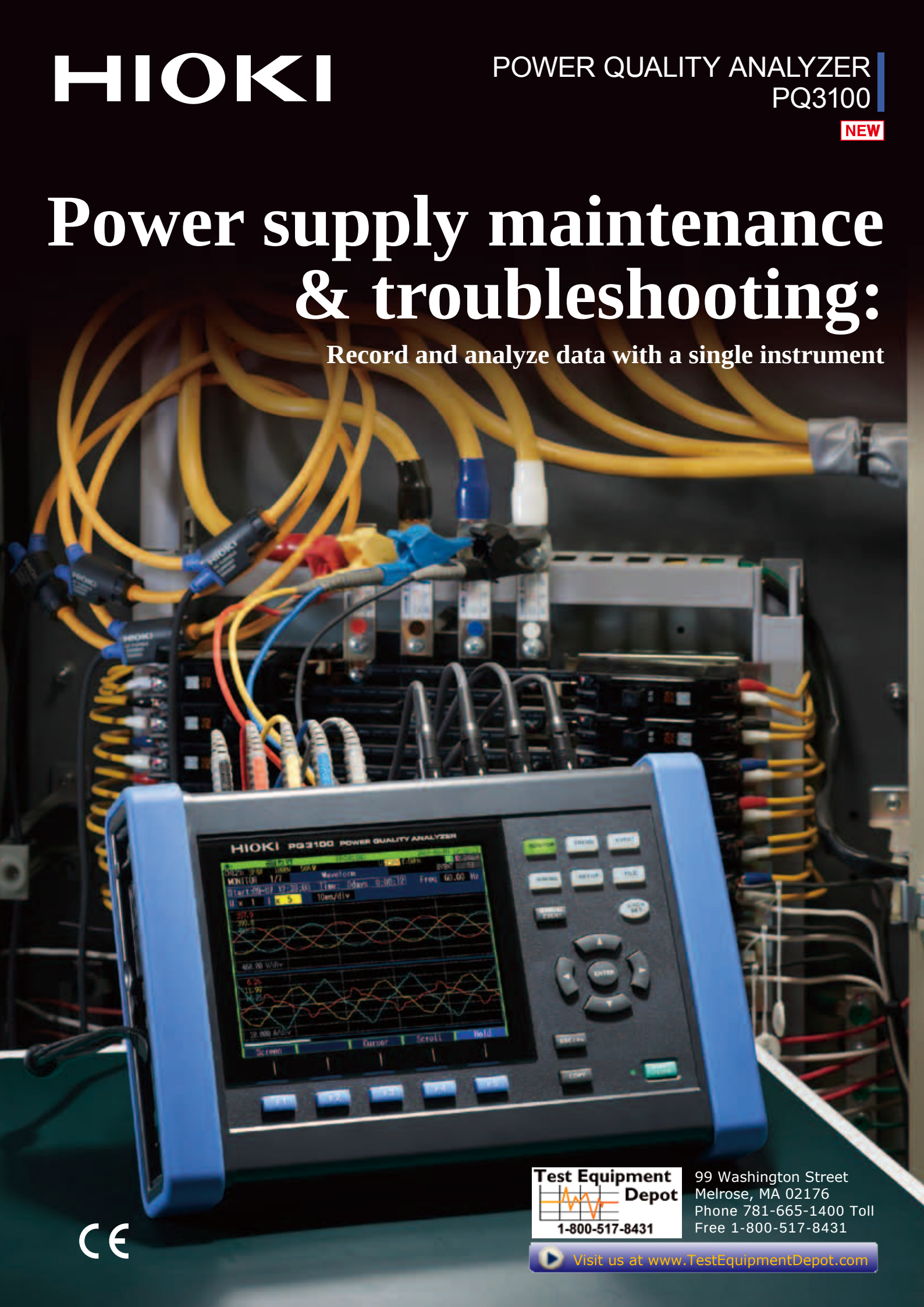
HIOKI

POWER QUALITY ANALYZER
PQ3100

NEW

Power supply maintenance & troubleshooting:

Record and analyze data with a single instrument



CE

Reliable power supply maintenance, management, troubleshooting, and analysis

The power grid is the single most important piece of infrastructure in our society, and regular maintenance and management are essential in order to prevent problems. When power supply issues are caused by factors such as equipment malfunctions or rapid surges in power demand, personnel are called upon to analyze the underlying causes quickly and precisely. The PQ3100 aids in reliable power analysis by delivering analytical capabilities that reliably captures the full range of power anomalies along with exceptional ease of use that facilitates each step of instrument operation, from connecting it to the circuit to recording data.

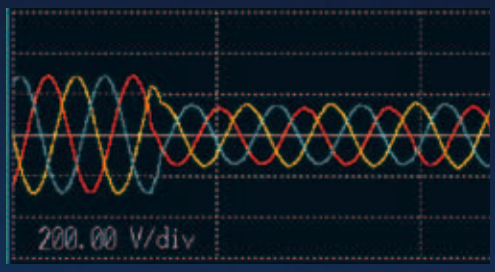
Recording power quality data for the grid

The PQ3100 records data including voltage, current, power, harmonics, and flicker* simultaneously along a single time axis, and the included PQ ONE application software makes it easy to create reports.

* Filcker recording available in future firmware updat

Analyzing device power supply issues

When you need to resolve issues with a device that unexpectedly malfunctions or suddenly stops, the PQ3100 captures all power anomalies, including instantaneous outages, voltage drops, and frequency fluctuations, while simultaneously recording trend data.



Measuring AC/DC power

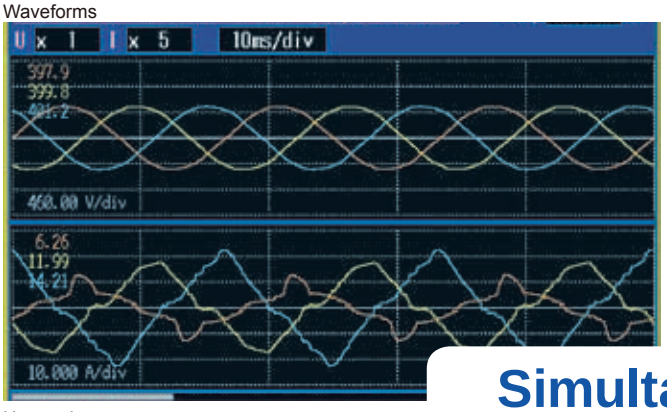
Used in combination with an AC/DC auto-zero current sensor, the PQ3100 can accurately measure DC currents over extended periods of time. Since the instrument supplies power to connected sensors, there's no need to use an additional power supply for sensors.

Simultaneously measure all parameters at once

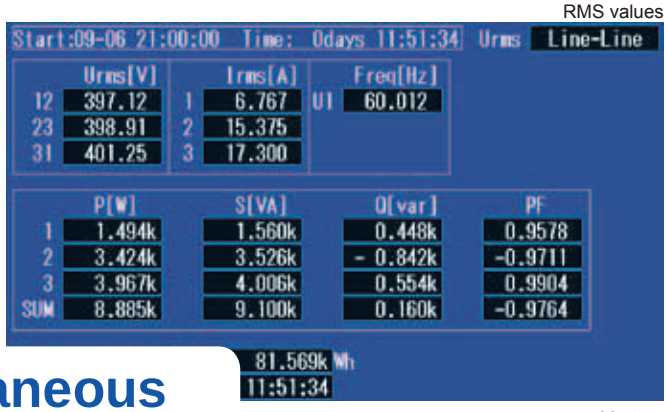
Measuring all parameters at the same time

The PQ3100 makes it easy to verify current conditions by displaying all measurement parameters simply by toggling the screens.

Waveforms



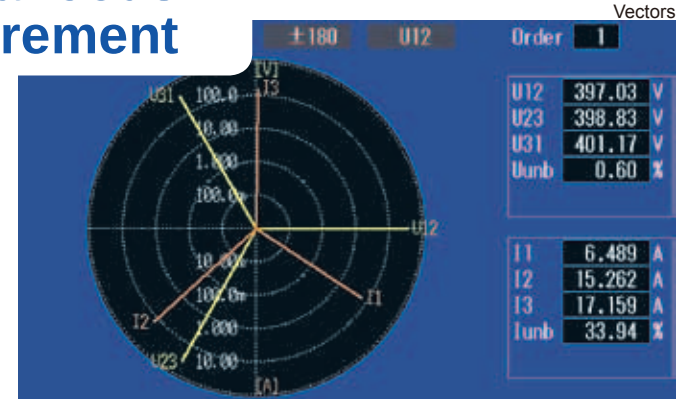
RMS values



Simultaneous measurement

Harmonics

Vectors

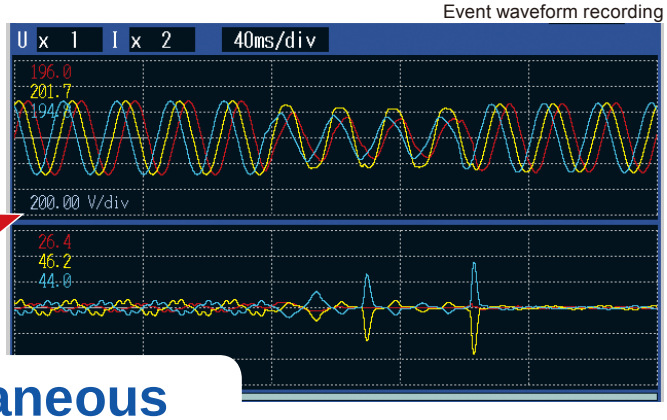


Simultaneously recording trend graphs and event waveforms

The PQ3100 records trend data for all parameters at once. When the PQA detects a power anomaly, the event is immediately recorded. Since maximum, minimum, and average values are recorded during each interval, you'll never miss peak values.

Trend recording

Event waveform recording

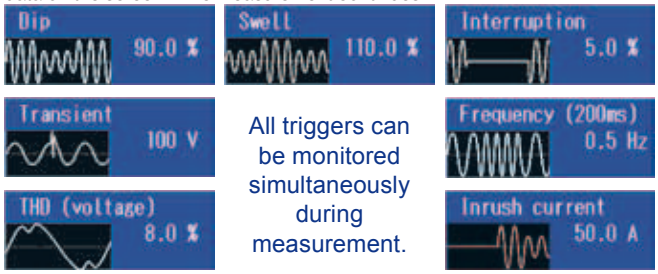


Simultaneous recording

30-second event trend data

The PQ3100 also records 1/2 RMS value fluctuations over a period of 30 seconds when a voltage spike, voltage drop, or inrush current occurs. In addition, the instrument can be used to investigate voltage drops caused by inrush current at motor startup.

Triggers can be set in parallel for all events, and you can review recorded data on the screen while measurement continues.



Easy wiring and configuration. Reliable measurement.

1 Quick Set: Easy-to-understand on-screen guide for measurement procedures

Simply launch Quick Set to navigate - from connecting and configuring the instrument to starting recording.

Setup Flow (example: 3P4W)

STEP 1

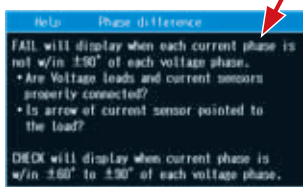
Choose the wiring type and connect cables to the instrument.

STEP 2

Connect the voltage cables and current sensors to the measurement target.

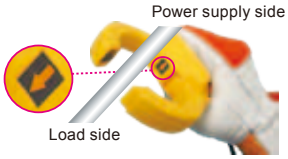
STEP 3

The instrument automatically performs a wiring check and displays the results.



On-screen help notification

Example on-screen help:
If the clamp-on sensor is oriented incorrectly, the instrument won't be able to measure power and power factor accurately.

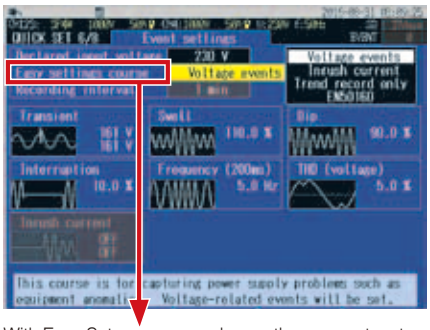


STEP 4

Set the parameters to record and the recording interval.

STEP 5

Start recording.

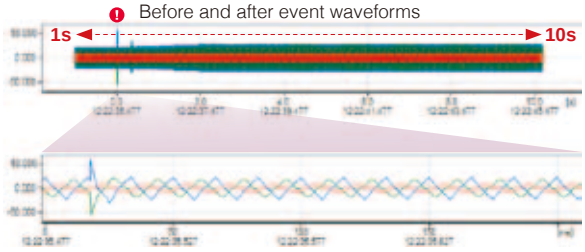


With Easy Setup, you can choose the parameters to record with one touch.

Voltage events	Capture power supply problems such as equipment anomalies. Voltage-related events will be set.
Inrush current	Measure inrush current. Threshold is set at 200% of the current RMS. Input voltage into CH1.
Trend record only	Record trend data only. All event items are set to OFF.
EN50160	Measure according to the EN50160 standard. Recording interval is set to 10 minutes.

2 Record 11 seconds of data before and after events

The PQ3100 can record waveforms for up to 1 second before and 10 seconds after an anomaly occurs. This capability is helpful when you need to analyze data bracketing an anomaly or when you need to verify normal return for a solar power conditioner.



Standard event waveforms (200 ms)

3 Superior level of safety

The PQ3100 supports CAT III (1000 V) and CAT IV (600 V) measurements.

4 High-precision measurement

Voltage RMS value accuracy: ±0.2% of nominal voltage
Swell, dip, outage: ±0.3% of nominal voltage
The PQ3100 complies with the IEC 61000-4-30 Class S standard.

5 Drive sensors without an external power supply

Since the PQA supplies power, there's no need to use a separate AC adapter for AC/DC sensors or flexible sensors.

6 Easily install in confined space

Flexible current sensors are convenient when making measurements in a confined space and when measuring a two- or three-line power circuit.

7 Measure DC power over extended periods of time

Used in combination with an auto-zero current sensor, the PQ3100 can measure DC power over extended periods of time without the need to worry about zero-point drift.

8 Extensive range coverage for use in an array of applications

For example, the CT7136 lets you choose from three measurement ranges (5 A, 50 A, or 500 A), allowing it to be used in a broad range of applications, from the secondary side of a CT to wires carrying large currents.

9 Long-term recording of data on an SD memory card

Choose optional cards with 2 GB or 8 GB of capacity.

Recording times when using a 2 GB SD memory card

Recording interval (example values)	Without harmonics	With harmonics	Event recording
200 ms	25 h 40 m	n/a	n/a
1 sec	5 d 7 h	7 h	Yes
2 sec	10 d 14 h	14 h	Yes
10 sec	53 d 12 h	2 d 21 h	Yes
1 min	321 d	17 d	Yes
10 min	1 year	178 d	Yes
30 min	1 year	1 year	Yes

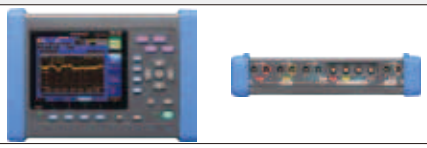
10 Up to 8 hours of battery operation

The PQ3100's energy-saving design means its battery lasts a long time, allowing you to continue measuring following a power outage or make measurements after taking the instrument to sites in the field.

11 Remote control via Ethernet

Configure settings or monitor contents from a remote location. You can also download data using the PQ3100's FTP function (available in a future firmware update).

Comparison of PQ3100 and PW3198 specifications

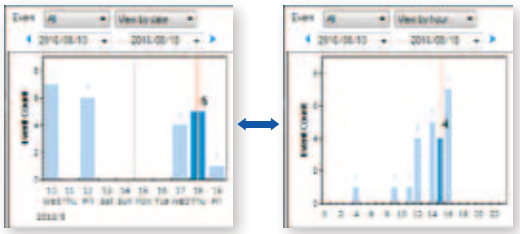
Model			PQ3100	PW3198
				
AC/DC			Yes	Yes
Fundamental frequency			DC/ 50 Hz/ 60 Hz	DC/ 50 Hz/ 60 Hz/ 400 Hz
Measurement lines			Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire, three-phase 4-wire + Ch. 4	
Voltage input	Number of channels		4 (U4: Not isolated)	4 (U4: Isolated from U1 to 3)
	Maximum terminal-to-ground rated voltage		1000 V (measurement category III) 600 V (measurement category IV)	600 V (measurement category IV)
Current input	Number of channels		4	4
	Power supply for sensors		Yes	n/a
Measurement parameters	Voltage		1/2 RMS value (half-wave offset wave calculation), RMS value, waveform peak, Voltage DC, Unbalance factor (negative-phase, zero-phase), frequency (1 wave/ 200 ms/ 10 sec.)	
			Crest factor	n/a
	Current		Inrush current (half-wave), RMS value, waveform peak, Current DC, Unbalance factor (negative-phase, zero-phase), K factor	
			1/2 RMS value (half-wave offset wave calculation), crest factor	n/a
	Power		Active power, Reactive power, Apparent power, Power factor, Displacement power factor, Active energy, Reactive energy	
			Apparent energy, Electrical charges	n/a
	Flicker		Support for flicker measurement planned with a future firmware update.	Pst, Plt, ΔV10 (simultaneous measurement of 3 channels)
	Harmonics		0th order (DC) to 50th order, Voltage/ Current/ Power, Phase angle (voltage/ current), Voltage/Current phase difference, Total harmonic distortion ratio (voltage/ current)	
	Inter-harmonics		0.5th order to 49.5th order, voltage/ current	
	High-order harmonics		n/a	2 kHz to 80 kHz
Time-series measurement	Recording period		Max. 1 year	Max. 1 year (55 weeks with repeat function on)
	Recording interval time		200 ms/600 ms/150 cycles (with 50 Hz input)/1/2/5/10/15/30 sec. to 2 h	150 cycles (with 50 Hz input), 1/3/15/30 sec. to 2 h
Event measurement	Maximum number of recordable events		9999 events × 365 days of repeat operation	1000 events × 55 repeats
	Event statistical processing		Display of the number of events per day by event type (Support for event statistics planned with a future firmware update.)	n/a
	Waveform acquisition:	Before event	Max. 1 sec.	n/a
		At event	200 ms	200 ms
		After event	Max. 10 sec.	Max. 1 sec. (with series of events)
Event parameters	Measurable event parameters		Voltage Swell/ Dip/ Interruption/ Frequency fluctuations/ Inrush current/ THD	
			-	RMS value/ Voltage waveform peak/ Current waveform peak/ Comparison of voltage waveforms/ Harmonics/ Unbalance factor/ Power
	Transient overvoltage		200 kS/s, 2.2 kV	2 MS/s, 6 kV
Setting aid			QuickSet	Simple Setting feature
Operating temperature and humidity			-20°C to 50°C (-4°F to 122°F), 80% RH	0°C to 50°C (32°F to 122°F), 80% RH
IEC 61000-4-30 standard compliance			Class S	Class A

PQ One: Analyze data and create reports on a PC with a dedicated application

The PQ3100 includes PQ ONE, a power quality analysis application whose latest version can be downloaded free of charge from Hioki's website.

Event statistics

Display statistics on event occurrence by date and time, making it easy to discover anomalies that occur during specific time periods or days of the week.



Daily statistics　　Hourly statistics

Trend graphs

Display time-series graphs of parameters such as voltage, current, frequency, harmonics, unbalance factor, power, and energy. Configure the display range on screen as desired and create reports by outputting graphs as-is.

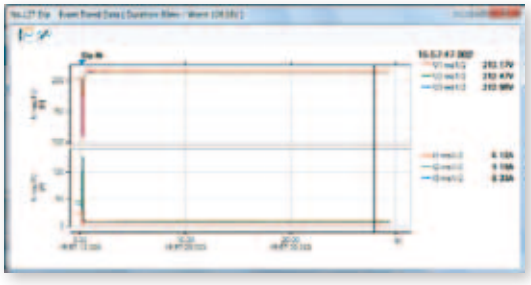
Choose measurement parameters, channels, and maximum, minimum, or average values.

Event list

Display statistics on event occurrence by date and time, making it easy to discover power supply anomalies that occur during certain time periods or days of the week.

Event details

Analyze 200 ms event waveforms, including parameter waveforms, harmonics, vectors, and value displays. You can also display 30 seconds of event trend data and 11 seconds of pre- and post-event waveforms.



Example voltage drop (30-second event trend data)

Report creation

Automatically create reports simply by choosing measurement parameters. If you output the report in Microsoft Word* format, you can also add comments.

*Microsoft Word is a product of Microsoft Corporation.

Basic specifications

Input channels	Voltage: 4 channels, Current: 4 channels
Input terminal profile	Voltage: Plug-in terminals (safety terminals) Current: Dedicated connector (HIOKI PL14)
Measurement circuits	Any of the following plus Ch. 4 additional input: Single-phase 2-wire: 1P2W Single-phase 3-wire: 1P3W Single-phase 3-wire/1-voltage measurement: 1P3W1U Three-phase 3-wire/2-power measurement: 3P3W2M Three-phase 3-wire/3-power measurement: 3P3W3M Three-phase 4-wire: 3P4W
Input methods	Voltage: Isolated input (U1/U2/U3/U4 and N-terminal common differential input, U1/U2/U3/U4 and N not isolated) Current: Isolated input via current sensors
Input resistance	Voltage inputs: 5 MΩ Current inputs: 200 kΩ
Maximum input voltage	Voltage inputs: 1000 V AC/DC, 2200 Vpeak
Maximum rated voltage to earth	1000 V AC (CAT III), 600 V AC (CAT IV) Anticipated transient overvoltage: 8000 V
Measurement method	Digital sampling and zero-cross synchronous computation
Sampling frequency	200 kHz
A/D converter resolution	16bit
Display range	Voltage: 2 V to 1300 V Current: 0.4% to 130% of range Power: 0.0% to 130% of range Measurement parameters other than above: 0% to 130% of range
Effective measurement range	Voltage: AC: 10 V to 1000 V, peak ±2200 V DC: 5 V to 1000 V Current: 5% to 120% of range, peak ±400% of range Power: 5% to 120% of range (with voltage and current that both fall within effective measurement range)

Accuracy specifications

Conditions of accuracy guarantee	Guaranteed accuracy period: 1 year Post-adjustment accuracy guaranteed period: 1 year Guaranteed accuracy temperature and humidity range: 23°C ±5°C, 80% RH or less Warmup time: 30 m or more Power supply frequency range: 50 Hz/60 Hz ±2 Hz Defined for power factor of 1, common-mode voltage of 0 V, and after zero-adjustment. The following additional conditions apply for AC measurement: Input of at least 10 Vrms to reference channel (U1) With measurement frequency set to 50 Hz: 40 Hz to 58 Hz With measurement frequency set to 60 Hz: 51 Hz to 70 Hz
Temperature coefficient	0.1% f.s./°C
Effects of common-mode voltage	0.2% f.s. or less (1000 Vrms AC, 50 Hz/60 Hz, between voltage input and enclosure)
Effects of External magnetic fields	1.5% f.s. or less (in magnetic field of 400 A rms AC/m, 50 Hz/60 Hz)

Measurement items

Transient overvoltage,
RMS voltage refreshed each half-cycle, Voltage waveform peak,
Voltage DC value, Voltage CF value, RMS voltage (phase), RMS voltage (line to line),
Swell, Dip, Interruption, RMS current refreshed each half-cycle,
Current waveform peak, Current DC value, Current CF value, RMS current,
Inrush current,
Frequency cycle, Frequency (200ms), 10-sec Frequency,
Active power, Active energy, Energy cost, Reactive power, Reactive energy,
Apparent power, Apparent energy,
Power factor /Displacement power factor,
Voltage unbalance factor (negative-phase, zero-phase),
Current unbalance factor (negative-phase, zero-phase),
Harmonic voltage, Harmonic current, Harmonic power,
Inter-harmonic voltage, Inter-harmonic current,
Harmonic voltage phase angle, Harmonic current phase angle,
Harmonic voltage-current phase angle,
Total harmonic voltage distortion factor,
Total harmonic current distortion factor, K Factor

Measurement specifications

Transient overvoltage

Detected from waveform obtained by eliminating the fundamental component (50 Hz/60 Hz) from the sampled waveform.

Measurement range: ±2.200 kVpeak
Measurement bandwidth: 5 kHz (-3dB) to 40 kHz (-3dB)
Measurement accuracy: ±5.0% rdg.±1.0% f.s.

Frequency cycle

Calculated as the reciprocal of the accumulated whole-cycle time during one U1 cycle.

Measurement accuracy: ±0.200 Hz or less (for input from 50 V to 1100 V)

RMS voltage/ RMS current refreshed each half-cycle

Calculated as the RMS value of sampling data for 1 waveform overlapped every half-cycle.

Measurement accuracy: Voltage With 10 V to 660 V input: ±0.3% of nominal voltage
Other than above: ±0.2% rdg.±0.1% f.s.
Current ±0.2% rdg.±0.1% f.s. + current sensor accuracy

Swell, Dip, Interruption

Detected when the RMS voltage refreshed each half-cycle value exceeds the threshold.

Measurement accuracy: Same as RMS voltage refreshed each half-cycle
Fluctuation: Saves RMS voltage and current refreshed each half cycle for 0.5 s before and 29.5 s after the event IN point.

Inrush current

Calculated as the current RMS value for current waveform data sampled every half-cycle. Maximum current RMS value from above measurement.

Measurement accuracy: ±0.3% rdg.±0.3% f.s. + current sensor accuracy
Fluctuation: Saves inrush current RMS value data for 0.5 s before and 29.5 s after the event IN point.

10-sec frequency

Calculated as the reciprocal of the accumulated whole-cycle time during the specified 10 s U1 (reference channel) period.

Measurement accuracy: ±0.010 Hz or less

Frequency (200ms)

Calculated as the reciprocal of the accumulated whole-cycle time within 200 ms relative to U1.

Measurement accuracy: ±0.020 Hz or less

Voltage waveform peak/ Current waveform peak

Maximum and minimum sampling points in 200 ms aggregation

Measurement range: Voltage ±2200.0 Vpk
Current Result of adding the crest factor to the current range
Measurement accuracy: Voltage During input of 10% to 150% of nominal voltage: 5% of nominal voltage
Other than above: 2% f.s.
Current With at least 50% f.s. input: 5 % rdg. + current sensor accuracy
Other than above: 2% f.s. + current sensor accuracy

RMS voltage, RMS current

Measured during 200 ms aggregation in accordance with IEC 61000-4-30.

Measurement accuracy: Voltage With 10 V to 660 V input: ±0.2% of nominal voltage
Other than above: ±0.1%rdg.±0.1%f.s.
Current ±0.1% rdg.±0.1% f.s. + current sensor accuracy

Voltage DC value, Current DC value

Average value during 200 ms aggregation

Measurement accuracy: Voltage ±0.3% rdg.±0.1% f.s.
Current ±0.5% rdg.±0.5% f.s. + current sensor accuracy

Voltage CF value, Current CF value

Calculated from the voltage RMS value and the voltage waveform peak value.

Measurement range: Voltage 224.001
Current 408.00
Measurement accuracy: No defined accuracy

Active power/ Apparent power/ Reactive power

Active power: Measured every 200 ms.

Apparent power: RMS value calculation: Calculated from the voltage RMS value and current RMS value.
Fundamental wave calculation: Calculated from the fundamental wave active power and fundamental wave reactive power.

Reactive power: RMS value calculation: Calculated from the apparent power S and active power P.
Fundamental wave calculation: Calculated from the fundamental wave voltage and current.

Measurement accuracy:
Active power DC: ±0.5% rdg.±0.5% f.s. + current sensor accuracy
AC: ±0.2% rdg.±0.1% f.s. + current sensor accuracy
Power factor effects: 1.0% rdg. or less (40 Hz to 70 Hz with a power factor of 0.5)
Apparent power ±1 dgt. for calculations derived from the various measurement values
Reactive power During RMS value calculation: ±1 dgt. for calculations derived from the various measurement values
During fundamental wave calculation: For fundamental wave frequency of 45 Hz to 66 Hz
±0.3% rdg. ±0.1% f.s. + current sensor specifications (reactive factor of 1)
Reactive factor effects: 1.0% rdg. or less (40 Hz to 70 Hz with reactive factor of 0.5)

Active energy, Reactive energy, Apparent energy

Measures energy from start of recording.
Active energy: Integrated separately by consumption and regeneration from active power.
Reactive energy: Integrated separately by lag and lead from reactive power.
Apparent energy: Integrated from apparent power.

Measurement accuracy:
Active energy: Active power measurement accuracy ±10 dgt.
Reactive energy: Reactive power measurement accuracy ±10 dgt.
Apparent energy: Apparent power measurement accuracy ±10 dgt.
Cumulative time accuracy: ±10 ppm

Energy cost

Calculated by multiplying the active energy (consumption) WP+ by the electricity unit cost (per kWh).

Measurement accuracy: ±1 dgt. for calculations derived from the various measurement values

Power factor, Displacement power factor

Power factor: Calculated from apparent power S and active power P
Displacement power factor: Calculated from fundamental wave active power and reactive power.

Harmonic voltage, Harmonic current

Uses IEC61000-4-7 Ed2.1:2009. From 1 to 50th order.

Measurement range:
Harmonic voltage RMS: 600.00 V, Content percentage: 100.00 %
Harmonic current Based on current sensor in use. Content percentage: 500.00 %

Measurement accuracy:
Harmonic voltage
Order 0: Same as voltage DC value
Order 1: Same as voltage RMS value
Order 2 to 50th: 1% of nominal input voltage or greater: ±10.0% rdg.
Less than 1% of nominal input voltage: ±0.05% of nominal input voltage
Harmonic current
Order 0: Same as current DC value
Order 1 to 20th: ±0.5% rdg.±0.2% f.s. + current sensor accuracy
Order 21 to 30th: ±1.0% rdg.±0.3% f.s. + current sensor accuracy
Order 31 to 40th: ±2.0% rdg.±0.3% f.s. + current sensor accuracy
Order 41 to 50th: ±3.0% rdg.±0.3% f.s. + current sensor accuracy

Harmonic power

Indicates the harmonic power for each channel and the sum value for multiple channels

Measurement accuracy:
Order 0: ±0.5% rdg.±0.5% f.s. + current sensor accuracy
Order 1 to 20th: ±0.5% rdg.±0.2% f.s. + current sensor accuracy
Order 21 to 30th: ±1.0% rdg.±0.3% f.s. + current sensor accuracy
Order 31 to 40th: ±2.0% rdg.±0.3% f.s. + current sensor accuracy
Order 41 to 50th: ±3.0% rdg.±0.3% f.s. + current sensor accuracy

Inter-harmonic voltage, Inter-harmonic current

After harmonic analysis, harmonic voltage and current are summed and displayed as inter-harmonic contents with the harmonic contents according to harmonic order From 0.5 to 49.5th order

Measurement accuracy:
Inter-harmonic voltage (harmonic input defined for a nominal input voltage of 100 V to 440 V)
At least 1% of harmonic input nominal voltage : ±10.0% rdg.
<1% of harmonic input nominal voltage : ±0.05% of nominal voltage
Inter-harmonic current
No defined accuracy

Harmonic voltage phase angle, Harmonic current phase angle

In accordance with IEC61000-4-7 Ed2.1:2009.

Measurement range: 0.00° to ±180.00°

Harmonic voltage-current phase angle

In accordance with IEC61000-4-7 Ed2.1:2009

Measurement range: 0.00° to ±180.00°
Measurement accuracy: Order 1 to 3rd: ±2°
Order 4 to 50th: ±(0.05° × k+2°) (k: Harmonic order)

However, add current sensor accuracy.
Defined when the harmonic voltage for each order is 1% of the nominal voltage and the current level is 1% f.s. or greater.

Total harmonic voltage distortion factor, Total harmonic current distortion factor

In accordance with IEC61000-4-7 Ed2.1:2009

THD-F: Total harmonic distortion factor for the fundamental wave
THD-R: Total harmonic distortion factor for the total harmonic including the fundamental wave

Measurement range: 0.00 to 100.00% (Voltage), 0.00 to 500.00% (Current)

Voltage unbalance factor (negative-phase, zero-phase)

Calculated using various components of the three-phase fundamental wave for three-phase 3-wire (3P3W2M, 3P3W3M) and three-phase 4-wire connections

Measurement range: Component is V and unbalance factor is 0.00% to 100.00%

Current unbalance factor (negative-phase, zero-phase)

Calculated using various components of the three-phase fundamental wave for three-phase 3-wire (3P3W2M, 3P3W3M) and three-phase 4-wire connections

Measurement range: Component is A and unbalance factor is 0.00% to 100.00%

K Factor (multiplication factor)

Calculated using the harmonic RMS current of the 2nd to 50th orders

Measurement range: 0.00 to 500.00

RMS value-frequency characteristics

Frequency	Voltage	Current	Power
40 Hz to 70 Hz	Defined for RMS voltage	Defined for RMS current	Defined for Active power
70 Hz to 1 kHz	±3% rdg. ±0.2% f.s.	±3% rdg. ±0.2% f.s.	±3% rdg. ±0.2% f.s.
1 kHz to 10 kHz	±10% rdg. ±0.2% f.s.	±10% rdg. ±0.2% f.s.	±10% rdg. ±0.2% f.s.
40 kHz	-3 dB	-3 dB	

Measurement setting specifications

Wiring	Displays wiring diagram and measured values for: Ch. 1/2/3: 1P2W, 1P3W, 1P3W1U, 3P3W2M, 3P3W3M, or 3P4W Ch. 4: On or off
Voltage range	1000.0 V
Current sensors and current ranges (Accuracy guaranteed up to 120% of range)	CT7126: 50 A / 5 A / 500 mA CT7131: 100 A / 50 A / 5 A CT7136: 500 A / 50 A / 5 A CT7116: 5 A / 500 mA / 50 mA CT7731: 100 A / 10 A CT7736: 500 A / 50 A CT7742: 2000 A / 1000 A / 500 A CT7044/CT7045/CT7046: 5000 A / 500 A / 50 A
Power range	

(Determined automatically based on current range in use.)

Wiring / Current range	1P2W	1P3W 1P3W1U 3P3W2M 3P3W3M	3P4W
500.00 mA	500.00 W	1.0000 kW	1.5000 kW
5.0000 A	5.0000 kW	10.000 kW	15.000 kW
50.000 A	50.000 kW	100.00 kW	150.00 kW
500.00 A	500.00 kW	1.0000 MW	1.5000 MW
5000.0 A	5.0000 MW	10.000 MW	15.000 MW
10.000 A	10.000 kW	20.000 kW	30.000 kW
100.00 A	100.00 kW	200.00 kW	300.00 kW
1000.0 A	1.0000 MW	2.0000 MW	3.0000 MW
2000.0 A	2.0000 MW	4.0000 MW	6.0000 MW

CT ratio	0.01 to 9999.99
VT ratio	0.01 to 9999.99
Declared input voltage	100/ 101/ 110/ 115/ 120/ 127/ 200/ 202/ 208/ 220/ 230/ 240/ 277/ 347/ 380/ 400/ 415/ 440/ 480/ 600/ User-defined (50 V to 800 V in increments of 1 V)
Frequency	50 Hz/ 60 Hz
Sensor recognition	Automatic recognition of current sensors
Calculation method selection	Urms: Phase voltage or line voltage PF/Q/S: RMS value calculation or fundamental wave calculation THD: THD-F or THD-R *Phase voltage/line voltage setting changes do not apply to RMS voltage refreshed each half-cycle values or transient measured values on the MONITOR screen.
Energy cost	Unit cost: 0.00000 to 99999.9 (per kWh) Currency unit: 3 alphanumeric characters

Recording settings

Storage location	SD memory card
Display of remaining storage space (in time)	Calculates and displays remaining time based on the available space left on the SD memory card and in internal memory, the recording interval, and the recording parameters. This information is also updated during trend measurement.
Recording interval	200 or 600 ms; 1, 2, 5, 10, 15, or 30 s; 1, 2, 5, 10, 15, or 30 m; 1 or 2 h; 150 or 180 cycles *The following functionality is not available during 200/600 ms operation: Saving of harmonic data (except total harmonic distortion and K factor) Event recording COPY key operation during recording
Recording parameters	With or without harmonics Records maximum, minimum, and average values in binary format.
Saving of screenshots	Off or on Saves the displayed screen at the recording interval as a BMP file. Minimum interval: 5 m
Methods for starting recording	Precise time, manual, time specification, or repeated
Methods for stopping recording	Manual, time specification, timer, or repeated Maximum recording/measurement time: 1 year
Recording time period	Allows user to set the time period for which to record data during repeated recording.
File/folder names	Automatic or user-specified (using 5 single-byte characters)

Event settings

Event hysteresis	0% to 10% (for all parameters except frequency) Hysteresis for frequency is fixed at 0.1 Hz or otherwise set as a percentage of the threshold value.
Timer event count	Off; 1, 2, 5, 10, 15, or 30 m; 1 or 2 h Generates events at the selected interval.
Event waveform	Instantaneous waveform for approx. 200 ms aggregation (12.5 kS/s)
Pre-event waveform	Off (0 s), 200 ms, 1 s Allows user to set the recording time for the instantaneous waveform before event occurrence.
Post-event waveform	Off (0 s), 200 ms, 400 ms, 1 s, 5 s, 10 s Allows user to set the recording time for the instantaneous waveform after the event.

Event specifications

Event detection method

Events can be detected at a recording interval of 1 s or greater.
See the measurement specifications for a description of detection methods for each event type's measured values.

External events: Events are detected by detecting signal input to the EVENT IN terminal.
Manual events: Events are detected based on MANUAL EVENT key presses.

Synchronized saving of events

Event waveform:
The instantaneous waveform when the event occurs is recorded for 200 ms.
Pre-event waveform:
The instantaneous waveform before the event occurs is recorded for up to 1 s.
Post-event waveform:
The instantaneous waveform after the event is recorded for up to 10 s.
Fluctuation data:
RMS value fluctuation data is recorded every half-cycle for the equivalent of 0.5 s before the event and 29.5 s after the event.

System settings

Beep tone	On or off
LCD backlight	Auto-off (2 m) or on
Display languages	Japanese, English, Chinese (traditional or simplified), Korean, German, French, Italian, Spanish, Turkish
Phase naming convention	R/S/T, A/B/C, L1/L2/L3, or U/V/W

Other functionality

Verification and warning function	Over-range, peak-over, event indicator
Setting verification function	Allows the user to check the current settings by pressing the [QUICK SET] key during recording.
Screenshot	Saves the contents of the screen when the COPY key is pressed to the SD memory card. Data format: Compressed BMP
Key lock	Disables all key operation except the POWER key.
SD memory card eject	Pressing the F key on the FILE screen during recording with a recording interval of 2 s or greater displays a confirmation and allows the SD memory card to be ejected.
System reset	Reverts the instrument's settings to their default values.
Automatic detection of current sensors	When selected on the settings screen, automatically detects connected Hioki PL14 connector-compatible sensors.
Behavior in event of power outage	If a Z1003 Battery Pack with remaining power is installed in the instrument, the instrument automatically switches to battery power and continues recording. If not, measurement operation stops, but settings up to that point are backed up, and the instrument will start recording again when power is restored. However, integration values and related data will be reset, and integration will start again when power is restored.

Interface specifications

SD memory card

Compatible cards: Z4001, Z4003

LAN Interface

Connector:	RJ-45 connector × 1
Electrical specifications:	IEEE 802.3 compliant
Transmission method:	100Base-TX
Protocol:	TCP/IP (with DHCP function)
Functionality:	Allows remote operation of the instrument from an Internet browser.

USB interface

Connector:	Series B receptacle × 1
Version/mode:	USB 2.0 (Full Speed, High Speed), mass storage class

RS-232C interface

Connector:	D-sub 9-pin connector × 1
Communication method:	RS-232C, EIA RS-232D, CCITT V.24, and JIS X5101 compliant Full duplex, start stop synchronization, data length of 8, no parity, 1 stop bit
Communications speed:	19,200 bps / 38,400 bps
Functionality:	Allows measurement and measurement data retrieval using communications commands.

External control interface

Connector: 4-pin screwless terminal block
External event input: [IN], [GND1]
External event output: [OUT], [GND2]

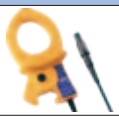
Event input: Shorts between the [GND1] and [IN] terminals (active-low) and the falling edge of pulse signals are recognized as event input.
Not isolated ([GND1] is common with the instrument's GND.)
Maximum rated terminal-to-terminal voltage: 45 V DC
Voltage input (high: 2 V to 45 V; low: 0 V to 0.5 V)
High interval: At least 100 ms; low interval: at least 100 ms

Event output: Open collector, 30 V/ 5 mA max. (photocoupler-isolated)
TTL low output at event generation between [GND2] and [OUT] terminals
Short pulse: Starts/stops measurement at width of approx. 10 ms; outputs pulse at event IN point.
Long pulse: Outputs pulse at event IN point only at width of approx. 2.5 s.

General Specifications

Operating environment	Indoors, altitude up to 3000 m Pollution degree 2
Operating temperature and humidity	-20 to 50°C (-4 to 122°F), 80% RH or less (non-condensating)
Storage temperature and humidity	-20 to 50°C (-22 to 122°F), 80% RH or less (non-condensating)
Dust and water resistance	IP30 (EN 60529)
Applicable standards	Safety: EN 61010 EMC: EN 61326 Class A
Standard compliance	Harmonics: IEC 61000-4-7 IEC 61000-2-4 Class 3 Power quality: IEC 61000-4-30 Class S EN 50160 IEEE 1159
Power supply	[Z1002 AC Adapter] 100 V to 240 V AC, 50 Hz/60 Hz Anticipated transient overvoltage: 2500 V Maximum rated power: 80 VA (including AC adapter) [Z1003 Battery Pack] Charging time: Max. 5 h 30 m Continuous operating time: Approx. 8 h
Maximum recording interval	1 year
Maximum number of recordable events	9999
Clock functionality	Auto calendar, automatic leap year detection, 24-hour clock
Real-time clock accuracy	±0.5 s per day (with instrument on and within operating temperature range)
Display	6.5-inch TFT color LCD Display refresh: 0.5 s
Dimensions	300 mm (11.81 in) W × 211 mm (8.31 in) H × 68 mm (2.68 in) D (excluding protrusions)
mass	2.5 kg (88.2 oz) (including battery pack)
Product warranty period	3 year
Accessories	Instruction manual, Measurement guide, VOLTAGE CORD L1000-05, spiral tubes, AC ADAPTER Z1002, strap, USB cable, BATTERY PACK Z1003, PQ ONE (software, CD)

Current measurement options

Model	AC CURRENT SENSOR CT7126	AC CURRENT SENSOR CT7131	AC CURRENT SENSOR CT7136
Appearance			
Rated measurement current	60 A AC	100 A AC	600 A AC
Measurable conductor diameter	Max.φ15 mm (0.59 in)		Max.φ46 mm (1.81 in)
PQ3100 current range and combined amplitude accuracy (45 to 66 Hz)	Current range / Combined accuracy 50.000 A / 0.4% rdg. + 0.112% f.s. 5.0000 A / 0.4% rdg. + 0.22% f.s. 500.0 mA / 0.4% rdg. + 1.3% f.s.	Current range / Combined accuracy 100.00 A / 0.4% rdg. + 0.12% f.s. 50.00 A / 0.4% rdg. + 0.14% f.s. 5.000 A / 0.4% rdg. + 0.50% f.s.	Current range / Combined accuracy 500.00 A / 0.4% rdg. + 0.112% f.s. 50.00 A / 0.4% rdg. + 0.22% f.s. 500.0 mA / 0.4% rdg. + 1.3% f.s.
Phase accuracy (45 to 66 Hz)	±2° or less	±1° or less	±0.5° or less
Maximum allowable input (45 to 66 Hz)	60 A continuous	130 A continuous	600 A continuous
Maximum rated voltage to earth	CAT III 300 V		CAT III 1000 V, CAT IV 600 V
Frequency band	Accuracy defined to 20 kHz		
Dimensions, mass, cord length	46 mm (1.81 in) W × 135 mm (5.31 in) H × 21 mm (0.83 in) D, 190 g (6.7 oz), 2.5 m (8.2 ft)		78 mm (3.07 in) W × 152 mm (5.98 in) H × 42 mm (1.65 in) D, 350 g (12.3 oz), 2.5 m (8.2 ft)
Output connector	Hioki PL14		

Model	AC FLEXIBLE CURRENT SENSOR CT7044	AC FLEXIBLE CURRENT SENSOR CT7045	AC FLEXIBLE CURRENT SENSOR CT7045
Appearance			
Rated measurement current	6000 A AC		
Measurable conductor diameter	Max.φ100 mm (3.94 in)	Max.φ180 mm (7.09 in)	Max.φ254 mm (10.00 in)
PQ3100 current range and combined amplitude accuracy (45 to 66 Hz)		Current range / Combined accuracy 5000.0 A/ 500.00 A / 1.6% rdg. + 0.4% f.s. 50.000 A / 1.6% rdg. + 3.1% f.s.	
Phase accuracy (45 to 66 Hz)	±1.0° or less		
Maximum allowable input (45 to 66 Hz)	10,000 A continuous		
Maximum rated voltage to earth	1000 V AC (CAT III), 600 V AC (CAT IV)		
Frequency band	10 Hz to 50 kHz (±3dB)		
Dimensions, cord length	Flexible loop cross-sectional diameter φ7.4 mm (0.29 in)/ 2.5m (8.2 ft)		
Mass	160 g (5.6 oz)	180 g (6.3 oz)	190 g (10.00 oz)
Output connector	HIOKI PL14		

Model	AC/DC AUTO-ZERO CURRENT SENSOR CT7731	AC/DC AUTO-ZERO CURRENT SENSOR CT7736	AC/DC AUTO-ZERO CURRENT SENSOR CT7742
Appearance			
Rated measurement current	100 A AC/DC	600 A AC/DC	2000 A AC/DC
Measurable conductor diameter	Max.φ33 mm (1.30 in)		Max.φ55 mm (2.17 in)
PQ3100 current range and combined amplitude accuracy — DC	Current range / Combined accuracy 100.00 A / 1.5% rdg. + 1.0% f.s. 10.000 A / 1.5% rdg. + 5.5% f.s.	Current range / Combined accuracy 500.00 A / 2.5% rdg. + 1.1% f.s. 50.000 A / 2.5% rdg. + 6.5% f.s.	Current range / Combined accuracy 2000.0 A / 2.0% rdg. + 1.75% f.s. 1000.0 A / 2.0% rdg. + 1.5% f.s. 500.00 A / 2.0% rdg. + 2.5% f.s.
PQ3100 current range and combined amplitude accuracy — 45 to 66 Hz	100.00 A / 1.1% rdg. + 0.6% f.s. 10.000 A / 1.1% rdg. + 5.1% f.s.	500.00 A / 2.1% rdg. + 0.7% f.s. 50.000 A / 2.1% rdg. + 6.1% f.s.	2000.0 A / 1.6% rdg. + 0.75% f.s. 1000.0 A / 1.6% rdg. + 1.1% f.s. 500.00 A / 1.6% rdg. + 2.1% f.s.
Phase accuracy (45 to 66 Hz)	±1.8° or less		±2.3° or less
Offset drift	±0.5% f.s. or less	±0.1% f.s. or less	±0.1% f.s. or less
Maximum allowable input (45 to 66 Hz)	100 A continuous	600 A continuous	2000 A continuous
Maximum rated voltage to earth	600 V AC/DC (CAT IV)	1000 V AC/DC (CAT III), 600 V AC/DC (CAT IV)	
Frequency band	DC to 5 kHz (-3dB)		
Dimensions, mass, cord length	58 mm (2.28 in) W × 132 mm (5.20 in) H × 18 mm (0.71 in) D, 250 g (8.8 oz), 2.5 m (8.2 ft)	64 mm (2.52 in) W × 160 mm (6.30 in) H × 34 mm (1.34 in) D, 320 g (11.3 oz), 2.5 m (8.2 ft)	64 mm (2.52 in) W × 195 mm (7.68 in) H × 34 mm (1.34 in) D, 510 g (18.0 oz), 2.5 m (8.2 ft)
Output connector	HIOKI PL14		

Model	AC LEAKAGE CURRENT SENSOR CT7116
Appearance	Exclusively for leakage current measurement  Insulated conductor
Rated measurement current	6 A AC
Measurable conductor diameter	Max.φ40 mm (1.57 in)
PQ3100 current range and combined amplitude accuracy (45 to 66 Hz)	Current range / Combined accuracy 5.0000 A / 1.1% rdg. + 0.16% f.s. 500.00 mA / 1.1% rdg. + 0.7% f.s. 50.000 mA / 1.1% rdg. + 6.1% f.s.
Phase accuracy (45 to 66 Hz)	±3 ° or less
Frequency band	40 Hz to 5 kHz (±3.0% rdg. ±0.1% f.s.)
Residual current characteristics	Max. 5 mA (in 100A go and return electric wire)
Effect of external magnetic fields	400A AC/m corresponds to 5mA, Max. 7.5mA
Dimensions, mass, cord length	74 mm (2.91 in) W × 145 mm (5.71 in) H × 42 mm (1.65 in) D, 340 g (12.0 oz), 2.5 m (8.2 ft)
Output connector	HIOKI PL14

CONVERSION CABLE L9910

Used to connect the following current sensors to the PQ3100.
(Output connector conversion: BNC to PL14)

CLAMP ON SENSOR
9694, 9660, 9661, 9669

AC FLEXIBLE CURRENT SENSOR
CT9667-01, CT9667-02, CT9667-03
(Power cannot be supplied to these sensors from the PQ3100.)

CLAMP ON LEAK SENSOR
9657-10, 9675

PQ3100 Lineup

POWER QUALITY ANALYZER KIT

Value Kits			
Model Name	POWER QUALITY ANALYZER KIT	POWER QUALITY ANALYZER KIT	POWER QUALITY ANALYZER KIT
Model No. (Order Code)	**PQ3100-91**	**PQ3100-92**	**PQ3100-94**
Kit contents	POWER QUALITY ANALYZER PQ3100* : 1 AC CURRENT SENSOR CT7136 : 2 CARRYING CASE C1009 : 1 SD MEMORY CARD 2GB Z4001 : 1	POWER QUALITY ANALYZER PQ3100* : 1 AC CURRENT SENSOR CT7136 : 4 CARRYING CASE C1009 : 1 SD MEMORY CARD 2GB Z4001 : 1	POWER QUALITY ANALYZER PQ3100* : 1 AC FLEXIBLE CURRENT SENSOR CT7045 : 4 CARRYING CASE C1009 : 1 SD MEMORY CARD 2GB Z4001 : 1

* PQ3100 accessories : Instruction manual, Measurement guide, VOLTAGE CORD L1000-05, Spiral Tube, AC ADAPTER Z1002, Strap, USB cable, BATTERY PACK Z1003, PQ ONE (Software, CD)

Current measurement options

AC CURRENT SENSOR CT7126	60 A AC, φ15 mm (0.59")
AC CURRENT SENSOR CT7131	100 A AC, φ15 mm (0.59")
AC CURRENT SENSOR CT7136	600 A AC, φ46 mm (1.81")
AC FLEXIBLE CURRENT SENSOR CT7044	6000 A AC, φ100 mm (3.94")
AC FLEXIBLE CURRENT SENSOR CT7045	6000 A AC, φ180 mm (7.09")
AC FLEXIBLE CURRENT SENSOR CT7046	6000 A AC, φ254 mm (10.0")
AC LEAKAGE CURRENT SENSOR CT7116	6 A AC, φ40 mm (1.57")
AC/DC AUTO-ZERO CURRENT SENSOR CT7731	100 A AC, φ33 mm (1.30")
AC/DC AUTO-ZERO CURRENT SENSOR CT7736	600 A AC, φ33 mm (1.30")
AC/DC AUTO-ZERO CURRENT SENSOR CT7742	2000 A AC, φ55 mm (2.17")
CONVERSION CABLE L9910 (BNC to PL14)	For BNC connector conversion

*The connectors used on CT7000 series current sensors differ from those used on legacy products. To use a legacy sensors, use Conversion Cable L9910.

Voltage measurement options

φ11 mm (0.43")

MAGNETIC ADAPTER 9804-01 (red)
MAGNETIC ADAPTER 9804-02 (black)
Magnetic tip for use with the standard Voltage Cord L1000-05 (generally compatible with M6 pan screws)

Red and black adapters sold separately.
Purchase the quantity and color appropriate for your application.
(Example: 3P3W - 3 adapters; 3P4W - 4 adapters)

GRABBER CLIP 9243
Use with L1000-05 to change tip.

Hioki welcomes requests for quotations for customized specifications such as current sensor cord extensions, voltage cord extensions, and voltage cord tip changes. For more information, please contact your nearest Hioki distributor.

Carrying cases, Water proof boxes

CARRYING CASE
C1009
Bag

CARRYING CASE
C1001
Soft case

CARRYING CASE
C1002
Hard case
413W× 595W× 265Dmm
(16.3"W× 23.4"H× 10.4"D)
5.7kg (201oz.)

Waterproof box
For outdoor installation;
IP65 compliant
Contact Hioki for a quotation.

Interfaces

SD MEMORY CARD 2GB
Z4001

SD MEMORY CARD 8GB
Z4003

IMPORTANT
Use only the SD memory card **Z4001** or **Z4003** sold by HIOKI.

RS-232C CABLE
9637
Length: 1.8 m (5.91 ft)
Cross, 9pin to 9pin

LAN CABLE
9642
Length: 5 m (16.41 ft)
supplied with straight to cross conversion cable

Model: POWER QUALITY ANALYZER PQ3100

Model No. (Order Code): **PQ3100**
For more information about accessories, see the specifications table above.

Bundled accessories

Voltage Cord L1000-05
5 cords (1 ea. black, red, yellow, green, and gray)
Length: 3 m (9.84 ft)

AC ADAPTER Z1002
Power supply for the PQ3100
100V AC to 240V AC

BATTERY PACK Z1003
(Ni-MH, 7.2 V/4500 mAh)

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