

**HV Power hints and tips:
PQ-Box 100 Power Quality Recorder**

Issue 11

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Measuring DC Voltage offset

The permanent recording value “DC Voltage” calculates the DC offset of an AC+DC waveform. The DC voltage can be expressed as:

- a) A percentage of the RMS value of the AC+DC value.
- b) An absolute voltage

The WinPQ mobil menu ‘setup/setup harmonics selector’ is used to determine the displayed units. Note that for percentage, it is the percentage of the ‘U eff’ value, not of the “nominal” setting value.

A test was conducted to demonstrate this recorded value. A single phase 50 Vrms 50 Hz waveform (see Figure 2, Waveform A) was first applied to a recording PQ-Box 100. The test waveform was then switched off, and reapplied - but with the addition of a 10 Vdc offset being applied (see Figure 2, Waveform B).

Figure 1, shows the U eff trace (red) in the upper portion of the graph. This shows a 50 V value while Waveform A was applied, and a 50.98 V value while Waveform B was applied. These values correlate closely to the calculated values (refer Table 1), confirming ‘U eff’ is recording the true RMS values (i.e. AC + DC component).

The lower trace in Figure 1 (pink) shows the ‘DC Voltage’ value which is calculated by the PQ-Box 100 during its recording using FFT data. Percentage Units were used for this display and this shows a 0 % value during waveform A, and an approx. 20 % value during waveform B (10.19 V displayed with units=voltage selected).

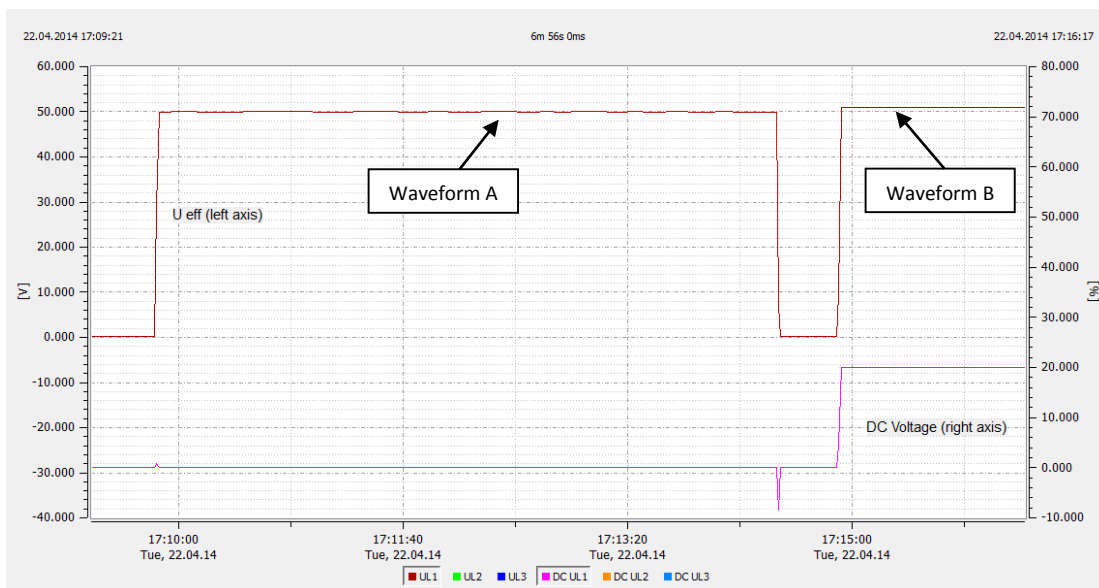


Figure 1. ‘U eff’ and ‘DC Voltage’ traces without (A) and with 10 Vdc offset applied (B) to 50 Vac waveform.

Expected RMS value Waveform A	$V_{rms} = \frac{V_{pk}}{\sqrt{2}} = \frac{70}{1.414} = 49.49 \text{ V}$ <i>(vs measured 49.99 V)</i>
Expected RMS value Waveform B	$V_{rms} = \sqrt{V_{ac}^2 + V_{dc}^2} = \sqrt{49.49^2 + 10^2} = 50.49$ <i>(vs measured 50.98 V)</i>

Table 1. Calculated 'U eff' values expected.

During this testing, manual Oscilloscope events were triggered, to record the applied waveshapes, refer to Figure 2. Screenshots of the Online Oscilloscope data were also taken and were compared to the Oscilloscope events, confirming these too showed any DC offset.

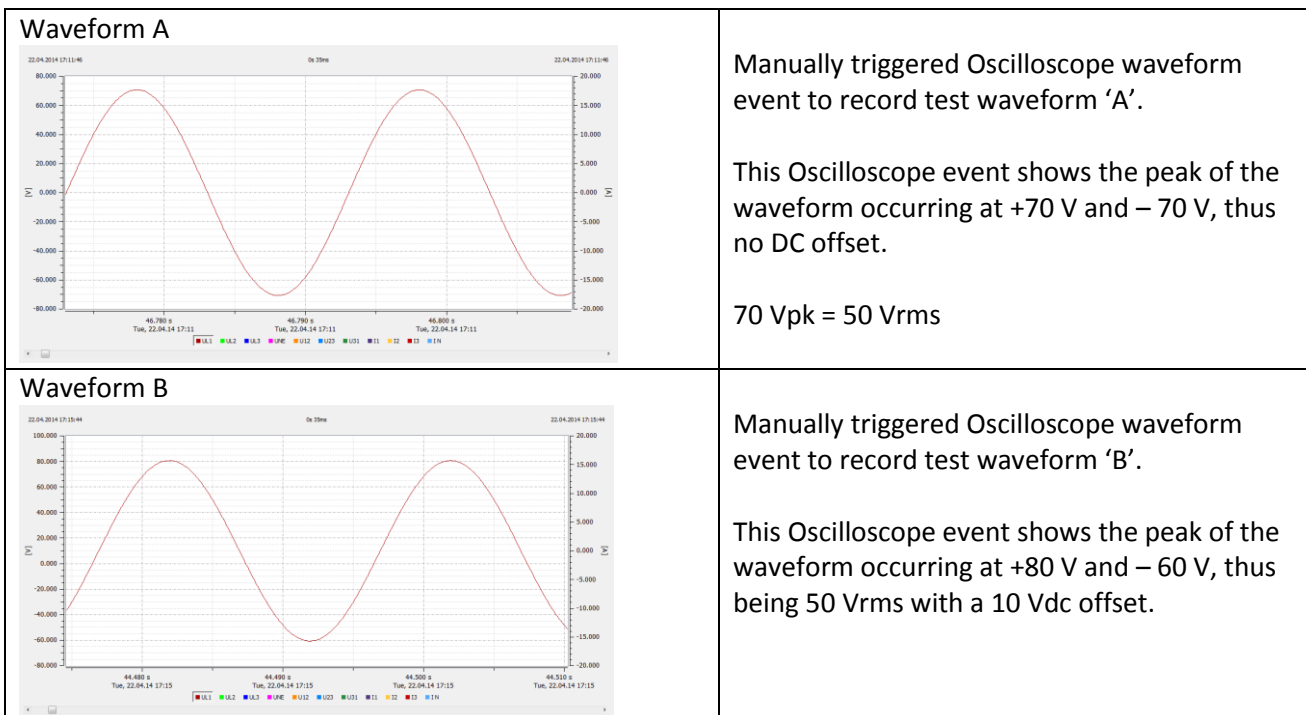


Figure 2. Applied test waveforms without and with 10 Vdc offset.

Please also refer to HV Power hints and tips Issue 7, for further information relating to recording DC voltages, especially for recommendations on setup when low voltage dc levels are to be measured.

Measuring DC Current offset

A "DC Current" value is also recorded by the PQ-Box 100 & 200. This is the current equivalent of the DC Voltage described above. A hall effect DC measuring current clamp (200 mA to 60 A or 0.5 A to 600 A), or a 2 A current shunt is available. These devices are AC+DC measuring, so true RMS current and DC component measurements are possible. When using the standard mini-clamps and Rogowski coils, as these are AC coupled, no DC measurement is possible.



The DC Current may be displayed as an absolute current, as a percentage of the 'I_{eff}' value, or as a percentage of a nominated current value.