

# Advanced, handheld, easy to use 3-phase power quality analyser



### Standards

Instrument is developed and manufactured in accordance with following standards

- Safety:** IEC/EN 61010-1
- EMC:** IEC/EN 61326-1
- Measurements:** IEC/EN 50160

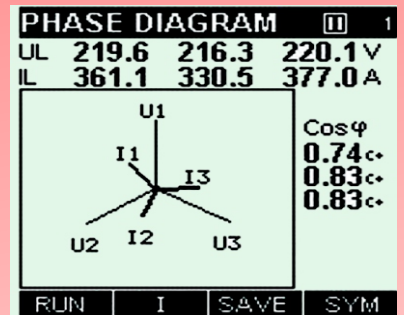
- PowerQ Plus is a genuine, portable 3-phase power quality analyser which favorably competes with higher priced instruments and can be easily implemented in a variety of different situations.
- PowerQ Plus is due to its small dimensions and ease of use ideally suited for routine or complex power quality assesment in heavy duty industrial environments.
- Pre-set logging screens allow on-site evaluation of all major power quality parameters (U,I, P, PF, cos $\phi$ , THD, individual harmonics componets, phase shifts, etc.).
- Windows compatible PowerQ Link software package expands a versatility

### Target applications

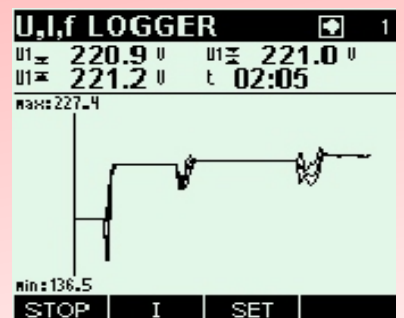
- Power quality assesment and troubleshooting in low voltage electrical systems.
- Balancing phase currents in 3-phase systems.
- Checking power correction equipment performance.
- Harmonics spectrum analysis for selection of harmonic filters.
- Capturing inrush currents e.g. motor's start up currents.
- Voltage deviations recording.
- Consumption recording.

### Main features

- Simultaneous analysis of basic power quality parameters (U,I,P,Q,S, PF)
- Harmonics analysis up to 50th component
- Phase diagram
- Voltage unbalance calculation for 3-phase systems
- On-line scope function
- Lightweight design
- Downloading software package PowerQ Link



Phase diagram helps at connecting the instrument on the power network and is effectively used at individual phase conditions assesment.



PowerQ<sup>Plus</sup> enables on-screen evaluation of various pre-set loggers. This is an example of a logger for U, I and f.

## Technical specification

### AC voltages

Three-phase AC voltage input  
(3 differential inputs, L<sub>1</sub>-N<sub>1</sub>, L<sub>2</sub>-N<sub>2</sub>, L<sub>3</sub>-N<sub>3</sub>).  
Input voltage range: 3-550 V<sub>RMS</sub> L-N  
3-550 V<sub>RMS</sub> L-L  
Resolution: 0.1 V  
Accuracy: ±1% of reading ±2.5 V  
Crest factor: < 1.4  
Frequency range: 45 ÷ 66 Hz

### AC currents

Three-phase AC input for connection to current transducers with voltage output.  
Range 1:  
Input current: 0.04 ÷ 0.1 V<sub>RMS</sub> for current range 4 ÷ 100 A  
Resolution: 0.1 A  
Accuracy: ±(2% of reading + 0.3 A)  
Crest factor: < 2.3  
Range 2:  
Input current: 0.04 ÷ 0.1 V<sub>RMS</sub> for current range 40 ÷ 1000 A  
Resolution: 0.1 A  
Accuracy: ±(2% of reading + 3 A)  
Crest factor: < 2.3

### Power measurements

Measured parameters:  
- Active power (P)  
- Reactive power (Q)  
- Apparent power (S)  
- Power factor  
- Cos φ  
- Energy (Wh, Vah, Varh)  
Accuracy:  
Power: ± (3% + 3dig)  
Power factor: ± 0.03  
Energy: ± 3%  
All measurements are performed in four quadrants: load or generator with capacitive or inductive character.

### Voltage harmonics measurement

Measuring range: U<sub>M</sub> > 3%U<sub>N</sub>  
Resolution: 0.1%  
Accuracy: 5% U<sub>M</sub> (3% for DC)  
Measuring range: U<sub>M</sub> < 3%U<sub>N</sub>  
Resolution: 0.1%  
Accuracy: 0.15% U<sub>N</sub>  
U<sub>N</sub>: nominal voltage (TRMS)  
U<sub>M</sub>: measured harmonic voltage h<sub>M</sub> = 1<sup>st</sup> ÷ 50<sup>th</sup>

## Accuracy

### Voltage

Measuring range	Resolution	Accuracy	Crest factor
Range 1: 5.0 V <sub>RMS</sub> ÷ 70.0 V <sub>RMS</sub>	0.1 V	±(5% + 1 V)	1.4 min
Range 2: 10.0 V <sub>RMS</sub> ÷ 130.0 V <sub>RMS</sub>		±(5% + 1.5 V)	
Range 3: 20.0 V <sub>RMS</sub> ÷ 300.0 V <sub>RMS</sub>		±(5% + 3 V)	
Range 4: 30.0 V <sub>RMS</sub> ÷ 550.0 V <sub>RMS</sub>		±(5% + 5 V)	

### Current

Measuring range	Resolution	Accuracy	Crest factor
Range 1: 4.0 (0.0) mV <sub>RMS</sub> ÷ 100 mV <sub>RMS</sub> (4 ÷ 100) A	0.1 A	±(5% + 0.6 A)	2.3 min
Range 2: 0.04 (0.00) V <sub>RMS</sub> ÷ 1 V <sub>RMS</sub> (40 ÷ 1000) A		±(5% + 6 A)	

### Voltage

#### Voltage events

Signals: selectable U1, U2, U3  
Swell limit: 1% ÷ 35% U<sub>N</sub>  
Dip limit: -35% ÷ -1% U<sub>N</sub>  
Interruption limit: 1% ÷ 20% U<sub>N</sub>  
Logging time: manual stop, (1, 2, 5, 10, 30) minutes or (1, 2, 5, 10, 30, 50, 75) hours  
Hysteresis: 1% U<sub>N</sub>

Measuring range	Resolution	Accuracy	Crest factor
Range 1: 5.0 V <sub>RMS</sub> ÷ 70.0 V <sub>RMS</sub>	0.1 V	±(5% + 1 V)	1.4 min
Range 2: 10.0 V <sub>RMS</sub> ÷ 130.0 V <sub>RMS</sub>		±(5% + 1.5 V)	
Range 3: 20.0 V <sub>RMS</sub> ÷ 300.0 V <sub>RMS</sub>		±(5% + 3 V)	
Range 4: 30.0 V <sub>RMS</sub> ÷ 550.0 V <sub>RMS</sub>		±(5% + 5 V)	

Logger lengths depend on selected interval. Maximum recording time is displayed automatically.

### Current harmonics measurement

Measuring range: I<sub>M</sub> > 3%I<sub>N</sub>  
Resolution: 0.1%  
Accuracy: 5% I<sub>M</sub> (3% for DC)  
Measuring range: I<sub>M</sub> < 3%I<sub>N</sub>  
Resolution: 0.1%  
Accuracy: 0.15% I<sub>N</sub>  
I<sub>N</sub>: nominal range (TRMS)  
I<sub>M</sub>: measured harmonic current h<sub>M</sub> = 1<sup>st</sup> ÷ 50<sup>th</sup>

### Loggers

#### Voltage and current logger

Signals: selectable U1, U2, U3, I1, I2, I3  
Interval: selectable, (1,2,5,15,30) (1,2,5,10,15,30) minutes  
Displayed data: average, min and max value of the interval

#### Power logger

Signals: selectable L1, L2, L3  
Interval: selectable, (1,2,5,15,30) seconds or (1,2,5,10,15,30) minutes  
Displayed data: average, min and max value of the interval (for all four quadrants)

#### Harmonics logger

Signals: selectable THDI1, THDI2, THDI3, THDU1, THDU2, THDU3, selectable, (1,2,5,15,30) (1,2,5,10,15,30) minutes

#### Inrush currents

Signals: selectable U1, U2, U3, I1, I2, I3  
Interval: selectable, (10, 20, 100, 200) ms  
Trigger channels: I1, I2, I3  
Trigger level: selectable, 2% ÷ 100% of current range (in steps of 0.1% of current range)  
Displayed data: average, min and max value of the interval

## General Technical specification

Working temperature range: -10 C ÷ +55 C  
Storage temperature range: -20 C ÷ +70 C  
Max. Humidity: 95% RH (0 C ÷ +40 C), non-condensing  
Pollution degree: 2  
Protection classification: double insulation  
Overvoltage category: voltage inputs: CAT III 600 V  
Protection degree: IP 42  
Display: graphic liquid crystal display with backlight, 160 x 160 dots.

External DC supply: 12 V, 400 mA  
Maximum power consumption: 360 mA  
Communication: RS232 serial interface  
Baud rate: 1200 baud ÷ 115200 baud  
Connector: 9 pin D-type  
Dimensions: (220 x 115 x 90) mm  
Weight (without accessories): 0.65 kg

## Ordering information

### Standard set

Part No. MI 2392



- Instrument PowerQ<sup>Plus</sup>
- Current clamp 1000A/1V, 3 pcs
- Test tips, 3 pcs
- Alligator clips, 4 pcs
- Voltage measurement clips, 4 pcs
- PC SW Package PowerQ Link on CD with RS232 cable
- Power supply adapter
- Rechargeable batteries, 6pcs
- Soft carrying bag
- User manual
- Product verification data
- Declaration of conformity
- Declaration of warranty

## Optional accessories



- A 1020 - Small soft carrying bag
- A 1037 - Current transformer 5 A/1 V
- A 1039 - Clamp adapter
- A 1069 - Mini clamp 100 A / 1 V
- A 1099 - Current clamp 3000 A / 1 V
- A 1120 - 3-phase flex-kit, 45 cm, 3000 A/1 V
- A 1122 - Mini clamp 5 A / 1 V
- S 2014 - Safety fuse adapters
- S 2015 - Safety flat clamps