

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

## Model PQ-Box 150

- ▶ **Fault detection**
- ▶ **Evaluation of voltage quality according to EN50160 and IEC61000-2-2 (2-4)**
- ▶ **FFT Analysis up to 10kHz**
- ▶ **Load analysis; energy measurements**
- ▶ **Ripple control signal analysis**
- ▶ **High-performance software**



**600V CAT IV / 1000V CAT III**

## 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 1000V CAT IV).

The PQ-Box 150 meets at 100% the demands of the IEC 61000-4-30 Ed.3 standard for a class-A device:

Parameter	Class
Accuracy of voltage measurement	A
Determination of time intervals	A
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 the direct use in

the immediate vicinity of current carrying conductors. Through the application-specific setting of trigger conditions, the device is very easy to handle.

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

An USB 2.0 interface and a TCP/IP (100Mbit/s) interface are available for a fast data transfer.

In the case of a supply interruption the integrated UPS continues the operation up to 6 hours.

## 2. Measurement functions

The PQ-Box 150 is optionally available with permanent frequency measurements from 2 kHz to 9 kHz

- ▶ **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 EN50160, IEC61000-2-2/-2-4 for public and industrial networks
- ▶ **Optional "IEC 61000-4-7 - 2 kHz bis 9 kHz" (B1)**
  - Frequency measurement of voltage and current according IEC 61000-4-7 from 2 kHz up to 9 kHz.
- ▶ **Optional "Ripple control recorder" (R1)**
  - Ripple control message of voltage and current

We take care of it.

Measurement / Functions	
<b>PQ-Box 150</b>	
Automatic event detection and evaluation standards for: EN50160 (2011) / IEC61000-2-2 / IEC61000-2-12 / IEC61000-2-4 (Class 1; 2; 3) / NRS048 / IEEE519 / IEC61000-4-30 Ed. 3 class A / IEC61000-4-7 / IEC61000-4-15	
<b>Continuous recording with user defined interval of &gt;3,500 parameters including::</b>	
Voltage: min. max. average	
Current: min. max. average	
Power: P, Q, S, PF, cos phi, sin phi, tan phi	
Distortion power D; fundamental power	
Energy: P, Q, P+, P-, Q+, Q-	
Flicker (Pst, Plt, Ps5) (IEC61000-4-15)	
Unbalanced voltage, current	
Voltage harmonics according to EN 61000-4-30 Class A (average, max.)	Up to 50th.
Voltage harmonics 200 Hz frequency bands (IEC61000-4-7)	2 kHz up to 9 kHz
Current harmonics (average, max.)	Up to 50th.
Current harmonics 200 Hz frequency bands (IEC61000-4-7)	2 kHz up to 9 kHz
Phase-angle of voltage and current harmonics	Up to 40th.
THD voltage, current; PWHD, PHC	
FFT calculation of voltages and currents	DC up to 10 kHz
Ripple control signal 100 Hz up to 3,7 kHz	
Frequency 10sec, average, min, max	
10/15/30 min interval – P, Q, S, D, cos phi, sin phi ...	
<b>Online mode for direct reading:</b>	
Oscilloscope recorder	20.48 kHz
3D power triangle for active, reactive, apparent power and distortion power	
Voltage, current harmonics	DC up to 10 kHz
Inter harmonics (U, I)	DC up to 10 kHz
Direction of harmonics & phase angle of harmonics	
<b>Trigger functions</b>	
Manual trigger – trigger button	
RMS level trigger (U, I)	
RMS jump trigger (U, I)	
Phase shift trigger	
Envelope trigger	
Automatic trigger	
Interval trigger	
Option ripple signal voltage recorder	<b>– Option R1</b> 100 Hz to 3,7 kHz

### 3. Design

Suitable for extreme measurement conditions:

- Extremely robust mechanical construction.
- Protection class IP65.
- No moving parts (fans, hard drive, etc.).
- Storage can be extended by SD card from the user with up to 32 GB (permitting several years recording).
- Internal UPS bridges the power up to 6 hours

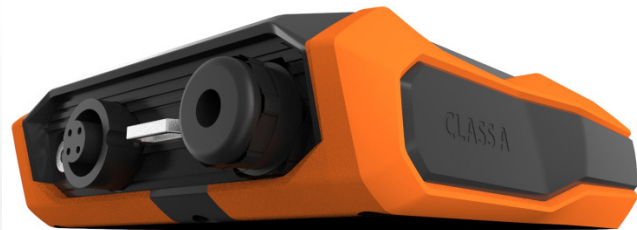
### 3.1 Evaluating measured data

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 can be downloaded via Internet free of charge. The same software supports both PQ-Box 100, PQ-Box 150 and Box 200. 32 and 64 bit Windows currently supported (Windows XP; Windows 7, 8 and 10)

### 3.2 Power Quality analyzer PQ-Box 150



### 3.3 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				
	L1	L2	L3	Total
U	222,45 V	241,12 V	231,12 V	1,25 V
I	125,25 A	102,54 A	125,24 A	23,12 A
				Total
P	21,425 kW	-21,145 kW	22,145 kW	65,452 kW
Phi	25,145 °	65,658 °	68,658 °	
F	50,458 Hz			

Aufnahme   0d 12:50:45 890 Mb / 796 Mb			
Rekorder			Anzahl
Oszilloskoprekorder			54
RMS Rekorder			125
Rundsteuersignale			14
PQ Ereignisse			458
Transiente Ereignisse			25

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### 3.4 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 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.

### 3.5 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.

### 3.6 Data memory

The meter is equipped with a micro-SD card of 4 GB and can use micro-SD memory cards up to 32 Gbyte. While 4 GB of memory is sufficient for several months of recording per EN 50160 procedures, the additional memory capability provides for longer term measurements, or for special high speed recording application.

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.

### 3.7 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 voltage ranges for the power supply are possible: 100V to 440V AC or 100V to 300V DC.

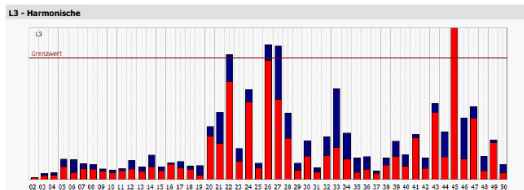
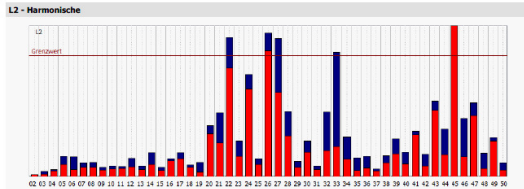
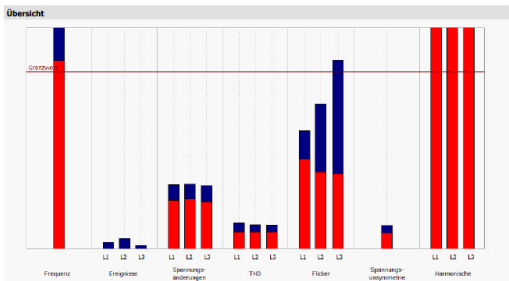
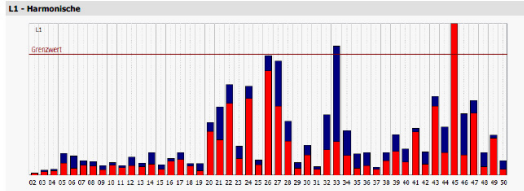
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### 3.8 EN 50160/IEC 61000-2-2 Evaluation

- Overview of the power quality statistic.
- Bar chart provides automatic summary of relevant metrics.
- Automated reporting in accordance with EN50160 / IEC61000-2-2 / -2-12 (public networks), IEC61000-2-4 (industrial networks), NRS048, or your own defined limits.
- The company logo in the report and as well as main text fields can be customized.

	<b>Auswertung nach EN50160/IEC61000-2-2</b>	29.03.2012 Seite 1/5
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<b>Firma</b>	Ab 18.05. 21:31 UTC Anlagenstillstand		
<b>Abteilung</b>	wg. Windmangel		
<b>Kunde</b>	Rückwirkung Harmonische		
<b>Adresse</b>	Führländer Aktiengesellschaft 56177 Walsdorfshain	Grund:	G25699660
<b>Contact:</b>		SW-Version:	1.6.13
<b>Spannungssystem:</b>	4 Leitbr-Netz	Seriennummer Gerät:	1109-119
<b>Nennspannung L-L / L-N:</b>	693V / 400V	Messintervall:	500s
<b>Frequenz:</b>	50Hz	Rundsteuerfrequenz:	168Hz
<b>Messung Beginn:</b>	16.05.2011 09:29:13	Messung Ende:	24.05.2011 07:50:00
<b>Messdauer:</b>	78 22h 20m 47s	Anzahl Messintervalle:	1142
<b>Firmware:</b>	1.130	DSP-Version:	1.233



Auswertung nach EN50160/IEC61000-2-2 Seite 1/5

Auswertung nach EN50160/IEC61000-2-2 Seite 3/5

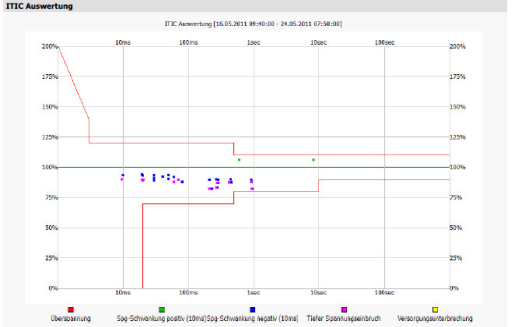
	<b>Auswertung nach EN50160/IEC61000-2-2</b>	29.03.2012 Seite 4/5
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THD	Grenzwert	L1 - 95.00%		L2 - 95.00%		L3 - 95.00%	
		L1 - Max	L1 - Min	L2 - Max	L2 - Min	L3 - Max	L3 - Min
1	0.0000	0.7650	1.1981	0.7656	1.1159	0.7856	0.8059
2	2.0000	0.0366	0.0412	0.0324	0.0371	0.0327	0.0394
3	5.0000	0.1427	0.2186	0.1102	0.2071	0.1608	0.2228
4	1.0000	0.0388	0.0521	0.0466	0.0505	0.0388	0.0544
5	6.0000	0.6123	1.0847	0.6993	1.0053	0.6063	0.9833
6	5.0000	0.0295	0.0799	0.0295	0.0823	0.0267	0.0812
7	5.0000	0.4527	0.6109	0.3811	0.5600	0.4319	0.6203
8	5.0000	0.0390	0.0578	0.0379	0.0587	0.0393	0.0622
9	1.5000	0.0704	0.1196	0.0843	0.1132	0.0951	0.1295
10	0.5000	0.0423	0.0534	0.0327	0.0439	0.0250	0.0351
11	3.5000	0.2192	0.2857	0.2318	0.2889	0.2354	0.3151
12	0.5000	0.0400	0.0760	0.0397	0.0770	0.0399	0.0785
13	1.0000	0.1173	0.3048	0.1818	0.3608	0.1939	0.3998
14	0.5000	0.0471	0.0946	0.0517	0.0987	0.0506	0.0993
15	0.5000	0.0250	0.0459	0.0260	0.0373	0.0340	0.0350
16	0.5000	0.0598	0.0694	0.0545	0.0725	0.0648	0.0662
17	2.0000	0.2594	0.3812	0.2957	0.4002	0.1878	0.2866
18	0.5000	0.0371	0.0485	0.0381	0.0494	0.0390	0.0520
19	1.5000	0.0447	0.1453	0.0295	0.1746	0.0277	0.1672
20	0.5000	0.1822	0.2202	0.1766	0.2104	0.1782	0.2177
21	0.5000	0.1484	0.2830	0.1398	0.2648	0.1469	0.2761
22	0.5000	0.2861	0.3751	0.4498	0.5793	0.4626	0.5146
23	1.5000	0.2075	0.3996	0.2555	0.4447	0.2136	0.3795
24	0.5000	0.3196	0.3705	0.3635	0.4226	0.3182	0.3720
25	1.5000	0.1312	0.1903	0.1510	0.2194	0.1370	0.1983
26	0.3500	0.3033	0.3478	0.3550	0.4171	0.3424	0.3882
27	0.4000	0.1152	0.1888	0.1296	0.2297	0.1320	0.2262
28	0.4000	0.0960	0.1517	0.1142	0.1831	0.1142	0.1857
29	1.0600	0.0640	0.1126	0.0787	0.1340	0.0765	0.1403
30	0.3300	0.0552	0.0827	0.0663	0.0980	0.0630	0.1051
31	0.9700	0.0609	0.0710	0.0991	0.0840	0.0661	0.0893
32	0.3300	0.0700	0.1660	0.0714	0.1770	0.0638	0.1159
33	0.2400	0.0559	0.2127	0.0497	0.2059	0.0527	0.1495
34	0.3300	0.0261	0.1188	0.0456	0.1053	0.0259	0.1211
35	0.8300	0.0494	0.1464	0.0430	0.1312	0.0447	0.1432
36	0.3300	0.0261	0.0842	0.0231	0.0543	0.0245	0.0595
37	0.7700	0.0388	0.0535	0.0343	0.0473	0.0367	0.0513
38	0.3300	0.0395	0.0602	0.0362	0.0554	0.0354	0.0548
39	0.4000	0.0400	0.0675	0.0382	0.0627	0.0374	0.0623
40	0.3100	0.0337	0.0679	0.0322	0.0635	0.0333	0.0628
41	0.6700	0.2416	0.2601	0.2334	0.2518	0.2293	0.2503
42	0.3100	0.0283	0.0597	0.0270	0.0578	0.0272	0.0539
43	0.6300	0.3611	0.4134	0.3468	0.3941	0.3466	0.3949
44	0.3100	0.0284	0.1239	0.0566	0.1217	0.0561	0.1208
45	0.3716	0.3716	0.4553	0.3567	0.4362	0.3656	0.4345
46	0.3000	0.0508	0.1527	0.0489	0.1442	0.0498	0.1516
47	0.5500	0.2841	0.3408	0.2797	0.3358	0.2764	0.3289
48	0.3000	0.0215	0.0575	0.0205	0.0577	0.0206	0.0573
49	0.5200	0.1613	0.1735	0.1546	0.1680	0.1555	0.1698
50	0.3000	0.0150	0.0363	0.0155	0.0337	0.0155	0.0361

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<b>PQ-Ergebnisse</b>	
<b>Frequenzabweichung:</b>	305 Rundstuersignal (Sec): 0
<b>Überspannung:</b>	0 Langsame Spannungsabweichung: 0
<b>Spg-Schwankung positiv (10ms):</b>	3 Überschreitung Langzeitlicher: 6
<b>Spg-Schwankung negativ (10ms):</b>	22 Überschreitung Unsymmetrie: 0
<b>Tiefer Spannungseinbruch:</b>	12 Überschreitung TWD: 0
<b>Versorgungsunterbrechung:</b>	0 Überschreitung Harmonische: 1470

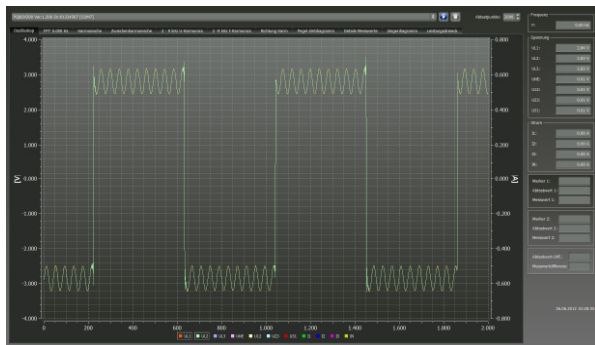


<b>Ergebnis-Matrix</b>																																					
<b>Restspannung u(%)</b>	<table border="1"> <tr> <th></th> <th>10 ... 200</th> <th>200 ... 500</th> <th>Dauer [ms]</th> <th>1000 ... 1000</th> <th>5000 ... 60000</th> </tr> <tr> <td>90 ... 80</td> <td>7</td> <td>0</td> <td>10</td> <td>5</td> <td>0</td> </tr> <tr> <td>80 ... 70</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>70 ... 40</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>40 ... 5</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>5 ... 0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </table>		10 ... 200	200 ... 500	Dauer [ms]	1000 ... 1000	5000 ... 60000	90 ... 80	7	0	10	5	0	80 ... 70	0	0	0	0	0	70 ... 40	0	0	0	0	0	40 ... 5	0	0	0	0	0	5 ... 0	0	0	0	0	0
	10 ... 200	200 ... 500	Dauer [ms]	1000 ... 1000	5000 ... 60000																																
90 ... 80	7	0	10	5	0																																
80 ... 70	0	0	0	0	0																																
70 ... 40	0	0	0	0	0																																
40 ... 5	0	0	0	0	0																																
5 ... 0	0	0	0	0	0																																
<b>Einbruch Spannung u(%)</b>	<table border="1"> <tr> <th></th> <th>10 ... 500</th> <th>Dauer [ms]</th> <th>500 ... 5000</th> <th>5000 ... 60000</th> </tr> <tr> <td>... 120</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>120 ... 110</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> </table>		10 ... 500	Dauer [ms]	500 ... 5000	5000 ... 60000	... 120	0	0	0	0	120 ... 110	0	0	0	0																					
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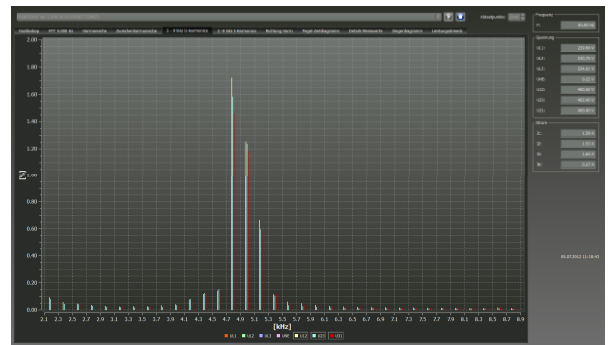
Auswertung nach EN50160/IEC61000-2-2 Seite 5/5

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### 3.9 Online analysis software



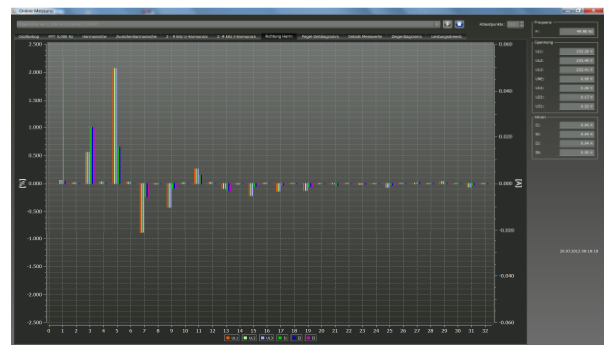
Online oscilloscope with 20,48 kHz



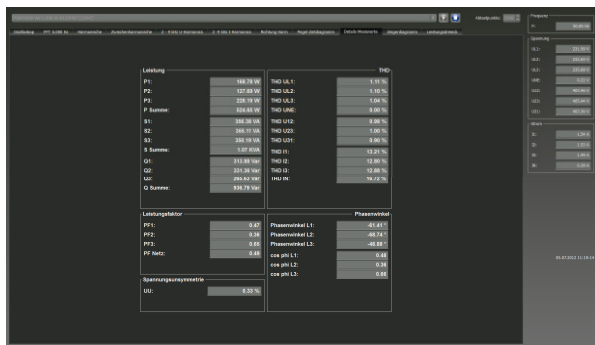
Online harmonics (voltage and current up to 9 kHz)



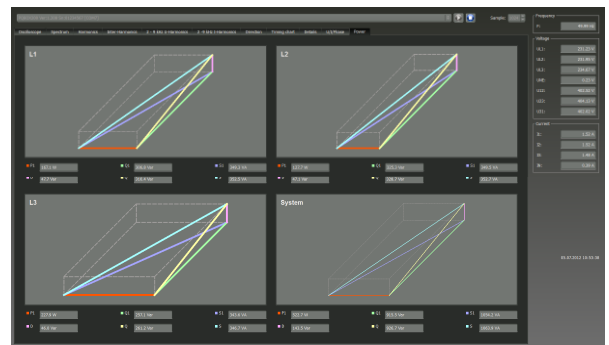
Online time level diagram



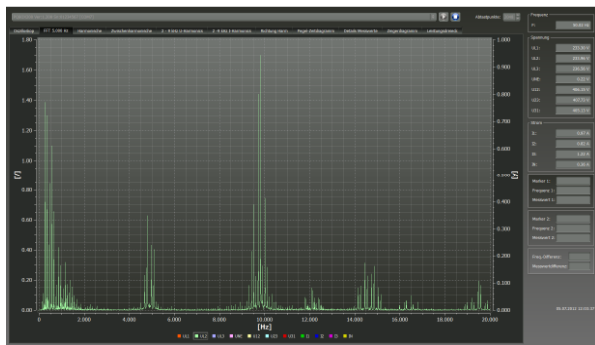
Direction and phase angle of harmonics



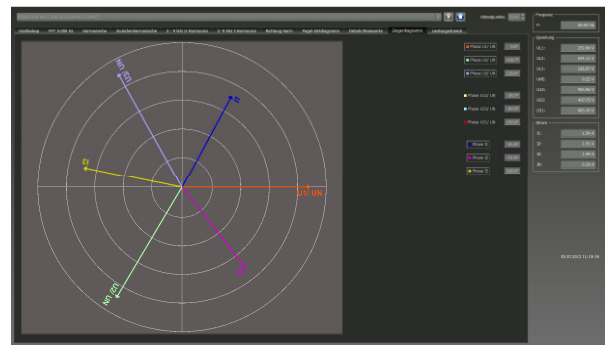
Online measured-values table



Online 3D power-cube



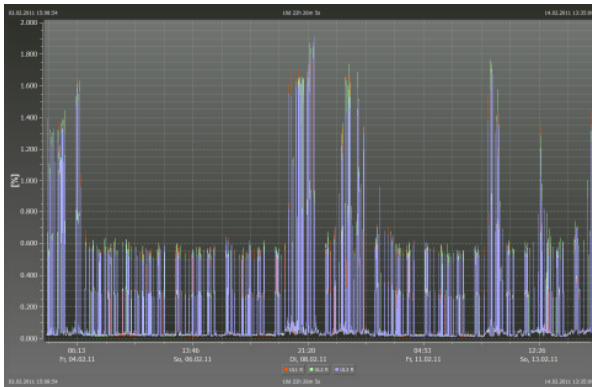
FFT-Analysis DC up to 10 kHz



Online phasor-diagram

### 3.10 Analysis of ripple control signals

- 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 pulse recorder is suitable for evaluation of the ripple control pulse pattern.



*Ripple control level over a few days*

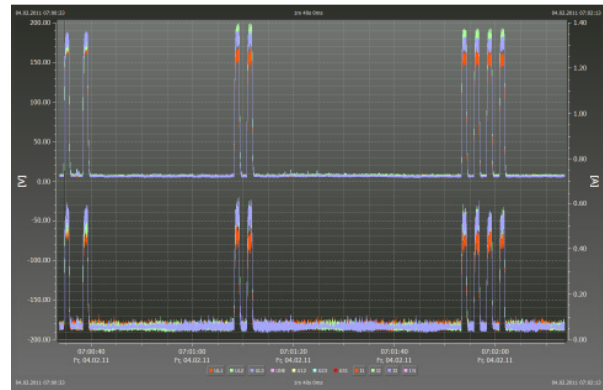
#### Ripple control signal - trigger (Option R1)

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*

### 3.11 Trigger functions

- Comprehensive trigger functions.
- Programmable trigger limits.
- Programmable recorders (cyclic data, oscilloscope-recorder, 10ms RMS recorder, recording & pre/post time).
- Automatic trigger selectable.
- Cross trigger function: The transient recorder triggers the oscilloscope and RMS recorder at the same time

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 to much data is impossible)

### 3.12 Option „IEC61000-4-7 - 2 kHz bis 9 kHz“ (B1)

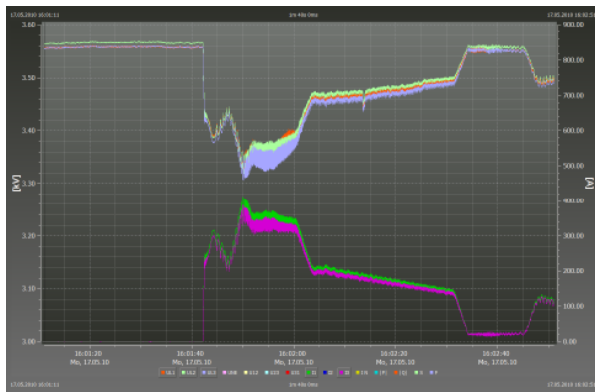
This option allows a permanent frequency measurement of voltage and current in accordance with IEC 61000-4-7 part 2 in the frequency range from 2 kHz to 9 kHz, in addition to the harmonics. The bandwidth is 200 Hz.

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

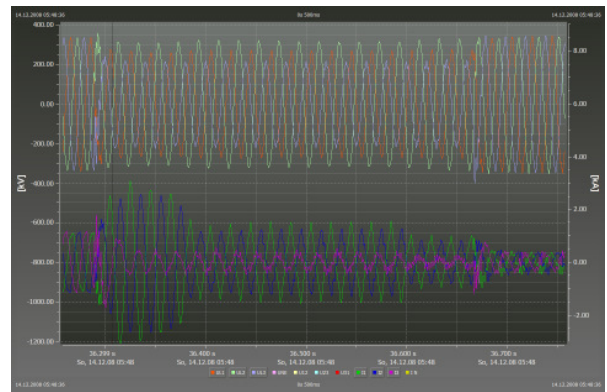
We take care of it.

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### 3.13 Fault records captured with Oscilloscope and 10ms RMS recorders



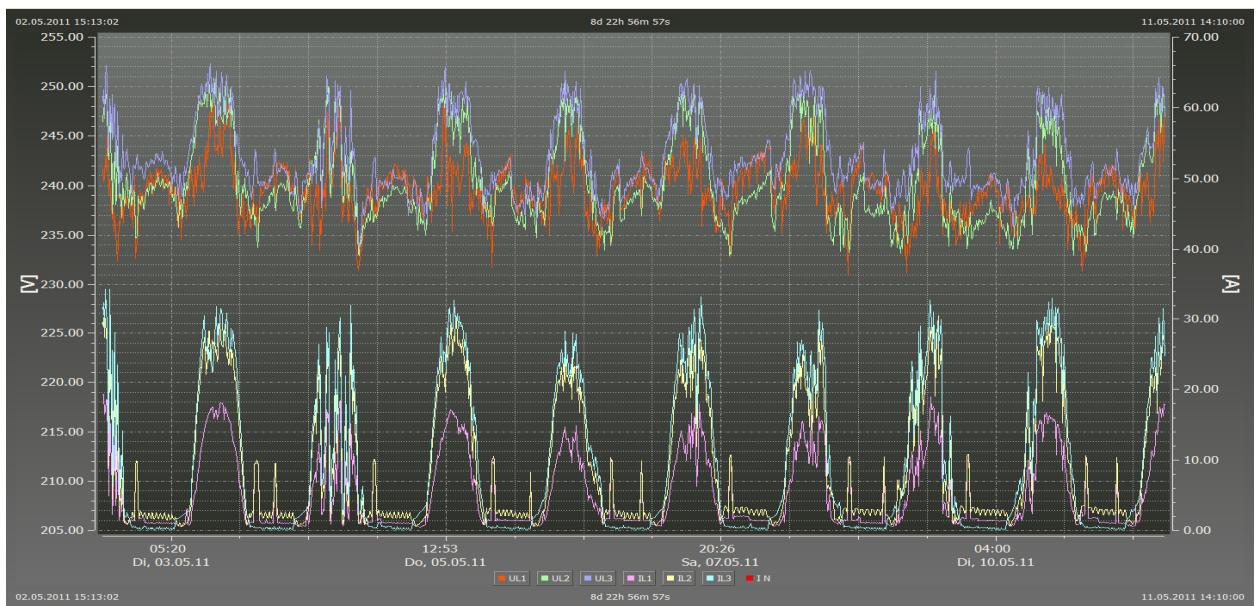
*10ms RMS record (example machine start-up)*



*Oscilloscope record*

## 4. Continuous recording

More than 3,800 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*

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## 4.1 Technical data

PQ Box 150 (4U/4I)	
4 voltage inputs (TRMS):	L1, L2, L3, N, PE
Maximum input voltage:	565V AC/800V DC L-N 980V AC/1380V DC L-L
Input Impedance:	10 MΩ impedance
4 current inputs (TRMS):	1000 mV input for mini clamp and 330mV for Rogowski current probes
Input Impedance:	10 kΩ impedance
Sampling frequency:	20,48 kHz
Synchronization to fundamental frequency:	45 Hz to 65 Hz
Measurement intervals:	adjustable from 1 sec to 30 minutes
Data memory:	4 GB standard Up to 32 GByte SD card (optional)
Interfaces:	USB 2.0 TCP/IP 100Mbit
Time synchronization:	DCF77 or GPS radio clock
Dimensions:	202 x 181 x 40 mm
Mass:	1.0 kg
Degree of protection:	IP 65
IEC 61000-4-30 (Ed. 3):	Class A
Accuracy:	< 0.1%
Insulation class:	CAT III / 1000V, CAT IV / 600V
Insulation test	Impulse voltage 12,8 kV 5 sec 7,4 kV rms
A/D converter:	24 Bit
Temperature range:	Operation: -20° ....60°C Storage:-30° ....80°C
Color display (TFT):	100 x 60 mm

PQ Box 150 (4U/4I)	
Power supply:	15V / <10VA
Via external adapter	

EMC	
CE-conformity	
<ul style="list-style-type: none"> <li>● Immunity           <ul style="list-style-type: none"> <li>— EN 61326</li> <li>— EN 61000-6-2</li> </ul> </li> <li>● Emitted interference           <ul style="list-style-type: none"> <li>— EN 61326</li> <li>— EN 61000-6-4</li> </ul> </li> </ul>	
ESD	8 kV / 16 kV
<ul style="list-style-type: none"> <li>— IEC 61000-4-2</li> <li>— IEC 60 255-22-2</li> </ul>	
Electromagnetic fields	10 V/m
<ul style="list-style-type: none"> <li>— IEC 61000-4-3</li> <li>— IEC 60 255-22-3</li> </ul>	
Burst	4 kV / 2 kV
<ul style="list-style-type: none"> <li>— IEC 61000-4-4</li> <li>— IEC 60 255-22-4</li> </ul>	
Surge	2 kV / 1 kV
<ul style="list-style-type: none"> <li>— IEC 61000-4-5</li> </ul>	
HF conducted disturbances	10 V, 150 kHz ... 80 MHz
<ul style="list-style-type: none"> <li>— IEC 61000-4-6</li> </ul>	
Voltage dips	100 1min
<ul style="list-style-type: none"> <li>— IEC 61000-4-11</li> </ul>	
Emitted interference:	
<ul style="list-style-type: none"> <li>● Housing at a distance of 10 m</li> </ul>	30...230 MHz, 40 dB 230...1000 MHz, 47 dB
<ul style="list-style-type: none"> <li>● AC supply connection at a distance of 10 m</li> </ul>	0,15...0,5 MHz, 79 dB 0,5...5 MHz, 73 dB 5...30 MHz, 73 dB

We take care of it.

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## 5. PQ-Box 150 current accessories

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

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

Current range: 3000A RMS; Accuracy: 1%

Rogowski clamp length= 610mm;

Diameter = 194mm; Rogowski clamp head = 9,9mm

Frequency range: 10Hz to 20kHz

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

Current range: 6000A RMS; Accuracy: 1%

Rogowski clamp length = 910mm;

Diameter = 290mm; Rogowski clamp head = 9,9mm

Frequency range: 10Hz to 20kHz

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

Current range: 1500A RMS; Accuracy: 1%

Rogowski clamp length = 400mm;

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

Frequency range: 10Hz to 20kHz

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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: 20A

Frequency range: 40Hz to 20kHz

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

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

Frequency range: 40Hz to 20kHz

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

Current range: 5A AC RMS

Frequency range: 40Hz to 20kHz

Free current adapter set necessary

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

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

Current range 60A/600A (two ranges)

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

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

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

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

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

Cable extension 5 m for current clamps or Rogowski coils.

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## 6. Order details

CHARACTERISTICS	CODE
<b>Fault recorder and network analyzer according to DIN EN 50160 and IEC 61000-3-40 class A</b> 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 <ul style="list-style-type: none"> <li>● 4 GB micro SD card memory</li> <li>● Slot for SD memory card 1GB to 32GB</li> <li>● USB 2.0 and TCP/IP interface</li> <li>● RS232 interface to connect radio clock or GPS clock</li> <li>● Color Display</li> <li>● IP65 rated enclosure</li> <li>● Uninterruptible power supply</li> <li>● USB- and TCP/IP cable set</li> <li>● Connection cable with 4 mm banana plug for voltage (internal power fuse 50kA)</li> <li>● 5 pcs. Dolphin clips</li> <li>● Hard case for PQ-Box 150 and accessories</li> <li>● Power supply AC/DC</li> <li>● Evaluation software WinPQ mobil</li> </ul>	<b>PQ-Box 150</b>
<b>Option</b> <ul style="list-style-type: none"> <li>● Frequency measurement 2 kHz up to 9 kHz</li> <li>● Ripple control analysis</li> </ul>	B1 R1
<b>Operating manual and display language</b> <ul style="list-style-type: none"> <li>● German</li> <li>● English</li> <li>● French</li> <li>● Spanish</li> <li>● Italian</li> <li>● Dutch</li> <li>● Czech</li> <li>● Russian</li> <li>● Polish</li> </ul>	G1 G2 G3 G4 G5 G6 G7 G8 G9
ACCESSOIRES	IDENT-NO.
● Voltage tap on insulated cable; contact support 1 ~, connected for 35-240mm <sup>2</sup>	111.7037
● Cable set 4 phase, 1.5 mm <sup>2</sup> , 2m long, 4x 16A fuse, 4x 4mm safety plugs	111.7038
● Network adapter connector socket for 1 ~; 4mm safety plugs	582.0511
● Calibration set for PQ-Box 100/150/200; calibration software and adapter box	111.7039
● Kensington lock - Lock for PQ-Box 150/200, 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, 4GByte industry-standard	900.9099
● Replacement battery pack	570.0010



*PQ-Box 150, hard case and accessories*

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Software - Version:

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Power Quality Analyzer – PQ-Box 150