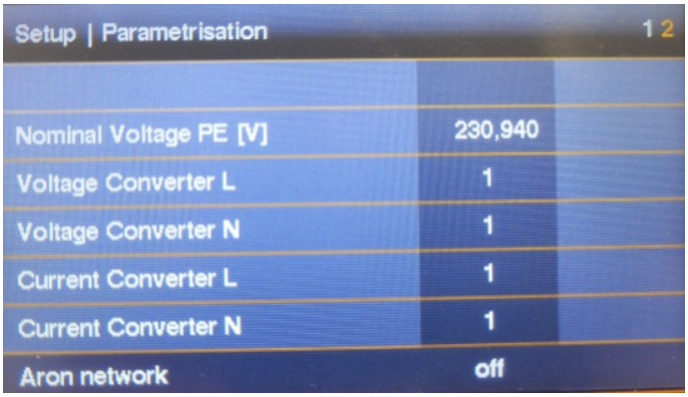
Parameterisation page 1



1) Load template
   Various setup files can be stored in the PQ-Box via the WinPQ mobile software, which can be selected at this point.
2) Freely adjustable measurement interval: 1 sec to 30 min (default interval setting = 600 sec)
   Settings < 1 min should only be used for short measurements.
3) Network frequency
   16,7Hz, 50Hz or 60Hz net is available
4) Switch between 1~; 3~ and 4~ conductor networks.
   In a single phase network, only phase L1, neutral and earth will be measured.
   In a 3-conductor system, all evaluations of the standard reports are calculated from the phase-phase voltages.
   In a 4-conductor system, all evaluations of the standard reports are calculated from the phase-ground voltages.
   Additional network types are: V-connection, split phase and delta high leg
5) Nominal voltage refers to the contractually agreed phase-to-phase voltage.
   All recorders refer to this value as a percentage.
   For the low voltage: 400 V applies.

✋ scroll with the left/right control keys

Parameterisation page 2



1) Voltage converter corresponds to the ratio between the primary and secondary voltage.
2) Current converter corresponds to the ratio between the primary and secondary current.
   Example: CT 600A/5A = factor 120
3) Switch Aron connection for 2-current converter measurement on and off (only available in 3-wire network)

Changing parameters

Setup | Parametrisation	1 2
Measurement Cycle	0600
Nominal Voltage	400
Voltage Converter L	1
Voltage Converter N	1
Current Converter L	1
Current Converter N	1

✋ Press .

→ the colour of the selected parameter changes to orange

✋ Select position

→ the value can now be changed with the up and down arrows

✋ Press to accept the changed value

→ the new value appears in the Menu

Settings page 1

Setup | Setup	1 2
Language	English
Date	25.09.2017
Time	17:48
Continuous mode	off
Memory limitation (680MB)	active
Interface Lock	off

1) Change the display language
2) Change the date
3) Change the time
4) Continuous mode (active = PQ-Box run permanent)
5) Memory limitation to 680 MB – active or no limitation of memory (Memory management)
6) Password protection for interfaces and display of PQ-Box (see chapter password protection)

11.5 Keypad Lock

✋ Press and hold the Setup key for > 5 sec while a measurement is in progress.

→ Keypad lock active.

✋ Then press and hold > 5 sec.

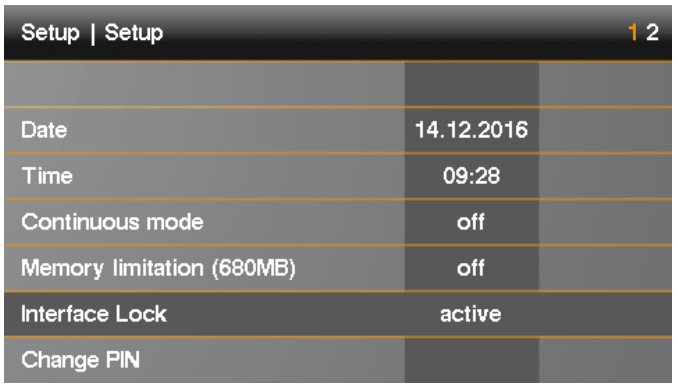
→ Keypad lock inactive.

It is possible to see the measurement readings when the keypad is locked.

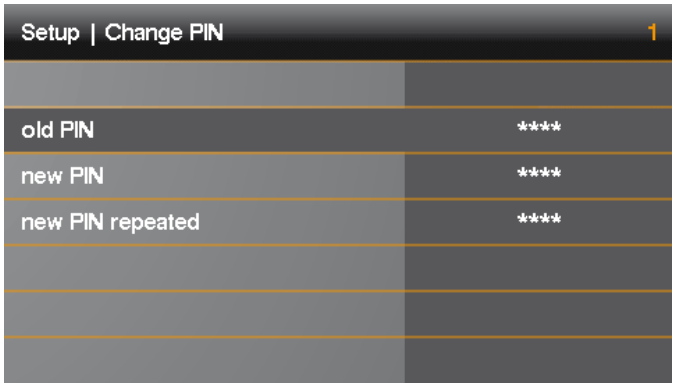
The Setup menu and screen pages are locked.

11.6 Password Protection and Interface Lock

In order to protect the PQ-box from unauthorized access and manipulation during measurement task the device provides an interface lock mode with password (PIN) protection. The interface lock can be activated in the setup menu and is protected with a corresponding four-digit numerical password, a PIN consisting of any combination from 0000 to 9999.



The PIN (default factory setting is 0000) is set in the menu item Change PIN.



If the interface lock is active, the password protection locks the device automatically one minute after starting a measurement. With the keypad lock function (see description above) the device can be locked with password protection manually. In locked mode the USB and Ethernet interface are deactivated and a display lock is active.

In active interface lock mode the device can only be unlocked with the correct PIN. After more than ten incorrect PIN entries, user access is locked permanently. The device can be reset by A. Eberle Support using a master password.

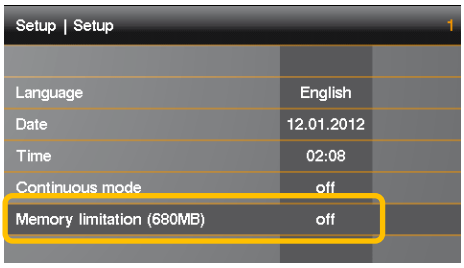
11.7 Memory management

So that the recorder data does not fill the whole memory when a too sensitive or incorrect trigger level is set and thus the long-term recording is stopped, at the start of the measurement the PQ-Box reserves a maximum size of the free space for all fault records. If this memory size is reached, this can be seen in the display by an asterisk * after the number of fault records.

e.g. Display: Oscilloscope recorder = 1312*

If the memory of the SC card is filled 100%, the message "**Memory full**", appears in the display.

Two possibilities to run the memory management:



- **Memory limitation (680MB) = off**

  On single data file can get up to the maximum size of 3,41GB. If the data size is reached then the PQ-Box automatically starts a new measurement file. This will be repeated until the maximum size of the microSD memory card is reached (f. e. 32 GByte). The size of all recorders is limited to 2GB in one 3,41GB file.

  Warning: This type needed for evaluating the 64bit WinPQ mobile software.

- **Memory limitation (680MB) = active**

  The PQ-Box memory size for one measurement file is limited to 680 MByte, to avoid problems with Windows 32bit systems. If the data size is reached then the PQ-Box automatically starts a new measurement file. This will be repeated until the maximum size of the microSD memory card is reached (f. e. 32 GByte).

  The size of all recorders is limited to 300 MB in one 680 MB file.

The data converter provides the opportunity to connect several measurements to one measurement file, if needed. (see chapter “Data Converter”)

• Auto: The device limits the maximum file size of all recorders as described above

• Off: The limit is deactivated. All recorders can fill the entire device memory.

11.8 Delete device memory

It is possible to clear the device memory of the PQ-Box using the front panel keys while the PQ-Box is booting up.

✋ Connect the power supply

✋ If “A. Eberle logo” appears hold enter key for some seconds

→ Message appears: "Please press start button to clear the device memory"

✋ Press record button

→ Device memory is formated
→ PQ-Box is starting

11.9 Storage requirements for measurement data

Storage requirements for long-term measurement data:
Example PQ-Box 150:

- 1 sec measurement interval generates approx. 33MB of data per hour
- 10 min measurement interval generates approx. 15 MB of data per week

Events and fault records have to be added to this amount of data. The amount of data is dependent on the occurrence of these events and the trigger settings of the measuring device.

11.10 Continuous mode without power supply

If the function „continuous mode“ is active, the PQ-Box doesn´t stop running if the power supply is pinched off. The PQ-Box can work up to 6 hours with battery supply. You can start and stop records or measure in online mode.
At 7% capacity, about 10 minutes before turning off, a warning message appears on the display.

Start without power supply
PQ-Box 150 can be started directly without power supply.

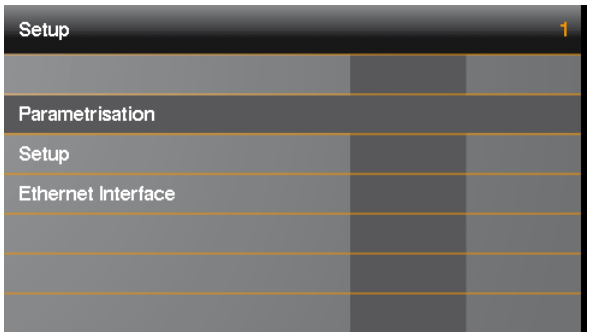
✋ press start button > 10 seconds

→ PQ-Box 150 starts without power supply via battery.
→ PQ-Box 150 is now in the "Battery continuous operation“

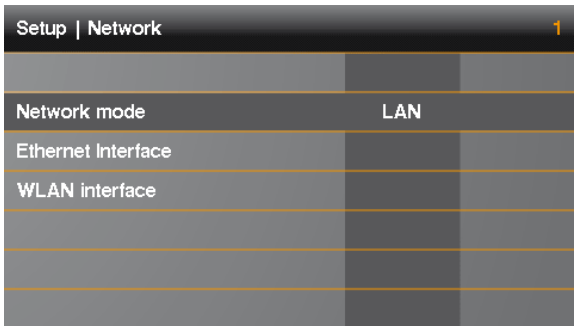
Deactivate battery mode via the setup menu "Off".

11.11 TCP-IP settings

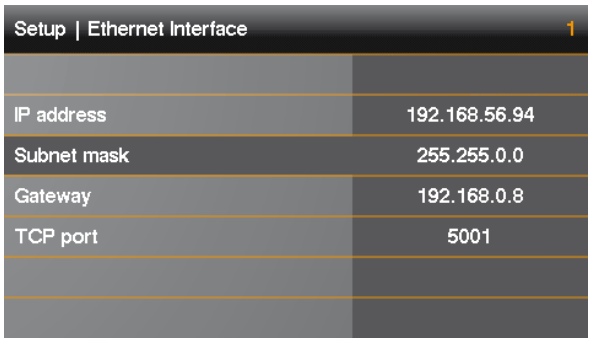
In “Setup/ Ethernet Interface” you can change all parameters for IP interface.



In “Network mode” it is possible to switch between WLAN and LAN communication. Both ways of communication can´t run at the same time.



Ethernet settings
This example shows the basic settings for the PQ-Box 150 interface.
All parameters can be changed with the control keys on the box.

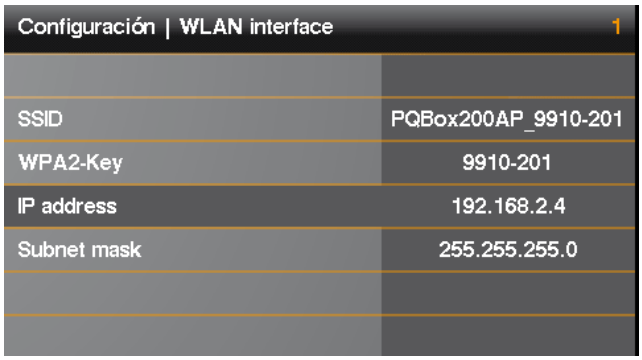


To accept the changed parameters, the device must be restarted

11.12 WLAN Settings (Option for PQ-Box 150)

The display screen shows the basic setting of the WLAN configuration with the following parameters. The IP address and subnet mask of the WLAN module can be set using the control pad.

Parameter	Meaning
SSID	Name of PQ-Box in network
WPA2-Key	Password
IP-Address	IP Address of PQ-Box
Subnet-mask	Restriction of the DHCP address range



Please use the address range 2 to 99 in the 4th block of IP address.

WLAN Connection with WinPQ mobil software or PQ-Box App:

- **When the WLAN module is activated, the PQ-Box is displayed with its SSID in the wireless network connections of your PC.**
- **To establish a connection, the WPA2 key must be entered. SSID and password for a WPA2 connection can be found on the nameplate of the network analyzer. (Example: for „SSID: PQBox150AP_1804-204“ the password would be „1804-204“).**

The connection establishment may take a few seconds, as many PCs first try to establish an Internet connection via the PQ-Box.

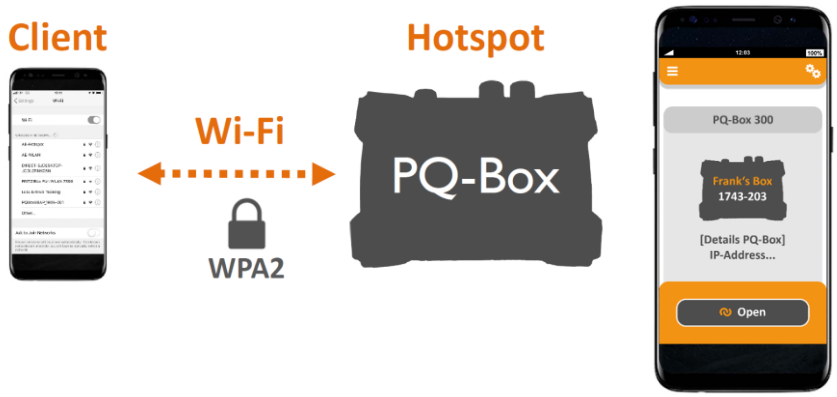
12. PQ-Box App

Via an app for Android and IOS operating systems, all PQ-Boxes with integrated WLAN/Wifi interface can be operated wirelessly. The app is available for free download in the Apple App Store as well as in the Google Play Store.

A variety of online screens are available. All measuring devices can also be easily parameterized, e.g. via a smartphone. A detailed parameterization of the PQ-Box (trigger limits, ripple control signal analysis, ...) is only possible via the WinPQ mobil software.

12.1 Connection to PQ-Box

The PQ-Box acts as a WLAN router. SSID and password for a WPA2 connection can be found on the nameplate of the network analyzer. (Example: for „SSID: PQBox150AP_1804-204“ the password would be „1804-204“)



13. Maintenance/Cleaning

This unit is maintenance-free for customers.

Exceptions are the battery pack and micro-SD card, which can be accessed via the rear panel. The fuses are in the voltage leads.

- Open the housing cover by unscrewing the 6 screws on the back

Spare parts no.

SD memory card, 4GByte industry-standard	900.9099-4
Replacement battery pack	570.0010
Fuse for voltage leads; 500mA (FF) 30kA AC/DC; 1000V 6,3mmx32mm	582.1058

⚠ DANGER!	**Danger of electric shock!** ✋ Do not open the unit. ✋ Maintenance of the equipment can only be carried out by A-Eberle.

For service, contact A-Eberle.

Service address:

A. Eberle GmbH & Co. KG

Frankenstraße 160

D-90461 Nuremberg

14. Calibration

We recommend a calibration interval of three years for the network analyzer PQ-Box 150 to maintain the accuracy of GEFOR-made-IEC61000-4-30 Class A instruments.

15. Disposal

To dispose of the device and its accessories, send all components to A-Eberle.

16. Product Warranty

- A-Eberle guarantees that this product will remain free of defects in material and workmanship for a period of three years from the date of purchase.
- For accessories like current clamps and the battery the period is one year.
- This warranty does not cover damage caused by accident, misuse or abnormal operating conditions.

To obtain service during the warranty period, please contact A-Eberle GmbH & Co KG in Nuremberg.

The detailed conditions for the warranty can be found in our terms and conditions:

https://www.a-eberle.de/agbs

PQ-Box 150
Information

WinPQ mobil
Software

Video-Tutorials
PQ-Box & WinPQ mobil

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No. 584.0841

Vers. PQ-Box 150 – 02.06.2025