

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.



| U[V] | I[A] | Freq[Hz] |
|-----------|----------|-----------|
| 12 397.12 | 1 6.267 | U1 60.012 |
| 23 398.91 | 2 15.375 | |
| 31 401.25 | 3 17.300 | |

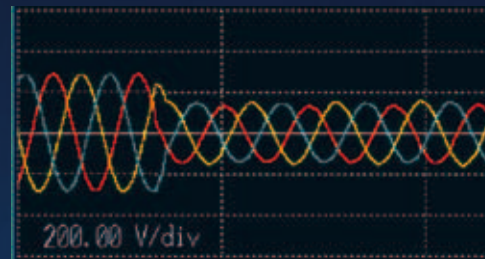
| | P[W] | S[VA] | Q[var] | PF |
|-----|--------|--------|---------|---------|
| 1 | 1.494k | 1.560k | 0.448k | 0.9578 |
| 2 | 3.424k | 3.526k | -0.842k | -0.9711 |
| 3 | 3.967k | 4.006k | 0.554k | 0.9904 |
| SUM | 8.885k | 9.100k | 0.160k | -0.9764 |

Active energy WP+ 81.569k Wh
Elapsed time 11:51:34

* Flicker recording available in future firmware update

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.

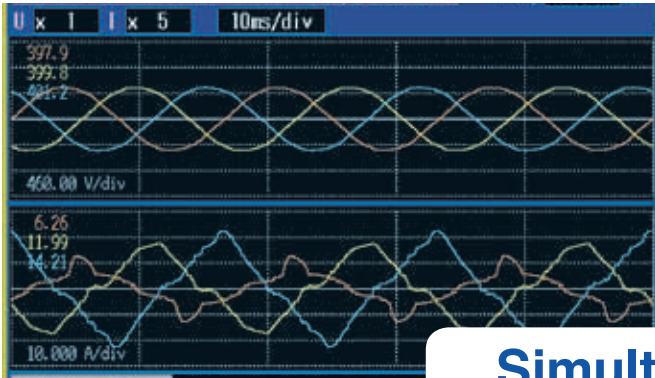


Simultaneously measure all parameters at once

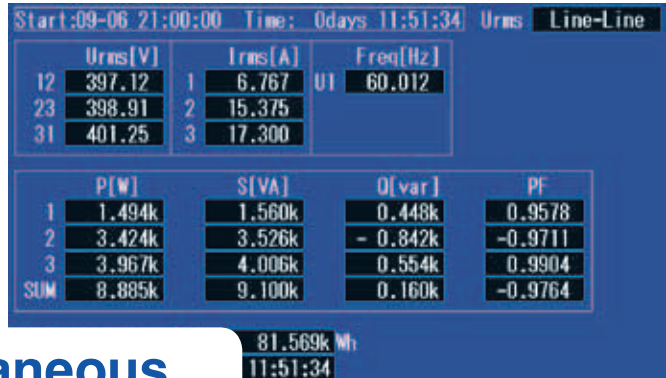
Measuring all parameters at the same time

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

Waveforms



RMS values

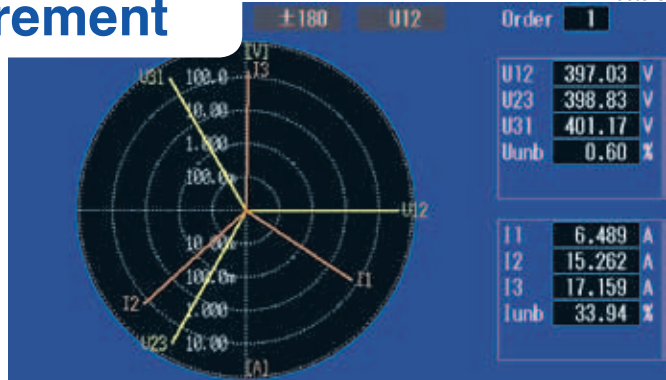


Simultaneous measurement

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

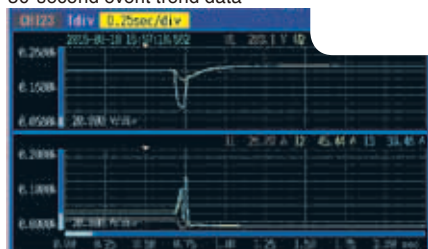


Event waveform recording

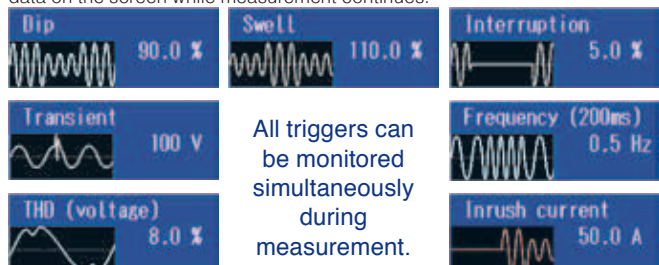


Simultaneous recording

30-second event trend data



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



All triggers can be monitored simultaneously during measurement.

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.

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.

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.

Power supply side
Load side

On-screen help notification



STEP 4

Set the parameters to record and the recording interval.

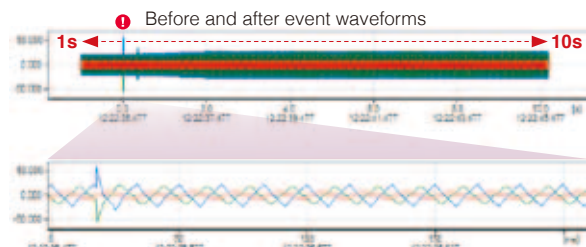
STEP 5

Start recording.

- 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.



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: $\pm 0.2\%$ of nominal voltage
Swell, dip, outage: $\pm 0.3\%$ 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 spaces



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 |


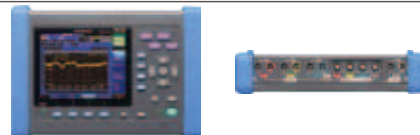
10 Up to 8 hours of battery operation

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

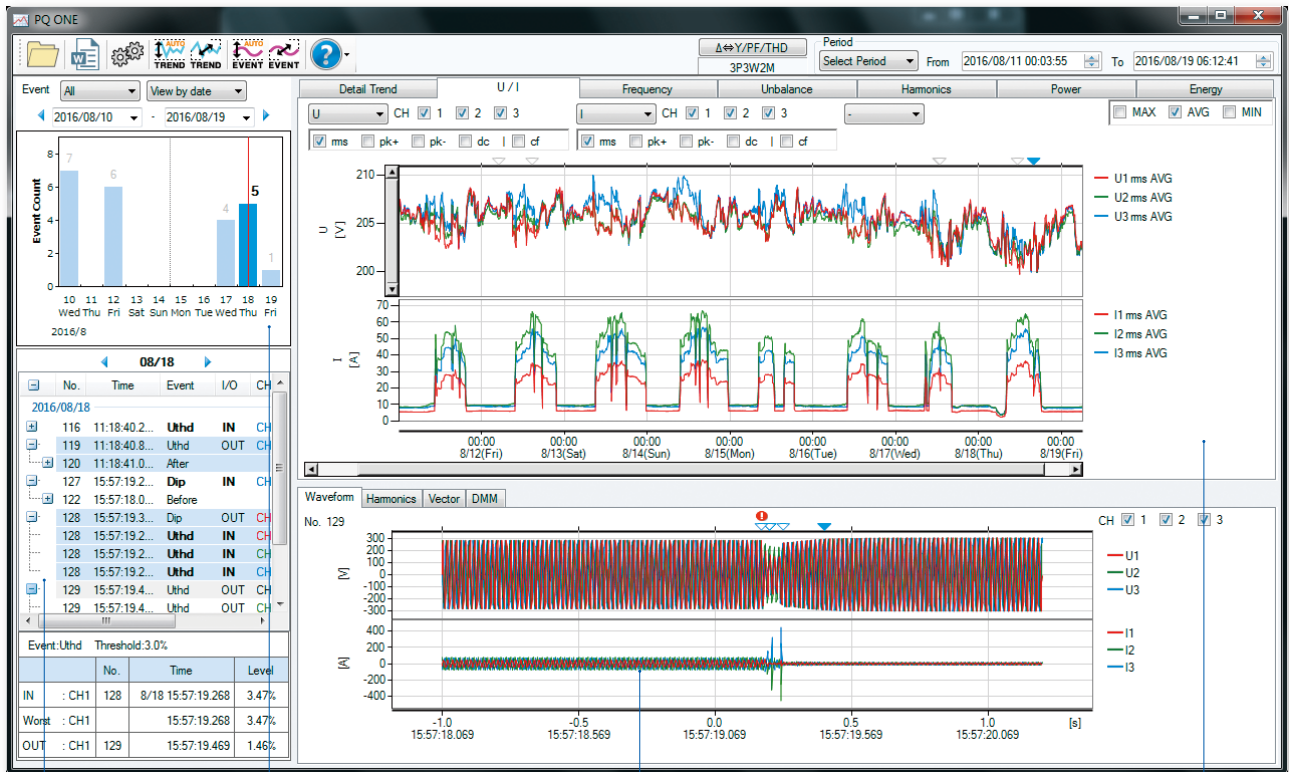
Configure settings or monitor contents from a remote location. You can also download data using the PQ3100's FTP function (available in a future firmware update).

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 | | |
| | 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 | | |
| | Power | Active power, Reactive power, Apparent power, Power factor, Displacement power factor, Active energy, Reactive energy | | |
| | | Apparent energy, Electrical charges | | |
| | 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 | | |
| | Recording interval time | 200 ms/600 ms/150 cycles (with 50 Hz input)/1/2/5/10/15/30 sec. to 2 h | Max. 1 year (55 weeks with repeat function on) 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 | | |
| | Event statistical processing | Display of the number of events per day by event type (Support for event statistics planned with a future firmware update.) | | |
| | Waveform acquisition: | Before event | Max. 1 sec. | |
| | | At event | 200 ms | |
| After event | | Max. 10 sec. | | |
| 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 | | |
| Setting aid | Transient overvoltage | 200 kS/s, 2.2 kV | 2 MS/s, 6 kV | |
| Operating temperature and humidity | | QuickSet | Simple Setting feature | |
| IEC 61000-4-30 standard compliance | | -20°C to 50°C (-4°F to 122°F), 80% RH | 0°C to 50°C (32°F to 122°F), 80% RH | |
| | | Class S | Class A | |

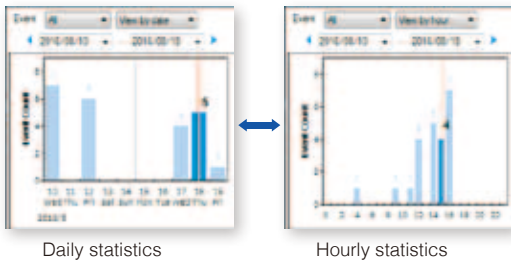
PQ One: Analyze data and create reports on a PC with a dedicated application

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



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.

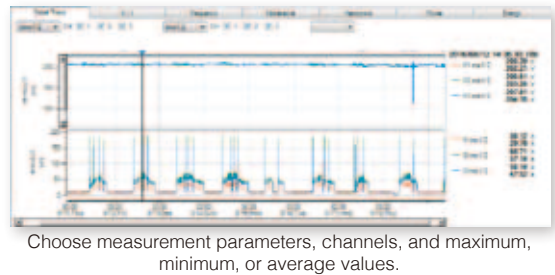
Report creation

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



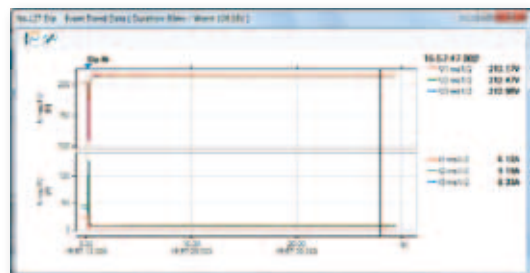
Trend graphs

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.



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)

*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 $\pm 400\%$ 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: | $\pm 5.0\%$ rdg. $\pm 1.0\%$ 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: $\pm 0.3\%$ of nominal voltage Other than above: $\pm 0.2\%$ rdg. $\pm 0.1\%$ f.s. Current $\pm 0.2\%$ rdg. $\pm 0.1\%$ 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: | $\pm 0.3\%$ rdg. $\pm 0.3\%$ 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: $\pm 0.2\%$ of nominal voltage Other than above: $\pm 0.1\%$ rdg. $\pm 0.1\%$ f.s. Current $\pm 0.1\%$ rdg. $\pm 0.1\%$ f.s. + current sensor accuracy |
| Voltage DC value, Current DC value | Average value during 200 ms aggregation |
| Measurement accuracy: | Voltage $\pm 0.3\%$ rdg. $\pm 0.1\%$ f.s. Current $\pm 0.5\%$ rdg. $\pm 0.5\%$ 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: $\pm 0.5\%$ rdg. $\pm 0.5\%$ f.s. + current sensor accuracy AC: $\pm 0.2\%$ rdg. $\pm 0.1\%$ 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 $\pm 0.3\%$ rdg. $\pm 0.1\%$ 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: $\pm 10.0\%$ rdg.

Less than 1% of nominal input voltage: $\pm 0.05\%$ of nominal input voltage

Harmonic current

Order 0 Same as current DC value

Order 1 to 20th $\pm 0.5\%$ rdg. $\pm 0.2\%$ f.s. + current sensor accuracy

Order 21 to 30th $\pm 1.0\%$ rdg. $\pm 0.3\%$ f.s. + current sensor accuracy

Order 31 to 40th $\pm 2.0\%$ rdg. $\pm 0.3\%$ f.s. + current sensor accuracy

Order 41 to 50th $\pm 3.0\%$ rdg. $\pm 0.3\%$ 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 $\pm 0.5\%$ rdg. $\pm 0.5\%$ f.s. + current sensor accuracy

Order 1 to 20th $\pm 0.5\%$ rdg. $\pm 0.2\%$ f.s. + current sensor accuracy

Order 21 to 30th $\pm 1.0\%$ rdg. $\pm 0.3\%$ f.s. + current sensor accuracy

Order 31 to 40th $\pm 2.0\%$ rdg. $\pm 0.3\%$ f.s. + current sensor accuracy

Order 41 to 50th $\pm 3.0\%$ rdg. $\pm 0.3\%$ 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: $\pm 10.0\%$ rdg.

<1% of harmonic input nominal voltage: $\pm 0.05\%$ 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 $\pm 180.00^\circ$

Harmonic voltage-current phase angle

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

Measurement range: 0.00° to $\pm 180.00^\circ$

Measurement accuracy: Order 1 to 3rd: $\pm 2^\circ$

Order 4 to 50th: $\pm(0.05^\circ \times k+2^\circ)$ (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 | $\pm 3\%$ rdg. $\pm 0.2\%$ f.s. | $\pm 3\%$ rdg. $\pm 0.2\%$ f.s. | $\pm 3\%$ rdg. $\pm 0.2\%$ f.s. |
| 1 kHz to 10 kHz | $\pm 10\%$ rdg. $\pm 0.2\%$ f.s. | $\pm 10\%$ rdg. $\pm 0.2\%$ f.s. | $\pm 10\%$ rdg. $\pm 0.2\%$ 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 | CT7126: 50 A / 5 A / 500 mA CT7131: 100 A / 50 A / 5 A CT7136: 500 A / 50 A / 5 A (Accuracy guaranteed up to 120% of range) 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 | 1P2W | 1P3W 1P3W1U 3P3W2M 3P3W3M | 3P4W |
|---------------|-----------|------------------------------------|-----------|
| Current range | | | |
| 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 x 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 x 1 |
| Version/mode: | USB 2.0 (Full Speed, High Speed), mass storage class |
| RS-232C interface | |
| Connector: | D-sub 9-pin connector x 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 x 211 mm (8.31 in) H x 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. ϕ 15 mm (0.59 in) | | Max. ϕ 46 mm (1.81 in) | |
| PQ3100 current range and combined amplitude accuracy (45 to 66 Hz) | Current range 50.000 A 5.0000 A 500.0 mA | Combined accuracy 0.4% rdg. + 0.112% f.s. 0.4% rdg. + 0.22% f.s. 0.4% rdg. + 1.3% f.s. | Current range 100.00 A 50.00 A 5.000 A | Combined accuracy 0.4% rdg. + 0.12% f.s. 0.4% rdg. + 0.14% f.s. 0.4% rdg. + 0.50% f.s. |
| Phase accuracy (45 to 66 Hz) | $\pm 2^\circ$ or less | | $\pm 1^\circ$ or less | |
| Maximum allowable input (45 to 66 Hz) | 60 A continuous | | 130 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 x 135 mm (5.31 in) H x 21 mm (0.83 in) D, 190 g (6.7 oz), 2.5 m (8.2 ft) | | 78 mm (3.07 in) W x 152 mm (5.98 in) H x 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. ϕ 100 mm (3.94 in) | Max. ϕ 180 mm (7.09 in) | Max. ϕ 254 mm (10.00 in) |
| PQ3100 current range and combined amplitude accuracy (45 to 66 Hz) | Current range 5000.0 A / 500.00 A 50.000 A | | Combined accuracy 1.6% rdg. + 0.4% f.s. 1.6% rdg. + 3.1% f.s. |
| Phase accuracy (45 to 66 Hz) | $\pm 1.0^\circ$ 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 (± 3 dB) | | |
| Dimensions, cord length | Flexible loop cross-sectional diameter ϕ 7.4 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. ϕ 33 mm (1.30 in) | | Max. ϕ 55 mm (2.17 in) | | | | |
| PQ3100 current range and combined amplitude accuracy | DC | Current range 100.00 A 10.000 A | Combined accuracy 1.5% rdg. + 1.0% f.s. 1.5% rdg. + 5.5% f.s. | Current range 500.00 A 50.000 A | Combined accuracy 2.5% rdg. + 1.1% f.s. 2.5% rdg. + 6.5% f.s. | Current range 2000.0 A 1000.0 A 500.00 A | Combined accuracy 2.0% rdg. + 1.75% f.s. 2.0% rdg. + 1.5% f.s. 2.0% rdg. + 2.5% f.s. |
| | 45 to 66 Hz | 100.00 A 10.000 A | 1.1% rdg. + 0.6% f.s. 1.1% rdg. + 5.1% f.s. | 500.00 A 50.000 A | 2.1% rdg. + 0.7% f.s. 2.1% rdg. + 6.1% f.s. | 2000.0 A 1000.0 A 500.00 A | 1.6% rdg. + 0.75% f.s. 1.6% rdg. + 1.1% f.s. 1.6% rdg. + 2.1% f.s. |
| Phase accuracy (45 to 66 Hz) | $\pm 1.8^\circ$ or less | | | | | | |
| Offset drift | $\pm 0.5\%$ f.s. or less | | $\pm 0.1\%$ f.s. or less | | | | |
| Maximum allowable input (45 to 66 Hz) | 100 A continuous | | 600 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 x 132 mm (5.20 in) H x 18 mm (0.71 in) D, 250 g (8.8 oz), 2.5 m (8.2 ft) | 64 mm (2.52 in) W x 160 mm (6.30 in) H x 34 mm (1.34 in) D, 320 g (11.3 oz), 2.5 m (8.2 ft) | 64 mm (2.52 in) W x 195 mm (7.68 in) H x 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 |  <div style="display: flex; align-items: center; gap: 10px;"> <div style="font-size: 0.8em;">Exclusively for leakage current measurement</div>  </div> | |
| Rated measurement current | 6 A AC | |
| Measurable conductor diameter | Max. ϕ 40 mm (1.57 in) | |
| PQ3100 current range and combined amplitude accuracy (45 to 66 Hz) | Current range 5.0000 A 500.00 mA 50.000 mA | Combined accuracy 1.1% rdg. + 0.16% f.s. 1.1% rdg. + 0.7% f.s. 1.1% rdg. + 6.1% f.s. |
| | $\pm 3^\circ$ or less | |
| | 40 Hz to 5 kHz ($\pm 3.0\%$ rdg. $\pm 0.1\%$ 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 x 145 mm (5.71 in) H x 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 |
| 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, ϕ 15 mm (0.59") |
| AC CURRENT SENSOR CT7131 | 100 A AC, ϕ 15 mm (0.59") |
| AC CURRENT SENSOR CT7136 | 600 A AC, ϕ 46 mm (1.81") |
| AC FLEXIBLE CURRENT SENSOR CT7044 | 6000 A AC, ϕ 100 mm (3.94") |
| AC FLEXIBLE CURRENT SENSOR CT7045 | 6000 A AC, ϕ 180 mm (7.09") |
| AC FLEXIBLE CURRENT SENSOR CT7046 | 6000 A AC, ϕ 254 mm (10.0") |
| AC LEAKAGE CURRENT SENSOR CT7116 | 6 A AC, ϕ 40 mm (1.57") |
| AC/DC AUTO-ZERO CURRENT SENSOR CT7731 | 100 A AC, ϕ 33 mm (1.30") |
| AC/DC AUTO-ZERO CURRENT SENSOR CT7736 | 600 A AC, ϕ 33 mm (1.30") |
| AC/DC AUTO-ZERO CURRENT SENSOR CT7742 | 2000 A AC, ϕ 55 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.

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.

Voltage measurement options



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.

Carrying cases, Water proof boxes



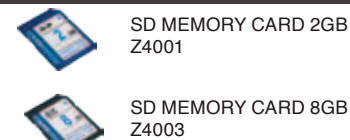
CARRYING CASE C1009
Bag

CARRYING CASE C1001
Soft case

CARRYING CASE C1002
Hard case
413Wx595Wx265Dmm
(16.3"Wx23.4"Hx10.4"D)
5.7kg (2010z.)

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)

Note: Company names and Product names appearing in this catalog are trademarks or registered trademarks of various companies.

HIOKI

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