# HIOKI

**NWI Instrumentation**

IEC61000-4-30 **Ed. 3** Class S

**Ver 2.00**
**Newly Added Functions**

Now IEC61000-4-30 **Ed. 3** Class A compliant!*

# Investigate power characteristics and analyze the causes of problems

Exceptional ease of use and international standard-compliant reliability

CE

**3** year Warranty

*The new software update to V.2.00 now makes the device compliant to the IEC61000-4-30 standard.
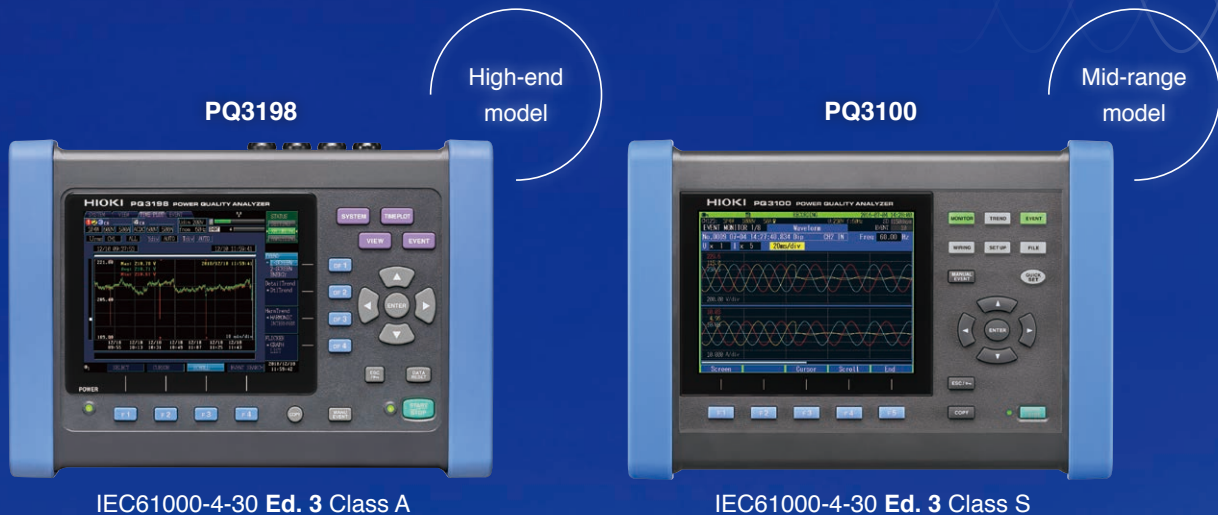
**Includes PQ ONE**
Analytical Software

- Extensive statistical analysis
- EN50160
- IEEE519 TDD
- GB Power Quality Statistics Report

# Maintain and manage power supplies and analyze problems more easily and reliably than ever before

## POWER QUALITY ANALYZER PQ3198 and PQ3100

The critical importance of electrical power in today's society necessitates daily maintenance and management to ensure that problems don't occur. When they do, for example due to an equipment failure or abrupt surge in demand, engineers face the need to analyze the cause quickly.

The POWER QUALITY ANALYZER PQ3198 and PQ3100 provide robust support for field personnel who need to analyze power characteristics in the form of measurement capabilities that reliably captures the full range of power anomalies and exceptional ease of use throughout the entire user experience, from connecting the instrument to recording data.

**PQ3198**

High-end model

**PQ3100**

Mid-range model

IEC61000-4-30 **Ed. 3** Class A

IEC61000-4-30 **Ed. 3** Class S

IEC 61000-4-30 Ed. 3 compliant

IEC61000-4-30 is an international standard that specifies methods for measuring power supply quality, Equipment certified as complying with this standard provides reliable and repeatable measurement results.

200.00 V/div
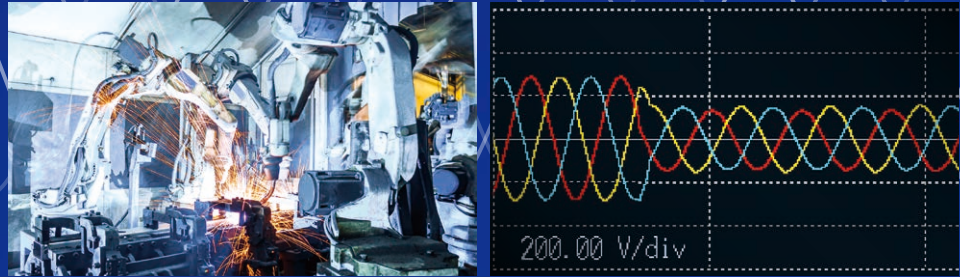
## Analyze equipment power problems

Capture the full range of power supply anomalies, including momentary interruptions, voltage drops, and frequency fluctuations, while recording trends to help investigate the causes of unexpected equipment malfunctions and sudden stoppages.





```
Start:09-06 21:00:00  Time:  0days 11:51:34  Urms  Line-Line
       Urms[V]       Irms[A]      Freq[Hz]
  12   397.12    1  6.767   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
```

## Record quality data for power systems

Record fluctuations in voltage, current, power, harmonics, and flicker when connecting a highly variable system such as a renewable energy source or EV charging station to the grid. Easily analyze the data with the included PQ ONE software.





## Measure AC/DC power

Use AC/DC auto-zero current sensors to measure DC current accurately over extended periods of time. Since the sensors are powered by the instrument, there's no need to set up a separate power supply.

High-end model

# Troubleshoot power supplies and verify power quality
# PQ3198

### Features

Class A compliance under international standards

Basic voltage measurement accuracy of ±0.1%

High-voltage, wideband performance

Two-circuit measurement

Simple inverter measurement

400 Hz line measurement

GPS time synchronization

Extensive array of event measurement parameters

### Applications

**Investigate power supply anomalies**

Investigate the causes of equipment failures and malfunctions, including issues that are difficult to identify, such as when a device causes a properly-functioning piece of equipment that is connected to the same power outlet to experience a voltage drop.

**Verify the quality of power from a solar power system**

Check fluctuations in the output voltage of a power conditioner in a solar power system along with flicker and transient voltages. You can also measure fluctuations in the frequency of the grid interconnection and fluctuations in the harmonic voltage and current components of the system's output.

**Verify the quality of power supplied by an EV rapid charger**

Since the PQ3198's fourth voltage channel is isolated from its first three voltage channels, the instrument can measure power and efficiency across two separate circuits. For example, you can verify the quality of the input (AC) and output (DC) of an EV rapid charger while simultaneously measuring power and efficiency between input and output.

# High-precision, wideband, broad-dynamic-range measurement

The PQ3198 delivers the high-end specifications and high reliability needed to capture the full range of power anomalies and analyze the underlying data with a high degree of precision.

## International standard IEC 61000-4-30 Ed. 3 Class A compliant

**Class A**

The PQ3198 complies with the IEC 61000-4-30 Ed. 3 Class A standard. As a result, it can perform standard-mandated measurement tasks such as gapless, continuous calculation; detection of events such as swells, dips, and interruptions; and time synchronization using GPS (optional).

### Basic measurement accuracy (50/60 Hz)

| | |
|---|---|
| Voltage | ±0.1% of nominal voltage |
| Current | ±0.1% rdg. ±0.1% f.s. + current sensor accuracy |
| Power | ±0.2% rdg. ±0.1% f.s. + current sensor accuracy |
| Frequency | 200ms: ±0.02Hz / 10s: ±0.003Hz |

Thanks to basic measurement accuracy that is among the best of any instrument in the industry, the PQ3198 offers high-precision measurement without the need to switch voltage ranges.

**Class A**
Part of the IEC 61000-4-30 international standard, Class A defines power quality parameters, accuracy, and standard compliance to facilitate the comparison and discussion of measurement results from different instruments.

## High-voltage, wideband performance

The PQ3198 can measure transient voltages of up to 6000 V lasting as little as 0.5 µs (2 MS/s). It can also measure high-order harmonic components from 2 kHz to 80 kHz. As inverters enter into widespread use, malfunctions and failures in that frequency band are becoming more common.

**Voltage measurement range**

Transient voltage
Line voltage (3P4W)
Line voltage (1P2W, 1P3W, 3P3W)
Phase voltage (1P2W, 1P3W, 3P4W)

780 V    1300 V    6000 Vpeak
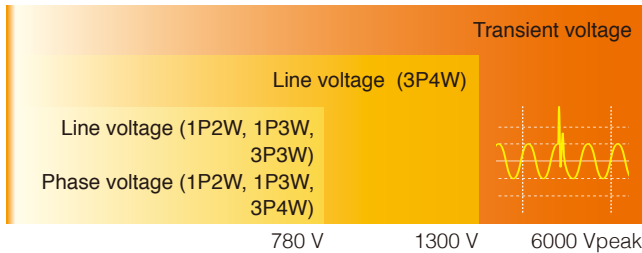
The PQ3198 can measure voltages of all magnitudes using a single range.

**Voltage frequency band**

Transient voltage detection
High-order harmonic measurement
Harmonic measurement

DC    3 kHz    80 kHz    700 kHz
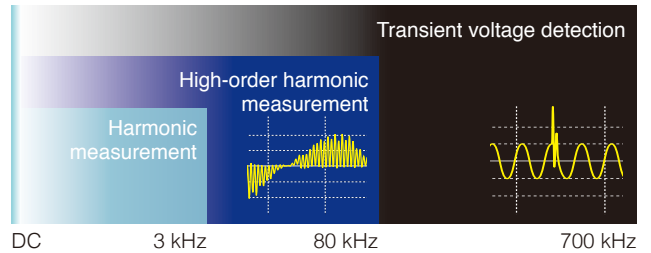
The PQ3198's wideband capability extends from DC voltages to 700 kHz.

## Two-circuit measurement

Since the PQ3198's fourth voltage channel is isolated from its first three voltage channels, the instrument can measure power and efficiency across two separate circuits.

### Applications
- Simultaneous measurement/monitoring of the primary (AC) and secondary (DC) sides of an EV rapid charger
- Simultaneous measurement/monitoring of the primary (DC) and secondary (AC) sides of a solar power system
- Simultaneous measurement of the primary (DC) and secondary (AC) sides of a DC/AC (3-phase) inverter
- Simultaneous measurement of the primary and secondary sides of a UPS
- Simultaneous measurement of power supply (AC) and control (DC) circuits
- Simultaneous measurement of a 3-phase line and a ground line
- Simultaneous measurement of a neutral line to detect ground

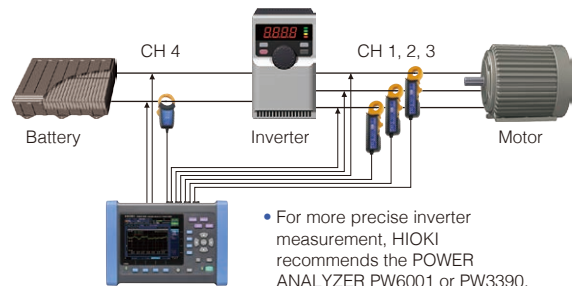*For DC measurement, an AC/DC Auto-Zero Current Sensor is required

Voltage channels 1, 2, and 3 ← Isolated → Voltage channel 4
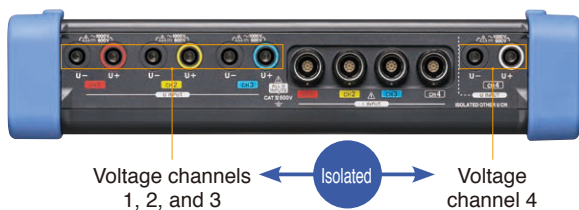
## 400 Hz line measurement

In addition to 50/60 Hz, the PQ3198 can measure a line frequency of 400 Hz.

## Simple inverter measurement

The PQ3198 can measure the secondary side of inverters with a fundamental frequency of 40 to 70 Hz and a carrier frequency of up to 20 kHz. It can also measure the efficiency of DC/3-phase inverters.

CH 4    CH 1, 2, 3
Battery    Inverter    Motor

- For more precise inverter measurement, HIOKI recommends the POWER ANALYZER PW6001 or PW3390.

## GPS time synchronization

The GPS OPTION PW9005 can be used to correct the instrument's internal time to UTC standard time. This capability eliminates any time difference between instruments to allow analysis that preserves the simultaneity of phenomena measured with multiple instruments.
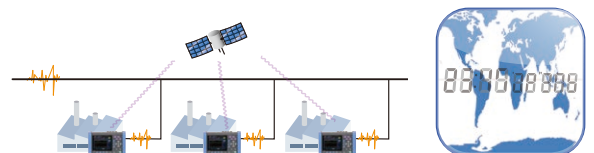
Mid-range model

# Investigate power supply conditions and prevent problems
# PQ3100

## Features

Simple setup with QUICK SET

Record event waveforms of up to 11 sec. in duration

8 hours of battery operation

200 ms and 600 ms data save capability

CAT III (1000 V)/CAT IV (600 V)

Display event statistics

Demand recording



## Applications



### Investigate power supply conditions

Measure voltage fluctuations, equipment capacity, and harmonics before installing new electrical equipment. You can also check whether newly installed equipment is affecting other equipment by repeating those measurements after installation and comparing the results.
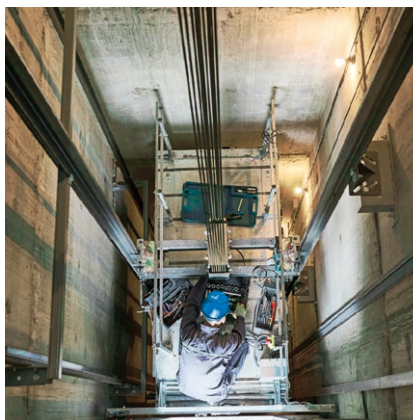


### Prevent power supply problems

Discover signs of impending problems by repeatedly measuring a component such as an elevator motor on a regular basis. Flexible current sensors make it possible to connect the instrument safely and easily, even in difficult settings involving double wiring, busbars, and crowded distribution boards.



### Perform load rejection testing of solar power systems

In load rejection testing, it's necessary to record transient changes in current and voltage when the system is taken offline. The PQ3100 can record anomalous waveforms for up to 11 seconds (1 second before and 10 after each event). Cursor measurement lets you verify peak values and duration as well.

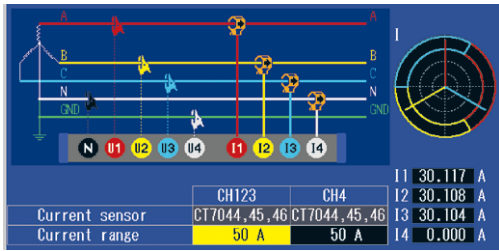# QUICK SET: Easy-to-understand measurement guidance

Launch QUICK SET to navigate the connection and setup processes so you can get started recording quickly.

### Setting up the instrument
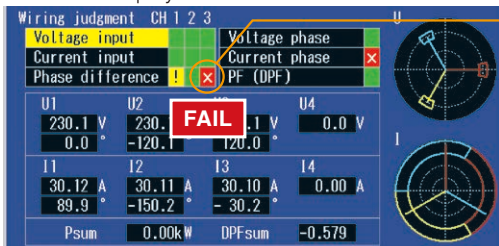(example: 2-meter power measurement of a 3-phase/3-wire circuit)

**STEP 1** Choose the connection type and connect the cables to the instrument.



**STEP 2** Connect the voltage cables and current sensors to the circuit to be measured.



| | CH123 | CH4 |
|---|---|---|
| Current sensor | CT7044,45,46 | CT7044,45,46 |
| Current range | 50 A | 50 A |

I1 30.117 A
I2 30.108 A
I3 30.104 A
I4 0.000 A

**STEP 3** The instrument will perform an automatic wiring check and display the results.



Notification of what to fix in the event of a FAIL result

Help      Phase difference

FAIL will display when each current phase is not w/in ±90° of each voltage phase.
• Are Voltage leads and current sensors properly connected?
• Is arrow of current sensor pointed to the load?

CHECK will display when current phase is w/in ±60° to ±90° of each voltage phase.

Power supply side



Load side

For example, you won't be able to measure power or power factor accurately if the clamp is oriented incorrectly.

**STEP 4** You need only set the recording parameters and interval in order to start measurement.
Recording parameters can be set simply by choosing a simple setup preset. (See page 8 for details.)
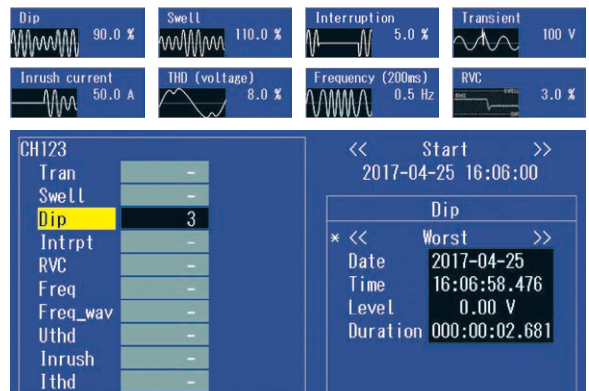


---

## Recording of 11 sec. before and after events

The PQ3100 can record waveforms for up to 1 second before an anomaly and 10 seconds after. This capability is useful when you need to analyze waveforms before and after an anomaly, perform load rejection testing of a solar power conditioner, or verify that a piece of equipment has returned to normal operation.

1 sec. before event   Event   10 sec. after event



Detailed display of waveforms



## Up to 8 hours of battery operation

The PQ3100 features an energy-saving design and a long-lasting battery. The bundled rechargeable battery lets you continue measurement in the event of a power outage or take the instrument into the field to make measurements in locations where AC power is not available.



- Outdoors
- During power outages
- Extended operation

## Display of event statistics

Check the number of times each type of event has occurred as well as the worst value for each.



## Demand recording

Record power consumption over time.

Features shared by both the PQ3198 and the PQ3100
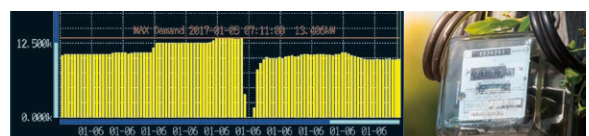
# Measurement functionality and data recording capabilities that ensure you'll capture the full picture with a single measurement

## Capture power anomalies reliably with simple settings

The PQ3198 and PQ3100 can measure all parameters at once, including power, harmonics, and anomaly waveforms. The instruments also provide simple setup functionality for automatically configuring recording parameters for popular applications.

Extensive event parameters

Simple, one-touch setup
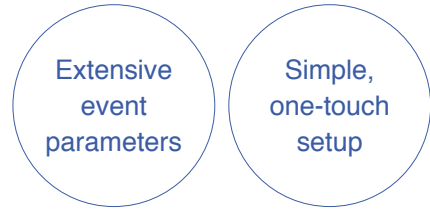
### Capture power supply anomalies reliably

#### Transient voltages

Capture phenomena characterized by precipitous voltage changes and high peak values caused by lightning or circuit breaker or relay contact issues or tripping.
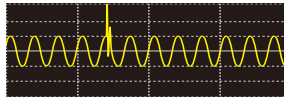
#### Voltage swells

Capture phenomena characterized by a momentary rise in voltage, for example due to lightning or power line switching.
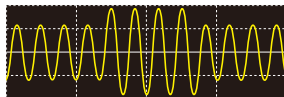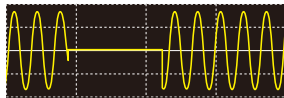
#### Voltage dips

Capture phenomena characterized by a short-duration drop in voltage when a large inrush current occurs, for example due to motor startup.
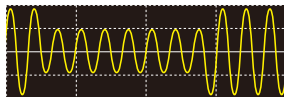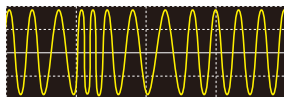
#### Interruptions

Capture phenomena characterized by a stoppage in the supply of power, for example when lightning interrupts power or when a power supply short-circuit trips a circuit breaker.
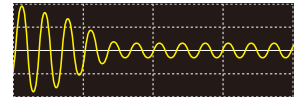
#### Frequency fluctuations

Capture frequency fluctuations caused when generator operation becomes unstable due to an abrupt increase or decrease in load.
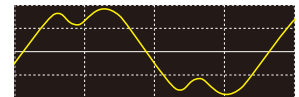
#### Inrush current

Capture phenomena characterized by a large current that flows momentarily when a device starts up upon receiving power, for example electric equipment and motors.

#### Harmonics

Capture phenomena characterized by distortions in voltage and current waveforms that are caused by semiconductor control devices.

#### High-order harmonics

Capture phenomena characterized by distortions in voltage and current waveforms caused by noise components from semiconductor control devices such as those used in electronic device power supplies.
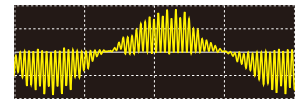
#### Unbalance

Observe voltage and current waveform distortion, voltage dips, and negative-phase-sequence voltage that occur when the loads connected to individual phases in a 3-phase power supply change or when unstable equipment operation increases the load on a specific phase.
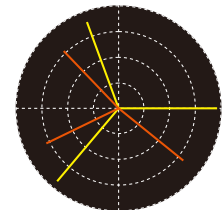
### Simple, one-touch setup

#### Simple setup functionality for simplified configuration of recording parameters

Simply choose the preset that suits your application, and the instrument will automatically configure the recording parameters.

| | |
|---|---|
| **Voltage anomaly detection** | Capture voltage and frequency anomalies. |
| **Basic power quality measurement** [*1] | Augment the voltage anomaly detection preset by capturing current and harmonic anomalies as well. |
| **Inrush current measurement** | Capture inrush current. |
| **Measured value recording** [*2] | Record only time-series data. |
| **EN 50160** | Perform measurement based on the EN 50160 standard. |

*1: PQ3198 only.  *2: This feature is known as "Trends only" for the PQ3100.

#### Automatic sensor detection to avoid erroneous measurement

Simply connect current sensors, touch "Sensor" on the screen, and the instrument will automatically detect sensor types and maximum current ranges.

Connect sensors ▶
Touch "Sensor" for automatic identification

### Easy-to-understand display of parameters

Since you can switch the display to show all measurement parameters while measurement is underway, it's easy to check conditions. *Screenshot shows the PQ3100 display.

Waveforms

Harmonics

MONITOR

RMS values

Vectors

# Simultaneously record event waveforms and trend graphs

Each time it makes a measurement, the PQ3198/PQ3100 records trend data for all parameters. When a power anomaly is detected, an event is recorded. Since the instrument records the maximum, minimum, and average values during the interval, you can rest assured that you won't miss peak values.

Extensive range of recording parameters

### Example: Voltage dip



0.1920k

↓

### Simultaneous recording of waveforms and trend data

#### Event waveform

When an event occurs, the instrument records the instantaneous waveform for 0.2 seconds. Triggers can be set for all event parameters in parallel, and you can check recorded data on the display while measurement is in progress.
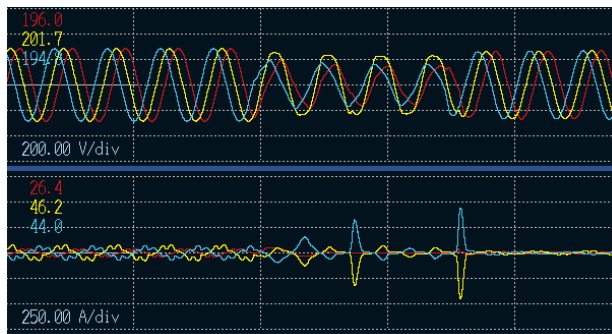


#### 30 sec. event fluctuation trend data

When a voltage swell, dip, or inrush current event occurs, the PQ3198/PQ3100 can simultaneously record 1/2 RMS value fluctuations for 30 seconds.
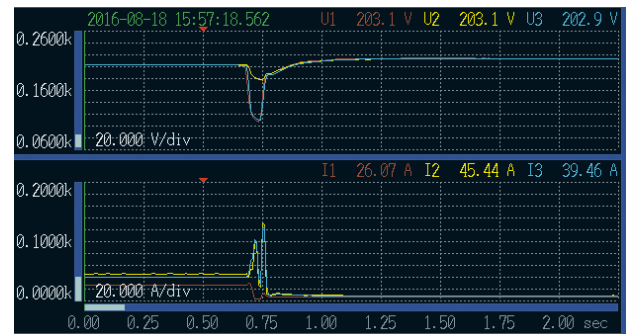


### List of recording parameters

#### PQ3198 and PQ3100

- Transient voltage
- Voltage 1/2 RMS value
- Current 1/2 RMS value
- Voltage waveform peak
- Voltage DC
- Voltage RMS value (phase)
- Voltage RMS value (line)
- Swell
- Dip
- Interruption
- Instantaneous flicker value
- Current waveform peak
- Current DC
- Current RMS value

- Inrush current
- Frequency 1 wave
- Frequency 200 ms
- Frequency 10 s
- Active power
- Active energy
- Reactive power
- Reactive energy
- Apparent power
- Power factor/ displacement power factor
- Voltage reverse-phase unbalance factor
- Voltage zero-phase unbalance factor
- Current reverse-phase unbalance factor
- Current zero-phase unbalance factor

- Harmonic voltage
- Harmonic current
- Harmonic power
- Inter-harmonic voltage
- Inter-harmonic current
- Harmonic voltage phase angle
- Harmonic current phase angle
- Harmonic voltage-current phase difference
- Voltage total harmonic distortion
- Current total harmonic distortion
- K factor
- IEC flicker
- ΔV10 flicker

#### PQ3198 only

- Efficiency
- High-order harmonic components
- Voltage waveform comparison

#### PQ3100 only

- Voltage CF
- Rapid voltage change (RVC)
- Current CF
- Electricity cost
- Apparent energy
- Apparent power demand amount
- Reactive power demand amount

- Apparent power demand amount
- Active power demand value
- Reactive power demand value
- Apparent power demand value
- Power factor demand value

### Flicker

The PQ3198/PQ3100 can simultaneously measure and record three channels of ΔV10 or IEC flicker.
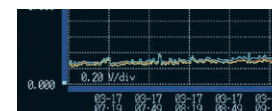


### Δ-Y, Y-Δ conversion function

When measuring a 3-phase/3-wire (3P3W3M) circuit or a 3-phase/4-wire circuit, the PQ3198/PQ3100 can switch between phase voltage and line voltage without changing the voltage connections.

# Designed to accommodate every possible application so that it's easy to use in all field settings

## Clamp sensors for every application

### Flexible sensors: Easy installation in confined locations

Flexible current sensors provide a convenient way to measure double- and triple-wired power supplies and in confined locations, with capacities of up to 6000 A.



### No need for an external power supply

Since sensor power is supplied by the instrument, there's no need for an AC adapter when using AC/DC sensors or flexible sensors.



### Auto-zero sensors: Stable measurement of DC power over extended periods of time

Auto-zero current sensors allow measurement of DC power over extended periods of time, eliminating the need to concern yourself with zero-point drift.



### Wide array of ranges to accommodate all applications

Use HIOKI sensors in an array of applications to measure equipment ranging from the secondary side of CTs to high-current wiring. The CT7136 offers three ranges* (5 A/50 A/500 A), as do HIOKI's flexible sensors (50 A/500 A/5000 A). Since the effective measurement range extends to 120% of the nominal range, flexible sensors can be used to measure currents of up to 6000 A.

*PQ3100 (PQ3198: 2 ranges [50 A/500 A]).



---

### Delivering both safety and high accuracy

### Exceptional safety

The PQ3100 supports CAT III (1000 V*) and CAT IV (600 V) situations, so it can safely measure service drops and distribution panels with a terminal-to-ground voltage of up to 1000 V.
*PQ3100 only (PQ3198: CAT IV [600 V]).



### High accuracy

The PQ3198 complies with IEC 61000-4-30 Ed. 3 Class A, and the PQ3100 with IEC 61000-4-30 Class S, ensuring both instruments' ability to deliver highly reliable, high-precision measurement.

|  | PQ3198 | PQ3100 |
|---|---|---|
| Voltage RMS value accuracy | ±0.1% of nominal voltage | ±0.2% of nominal voltage |
| Swell/dip/interruption | ±0.2% of nominal voltage | ±0.3% of nominal voltage |

# Convenient tools

## When it's hard to clip leads to terminals

In locations where it's hard to attach alligator clip-style leads to metal terminals, you can replace the tips of the voltage cords with magnetic adapters so that you can more easily detect the voltage.
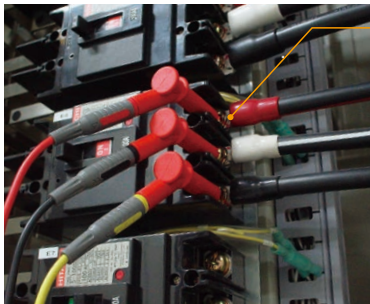
Magnetic design (diameter: 11 mm)

Magnetic adapters
Red: 9804-01
Black: 9804-02

Magnetic adapters are easy to affix to terminals in confined locations.

## Secure the PQA to the side of a distribution panel

Use two heavy-duty magnetic straps to attach the instrument to the side or door of a distribution panel.

Heavy-duty magnetic straps

Magnetic straps
Heavy-duty type: Z5020
Standard type: Z5004

Magnetic straps can also be used to help keep voltage cords from coming loose.

# Extensive range of interfaces

## Remote control via Ethernet

Use the PQ3198/PQ3100's HTTP server function to configure and monitor the instrument from a browser. You can also download data using the instrument's FTP server function.
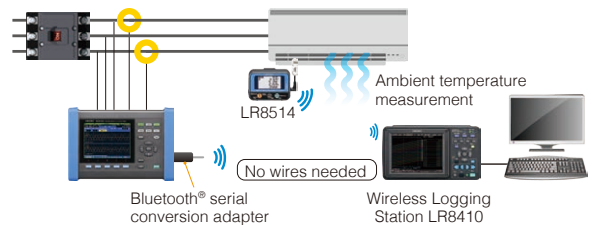
Wi-Fi

Router

PDA

PC

Tablet
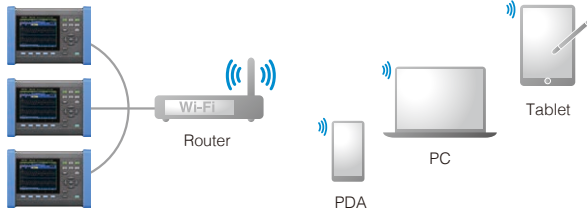
## Email notification function*

The instrument can send emails when an event occurs or at a regular time every day. *PQ3100 only

## Transfer data to a logger wirelessly*

Pair a data logger (that supports LR8410 Link) to the instrument via Bluetooth® wireless technology to transfer measured values for up to six parameters to the logger. In this way, you can use a single data logger to aggregate measurement data from multiple locations.

Ambient temperature measurement
LR8514

No wires needed

Bluetooth® serial conversion adapter

Wireless Logging Station LR8410

*PQ3100 only. Connection requires a serial-Bluetooth® wireless technology conversion adapter as recommended by HIOKI. Please contact your HIOKI distributor for more information.

# Extended recording times supports permanent installation

## Extended recording to an SD memory card

The PQ3198/PQ3100 can record time-series data and event waveforms to an SD memory card. Choose from 2 GB and 8 GB cards.

PQ3198 recording times (when using a 2 GB SD card)

| Recording interval | All parameters | Power and harmonics | Power only | Event recording |
|---|---|---|---|---|
| 1 sec. | 16 hr. | 23 hr. | 11 days | Yes |
| 3 sec. | 2 days | 3 days | 34 days | Yes |
| 15 sec. | 10 days | 14 days | 24 weeks | Yes |
| 30 sec. | 21 days | 29 days | 49 weeks | Yes |
| 1 min. | 42 days | 8 weeks | 1 year | Yes |
| 5 min. | 30 weeks | 42 weeks | 1 year | Yes |
| 10 min. | 1 year | 1 year | 1 year | Yes |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |

PQ3100 recording times (when using a 2 GB SD card)

| Recording interval | Without harmonics | With harmonics | Event recording |
|---|---|---|---|
| 200 ms | 25 hours | No | No |
| 1 sec. | 5 days | 7 hours | Yes |
| 2 sec. | 10 days | 14 hours | Yes |
| 10 sec. | 53 days | 2 days | Yes |
| 1 min. | 321 days | 17 days | Yes |
| 10 min. | 1 year | 178 days | Yes |
| 30 min. | 1 year | 1 year | Yes |
| ⋮ | ⋮ | ⋮ | ⋮ |

2 GB

8 GB

# Analyze data and generate reports with HIOKI's PQ ONE power quality analysis software

**Standard accessory**    Download the latest version from HIOKI's website for free. Sample data from actual instruments is also available for download.

Loading measurement data    ## Review multiple data sets at a glance

Group data from different measurement locations, times, and dates into folders and view them together.
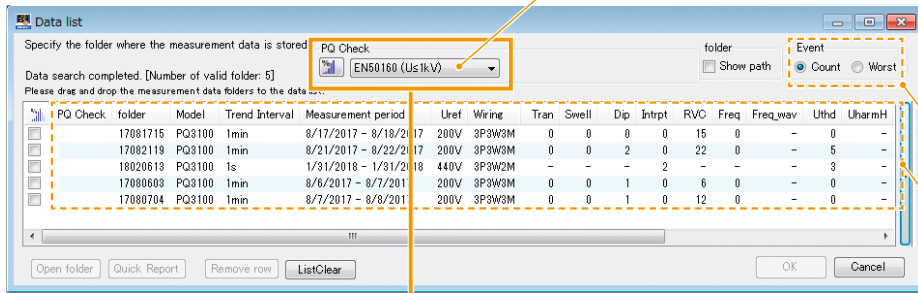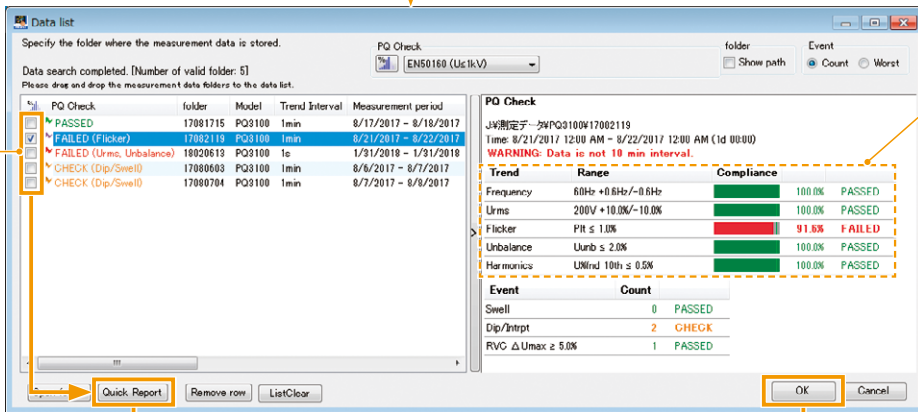


**PQ Check function**

Automatically check data to see if it complies with power quality standards. (Thresholds can be customized.)

Toggle the display between event counts and worst values.

Display event status and other information in the list of loaded data.

Example: Using PQ Check to assess whether a given set of data complies with the EN 50160 standard



Choose report parameters.

**PASS/FAIL judgments for the standard**

Understand at a glance that the flicker value falls outside the standard.

Output FAIL (non-compliant) data with a single click using the Quick Report function.
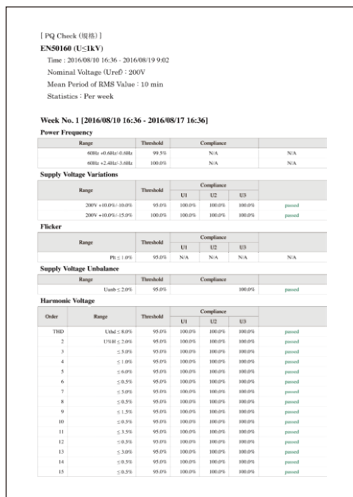
Generate a quick report    View a detailed analysis on the main screen

Simple report creation    ## Quick Report function

Group together trend graphs for multiple data sets and output them as a report. This feature is useful when you wish to compare dates from a repeat recording run or data from multiple locations.



Detailed analysis    ## Display a list of analytical data

Display detailed measurement data, including event statistics, an event list, and event graphs. Simply choose the parameters you need to output to the report.

**PQ ONE main screen** Display a list of detailed information for an individual data set



1. **Select data to load**
   Load a new data set or choose the most recently used data set.

2. **Option settings**
   Configure options such as display parameters, language, and cache files.

3. **Verify settings at the time of measurement**
   Display the status screen with information such as the instrument settings that were in effect at the time of measurement.

4. **Report creation**
   Generate detailed reports with trend and event information.

5. **CSV file conversion**
   Output trends and event waveforms as a CSV-format file.

6. **Statistical values and standard values**
   Display statistical values and perform evaluations and analysis based on standards.

7. **User manual and version information**
   Review the PQ ONE user manual and software version.

8. **Measured value trend graph**
   Zoom in and out or use the cursor to display measured values.

9. **Trend graph display interval**
   Set the interval for which to display trend data on the screen.

10. **Event statistics and ITIC curve**
    Display bar graphs with data such as the number of events that occurred.

11. **Event list**
    Display information including the event type, time, duration, and channel.

12. **Detailed event data**
    Display detailed information about the event selected in the event list.

Features shared by the PQ3198 and PQ3100

# Analyze data and generate reports with PQ ONE power quality analysis software

## Examples of the types of analyses that can be performed with PQ ONE

### Event statistics

Display statistics about events by date or time. This feature makes it easy to discover anomalies that occur at particular times of day or on particular days of the week. In addition, you can perform ITIC (CBEMA) curve analyses (using tolerance curves), which are used by power quality management standards in the U.S.



Date-based statistics          Time-based statistics
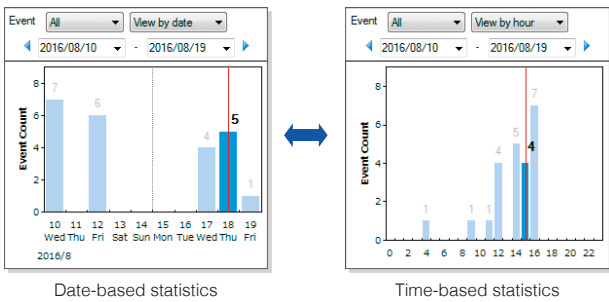
### Event list

Display statistics about events by date or time of day. This feature makes it easy to discover power supply anomalies that occur at particular times of day or on particular days of the week.



Click the event statistics bar graph to display the event list.

### ITIC curve

Perform ITIC (CBEMA) curve analyses (using tolerance curves), which are used by power quality management standards in the U.S. This feature lets you display the event duration and worst values for voltage swells, voltage dips, and interruptions.
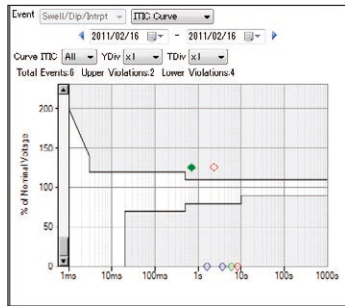


Example ITIC curve screen

### Trend graphs

Display voltage, current, frequency, harmonics, unbalance factor, power, energy, and other data as a time series. Set the display range as desired on the screen and output reports with the shown data. PQ ONE can generate a demand display for the PQ3198, even though that model does not include demand measurement.
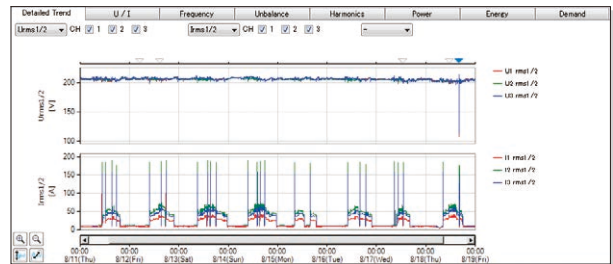


Choose the measurement parameter, channel, or max./min./avg. value.

### Event details

Analyze 200 ms event waveforms, including waveforms, harmonics, vector, and numerical displays. You can also display 30 sec. event fluctuation data, transient waveforms, high-order harmonic waveforms[1], high-order harmonic frequency analysis data[1], and 11 sec. waveforms preceding events[2].
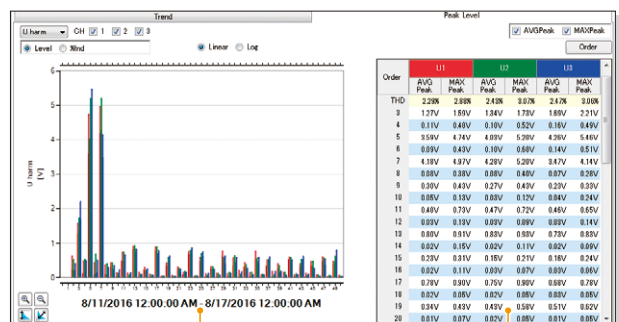*1: PQ3198 only. *2: PQ3100 only.
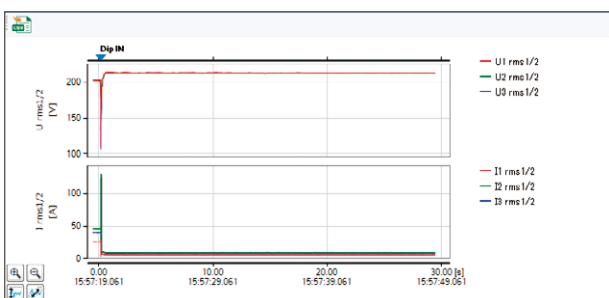


Example voltage dip screen (30 sec. event fluctuation data)

### Peak level display

Display a bar graph showing peak values during the voltage harmonic or current harmonic trend display interval. You can check average peak and maximum peak measured values for the period of time selected with the cursor to the right of the graph.
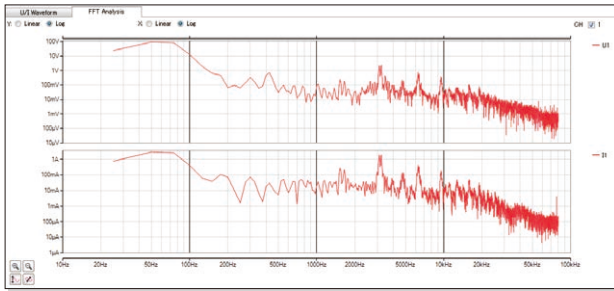


Peak level detection interval          Average peak and maximum peak details

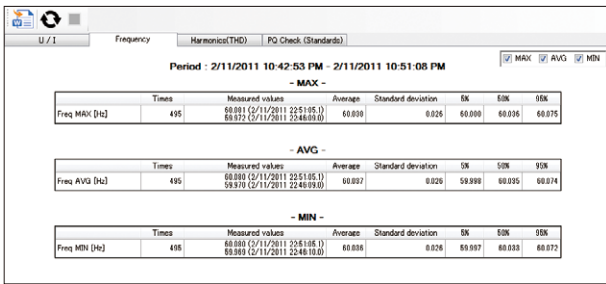## High-order harmonics and frequency analysis display*

Display high-order harmonic event waveforms (2 to 80 kHz) and associated frequency analysis data. By displaying the frequency analysis, you can determine the frequency band in which noise is occurring. *PQ3198 only.



Example high-order harmonics and frequency analysis screen

## Report creation

Automatically generate reports in Microsoft Word* by simply selecting the necessary data categories. Add comments as required.

*Microsoft Word is a product of Microsoft Corporation.



Choose report parameters → Output a report with only the necessary data
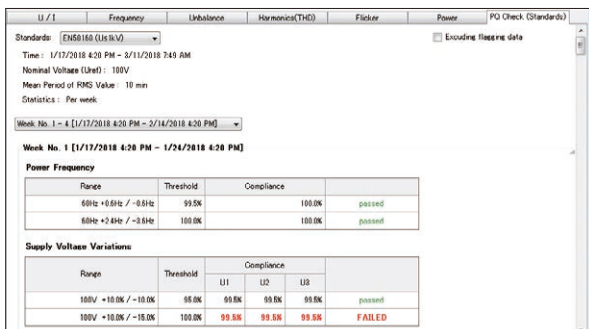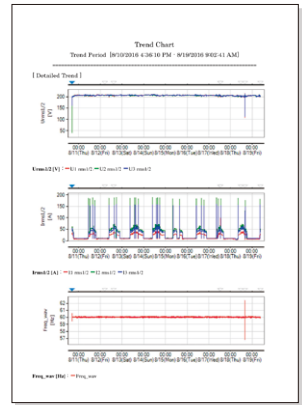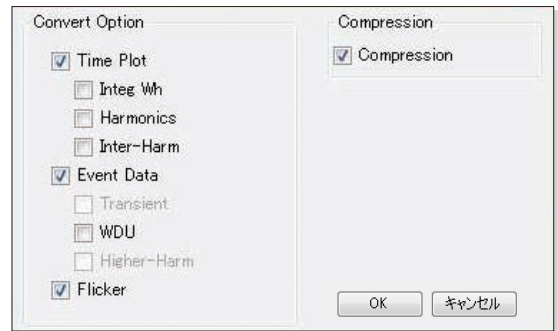
## Statistics display function

Present statistical data for voltage, current, frequency, harmonics, flicker and other parameters on the Statistics screen. You can also see the maximum and minimum (with time of occurrence), average, 5%, 50%, or 95% of the value (default values, user settable) of any selected parameter.



Example frequency screen

## CSV conversion and PQDIF output function

Output CSV and PQDIF format files for the parameters you choose. PQDIF format files can also be uploaded to the software.



PQDIF output settings screen

## EN 50160 judgment function

Evaluate whether data complies with the EN 50160 standard by analyzing it and generating a judgment based on voltage fluctuations during the trend interval. You can also customize the judgment criteria and parameters.



Display detailed settings and judgment results

## Compute TDD (Total Demand Distortion) based on the IEEE519 standard

Calculate TDD using PQ ONE.

$$TDD_I = \sqrt{I_2^2 + I_3^2 + \ldots + I_{49}^2 + I_{50}^2} \; / \; I_L$$

$I_L$: Maximum current demand (configure in PQ ONE)

## Display language

Choose from English, German, French, Italian, Spanish, Turkish, Japanese, Simplified Chinese, Traditional Chinese, and Korean.
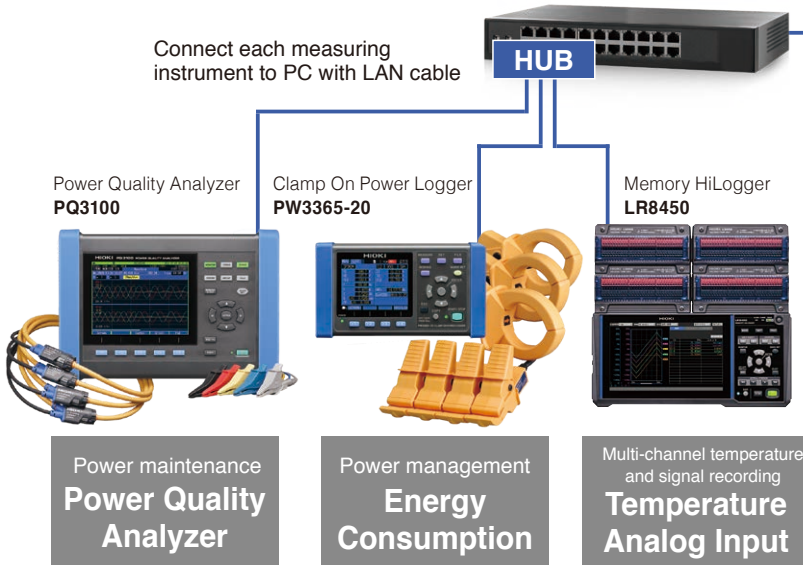


Choose "Automatic" to use the Windows language.

PC Application Program
# GENNECT One

Connect each measuring instrument to PC with LAN cable

**HUB**

| Power Quality Analyzer **PQ3100** | Clamp On Power Logger **PW3365-20** | Memory HiLogger **LR8450** |
|---|---|---|

| Power maintenance **Power Quality Analyzer** | Power management **Energy Consumption** | Multi-channel temperature and signal recording **Temperature Analog Input** |
|---|---|---|

## Simultaneously monitor all data in real-time

- Connect measuring instruments to PC with LAN cable
  Operation guaranteed for up to 30 units. Please contact your nearest Hioki distributor for connections exceeding 30.
- Software automatically recognizes LAN-connected measuring instrument
- Display acquired data as graphs in real-time
- Manage and save results with software
- List MAX, MIN and AVG values
  (Display time of MAX & MIN data)

| Compatible instruments | Available items to monitor and save on PC | | Number of items able to be saved | Recording time |
|---|---|---|---|---|
| POWER QUALITY ANALYZER PQ3100, PQ3198 | Voltage Current Power | Instantaneous value of each interval; MAX, MIN, AVG value of each interval | **Save up to 512 items** *Maximum 32 items when simultaneously displaying graphs | When memory size of acquired data reaches to 64MB, data will be separated automatically [Continuous measurement] When storage capacity falls below 512MB, measurement will stop |
| CLAMP ON POWER LOGGER PW3365 | | | | |
| CLAMP ON POWER LOGGER PW3360 | | | | |
| MEMORY HiLOGGER LR8450, LR8450-01 | Temperature Analog Input | Instantaneous value of each interval | | |
| WIRELESS LOGGING STATION LR8410 | | | | |

## Get results from the job site in real-time
### Present data from multiple sources as a graph or list together in real-time

| Entire screen | 1. Monitor | 2. Graph | 3. List |
|---|---|---|---|
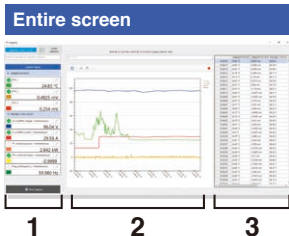
**1. Monitor display (Max 512 items)**
Display each measured data in real-time

**2. Graph display (Max 32 items)**
Display selected data as graphs

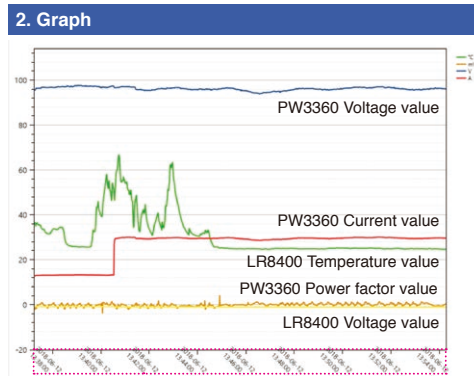**3. List display (Max 32 items)**
Display selected data in list

PW3360 Voltage value
PW3360 Current value
LR8400 Temperature value
PW3360 Power factor value
LR8400 Voltage value

logging time (display up to 1024 points)

## Other functionality

### LAN remote control function

The application displays a virtual instrument and allows you to control it directly with the mouse. You can also easily change instrument settings and control the instrument, for example to start and stop measurement.
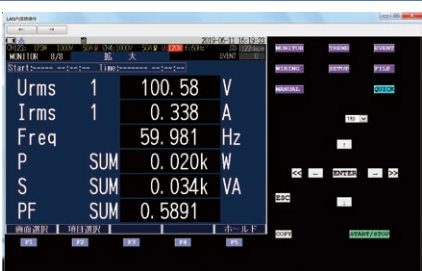
### LAN automatic file download function

This function lets you acquire data in real time on a PC, including data created when the instrument's trigger is activated and measurement files that are automatically generated on a daily basis. Example uses include capturing abnormal phenomena with an instrument installed in the field and automatically acquiring daily power consumption data on a PC.

**Automatically transfer measurement files to a PC.**

Review measured values on a PC anytime.
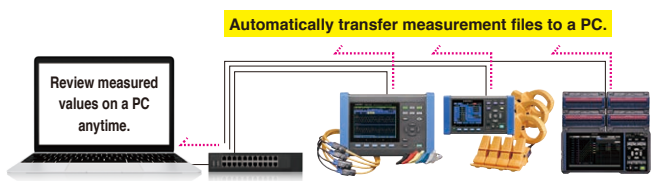
## Download GENNECT One

| HIOKI website > Technical Support > Drivers, Firmware, Software | Model No. (Order code) | **SF4000** | Search |
|---|---|---|---|

Enter the model number of any one of the compatible Hioki measuring instruments in the search field to download the software to get started!

# Interfaces

PQ3198 top



Current input terminals (4 channels)

Voltage input terminals (4 channels; channels 1/2/3 and channel 4 are isolated from each other)

PQ3100 top



Voltage input terminals (4 channels)

Current input terminals (4 channels)

Shared features: Side



Power switch

AC adapter terminal

Charging indicator
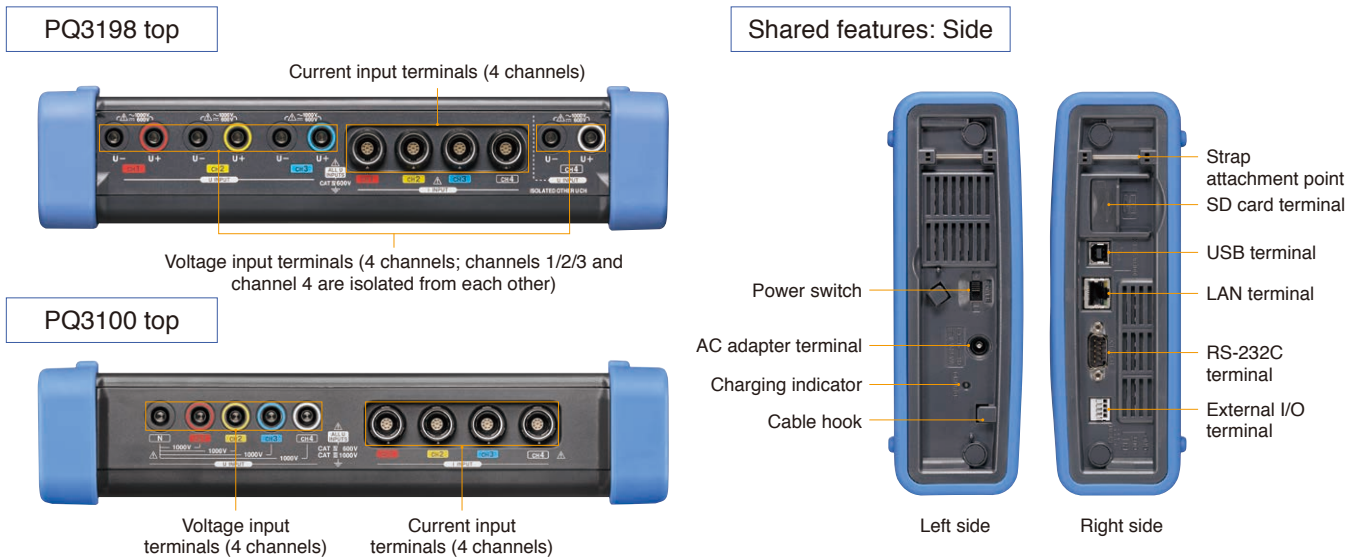
Cable hook

Strap attachment point
SD card terminal
USB terminal
LAN terminal
RS-232C terminal
External I/O terminal

Left side

Right side

## Simple comparison chart

### PQ3198 features

The PQ3198 offers an extensive range of event parameters. This model is ideal for use in troubleshooting-related measurement since it can capture a variety of power supply anomalies. Additionally, it can measure power and efficiency across two circuits carrying different voltages (3-phase and DC, etc.).

### PQ3100 features

The PQ3100 offers the QUICK SET function, which makes it easy to generate reliable measurements. Additionally, it can record 11 sec. event waveforms, yielding extended waveforms when anomalies occur. It can also be used in applications such as load rejection testing of solar power systems.

| Model | | PQ3198 | PQ3100 |
|---|---|---|---|
| IEC 61000-4-30 standard compliance | | Class A | Class S |
| Fundamental frequency | | DC/50 Hz/60 Hz/400 Hz | DC/50 Hz/60 Hz |
| Measurement lines | | 1-phase/2-wire, 1-phase/3-wire, 3-phase/3-wire, or 3-phase/4-wire + CH 4 | |
| Event parameters | Events that can be measured to capture anomalies | Transient, swell, dip, interruption, frequency fluctuation, inrush current, THD | |
| | | RMS values<br>Voltage/current waveform peak<br>Voltage waveform comparison<br>Harmonics<br>Unbalance factor<br>Power | Rapid voltage change (RVC) |
| | Transient voltage | 2 MS/s<br>6 kV | 200 kS/s<br>2.2 kV |
| Measurement parameters | Efficiency | CH 4 power calculation<br>Efficiency calculation | N/A |
| | High-order harmonics | 2 kHz to 80 kHz | N/A |
| | Power | Power 2-circuit measurement | N/A |
| | | Active power, reactive power, apparent power, power factor, displacement power factor, active energy, reactive energy | |
| | Voltage | 1/2 RMS value (half-wave shifted 1-wave calculation), RMS value, waveform peak, DC value, unbalance factor (reverse-phase/zero-phase), frequency (1-wave/200 ms/10 sec.) | |
| | Current | Inrush current (half-wave), RMS value, waveform peak, DC value, unbalance factor (reverse-phase/zero-phase), K factor | |
| | Harmonics | 0th order (DC) to 50th order, voltage/current/power, phase angle (voltage/current), voltage-current phase difference, total harmonic distortion (voltage/current) | |
| | Flicker | Pst, Plt, ΔV10 (3-channel simultaneous measurement) | |
| | Inter-harmonics | 0.5th order to 49.5th order, voltage/current | |
| Event measurement | Maximum number of recordable events | 9999 events × 366 day repeat | |
| | Waveform acquired at time of event | 200 ms | |
| | Waveform acquired before event | 2 waveforms | Max. 1 sec. |
| | Waveform acquired after event | Max. 1 sec. (for 5 successive events) | Max. 10 sec. |
| | Event statistics processing | N/A | Display of count for each event type and each day |
| Voltage measurement | CH 1/2/3 and CH 4 isolation | Yes | N/A |
| | Measurement accuracy | High accuracy: ±0.1% rdg. | ±0.2% rdg. |
| | Maximum rated terminal-to-ground voltage | 600 V (CAT IV) | 1000 V (CAT III)<br>600 V (CAT IV) |
| Current measurement | Measurement of 4 single-phase circuits | Yes | Yes |
| | Sensor power supply | Yes | Yes |
| Time-series measurement | 1 year recording | Yes | Yes |
| | Recording interval times | 1 sec. to 2 hours | 200 ms/600 ms/1 sec. to 2 hours |
| Setup assistance | | Simplified setup function | QUICK SET (navigation-style assistance from connecting the instrument to the start of recording) |
| Battery operation | | 3 hours | 8 hours |

# Specifications

The following specifications apply when the PQ3198/PQ3100 is set to a measurement frequency of 50/60 Hz. For more detailed specifications, including for when the PQ3198 is set to 400 Hz, please download the user manual from the HIOKI website.

| Basic specifications | PQ3198 | PQ3100 |
|---|---|---|
| Number of channels | Voltage: 4 / Current: 4 | |
| Input terminal type | Voltage: Plug-in terminals (safety terminals) / Current: Dedicated connectors (HIOKI PL 14) | |
| Connections | Any of the following + additional input to CH 4: 1-phase/2-wire / 1-phase/3-wire / 1-phase/3-wire/1 voltmeter *PQ3100 only | 3-phase/3-wire/2 power meter    3-phase/4-wire/2.5 element / 3-phase/3-wire/3 power meter / 3-phase/4-wire |
| Input resistance | Voltage inputs: 4 MΩ / Current inputs: 100 kΩ | Voltage inputs: 5 MΩ / Current inputs: 200 kΩ |
| Maximum input voltage | Voltage inputs: 1000 V AC, ±600 V DC, 6000 Vpeak | Voltage inputs: 1000 V AC/DC, 2200 Vpeak |
| Maximum rated terminal-to-ground voltage | 600 V AC (CAT IV) with an expected transient overvoltage of 8000 V | 1000 V AC (CAT III) or 600 V AC (CAT IV) with an expected transient overvoltage of 8000 V |
| Sampling frequency | Parameters other than transient voltage: 200 kHz; transient voltage: 2 MHz | 200 kHz for all parameters |
| A/D converter resolution | Parameters other than transient voltage: 16 bits; transient voltage: 12 bits | 16 bits |
| Display range | Voltage: 0.48 V to 780 V / Current: 0.5% to 130% of range | Voltage: 2 V to 1300 V / Current: 0.4% to 130% of range |
| | Power: 0.0% to 130% of range / Parameters other than above: 0% to 130% of range | |
| Effective measurement ranges | Voltage: 10 V to 780 V AC, peak of ±2200 V / 1 V to 600 V DC / Current: 1% to 120% of range, peak of ±400% of range / Power: 0.15% to 130% of range / (When voltage and current both fall within the effective measurement range) | Voltage: 10 V to 1000 V AC, peak of ±2200 V / 5 V to 1000 V DC / Current: 5% to 120% of range, peak of ±400% of range / Power: 5% to 120% of range / (When voltage and current both fall within the effective measurement range) |

| Accuracy specifications | | |
|---|---|---|
| Accuracy guarantee conditions | Accuracy guarantee duration: 1 year / Accuracy guarantee temperature and humidity range: 23°C ±5°C, 80% RH or less / Warm-up time: 30 min. or greater | |
| Temperature coefficient | 0.03% f.s./°C (DC measurement, add ±0.05% f.s./°C) | 0.1% f.s./°C |
| Common-mode voltage effects | Within 0.2% f.s. (600 Vrms AC, 50 Hz/60 Hz, between voltage input and enclosure) | Within 0.2% f.s. (1000 Vrms AC, 50 Hz/60 Hz, between voltage input and enclosure) |
| External magnetic field effects | Voltage: Within ±3 V / Current: Within 1.5% f.s. (400 Arms/m AC, in 50 Hz/60 Hz magnetic field) | Within 1.5% f.s. (400 Arms/m AC, in 50 Hz/60 Hz magnetic field) |

| Measurement parameters | | | | |
|---|---|---|---|---|
| Measurement parameters | Transient voltage / Voltage 1/2 RMS value / Current 1/2 RMS value / Voltage waveform peak / Voltage DC / Voltage RMS value (phase/line) / Swell / Dip / Interruption / Instantaneous flicker value | Current waveform peak / Current DC / Current RMS value / Inrush current / Frequency 1 wave / Frequency 200 ms / Frequency 10 sec. / Active power / Active energy / Reactive power | Reactive energy / Apparent power / Power factor/displacement power factor / Voltage reverse-phase unbalance factor / Voltage zero-phase unbalance factor / Current reverse-phase unbalance factor / Current zero-phase unbalance factor / Harmonic voltage / Harmonic current / Harmonic power | Inter-harmonic voltage / Inter-harmonic current / Harmonic voltage phase angle / Harmonic current phase angle / Harmonic voltage-current phase difference / Voltage total harmonic distortion / Current total harmonic distortion / K factor / IEC flicker / ΔV10 flicker |
| | Efficiency / High-order harmonic components / Voltage waveform comparison | | Voltage CF / Rapid voltage change (RVC) / Current CF / Electricity cost / Apparent energy / Active power demand amount* | Reactive power demand amount* / Apparent power demand amount* / Active power demand value / Reactive power demand value / Apparent power demand value / Power factor demand value / *Data output to SD memory card only |

| Measurement specifications | | |
|---|---|---|
| Transient voltage (Tran) | Detected based on waveform after the fundamental wave component has been eliminated from the sampled waveform. | |
| | Measurement range: ±6.000 kVpeak / Measurement band: 5 kHz (-3 dB) to 700 kHz (-3 dB) / Measurement accuracy: ±5.0% rdg. ±1.0% f.s. | Measurement range: ±2.200 kVpeak / Measurement band: 5 kHz (-3 dB) to 40 kHz (-3 dB) / Measurement accuracy: ±5.0% rdg. ±1.0% f.s. |
| Voltage 1/2 RMS value (Urms1/2), current 1/2 RMS value (Irms1/2) | Voltage 1/2 RMS value: Calculated as the RMS value for 1 sampled waveform that has been overlapped every half-wave. / Current 1/2 RMS value: Calculated as the RMS value every half-wave. / Measurement accuracy / Voltage: ±0.2% of the nominal voltage (for input of 10 V to 660 V) / ±0.2% rdg. ±0.08% f.s. (for input other than above) / Current: ±0.3% rdg. ±0.5% f.s. + current sensor accuracy | Calculated as the RMS value for 1 sampled waveform that has been overlapped every half-wave. / Measurement accuracy / Voltage: ±0.3% of the nominal voltage (for input of 10 V to 660 V) / ±0.2% rdg. ±0.1% f.s. (for input other than above) / Current: ±0.2% rdg. ±0.1% f.s. + current sensor accuracy |
| Swell (Swell), dip (Dip), interruption (Intrpt) | Detected when the voltage 1/2 RMS value exceeds the threshold. / Measurement accuracy: Same as voltage 1/2 RMS value / Fluctuation data: Voltage and current 1/2 RMS value data is saved. | |
| Rapid voltage change (RVC) | None | Detected when the 1-sec. average of voltage 1/2 RMS values exceeds the threshold; however, if the average is less than the dip threshold or greater than the swell threshold, the event is detected as a dip (or swell), rather than as an RVC. / Measurement accuracy: Same as voltage 1/2 RMS value / ΔUss: Absolute difference between the 1-sec. average of voltage 1/2 RMS values immediately before the event and the first 1-sec. average of voltage 1/2 RMS values after the event [V] / ΔUmax: Absolute maximum difference between all voltage 1/2 RMS values during the event and the 1-sec. average of voltage 1/2 RMS values immediately before the event [V] / Fluctuation data: Voltage and current 1/2 RMS value data is saved. |
| Inrush current (Inrush) | Same as current 1/2 RMS value. Inrush current is detected when the setting is exceeded in the positive direction. / Measurement accuracy: Same as current 1/2 RMS value / Fluctuation data: Current 1/2 RMS Value data | Calculated as the current RMS value for data obtained by sampling the current waveform every half-wave. Inrush current is detected when the setting is exceeded in the positive direction. / Measurement accuracy: ±0.3% rdg. ±0.3% f.s. + current sensor accuracy / Fluctuation data: Voltage 1/2 RMS value data and inrush current RMS value data are saved. |
| Voltage RMS value (Urms), current RMS value (Irms) | Measured using a 200 ms aggregate. / Measurement accuracy / Voltage: ±0.1% of the nominal voltage (for input of 10 V to 660 V) / ±0.2% rdg. ±0.08% f.s. (input other than above) / Current: ±0.1% rdg. ±0.1% f.s. + current sensor accuracy | Measured using a 200 ms aggregate. / Measurement accuracy / Voltage: ±0.2% of the nominal voltage (for input of 10 V to 660 V) / ±0.1% rdg. ±0.1% f.s. (for input other than above) / Current: ±0.1% rdg. ±0.1% f.s. + current sensor accuracy |
| Voltage DC value (Udc), current DC value (Idc) | Average of 200 ms aggregate values (calculated using CH 4 only) / Measurement accuracy / Voltage: ±0.3% rdg. ±0.08% f.s. / Current: ±0.5% rdg. ±0.5% f.s. + current sensor accuracy | Average of 200 ms aggregate values / Measurement accuracy / Voltage: ±0.3% rdg. ±0.1% f.s. / Current: ±0.5% rdg. ±0.5% f.s. + current sensor accuracy |

| Measurement specifications | PQ3198 | | PQ3100 | |
| --- | --- | --- | --- | --- |
| Voltage waveform peak (Upk), current waveform peak (Ipk) | Maximum and minimum points in sampled data within 200 ms aggregate<br>Measurement range<br>Voltage: ±1200.0 Vpk<br>Current: 400% current range<br>Measurement accuracy<br>Voltage: 5% of the nominal voltage (for input of 10% to 150% of the nominal voltage)<br>　2% f.s. (for input other than above)<br>Current: 5% rdg. (for input of at least 50% f.s.)<br>　2% f.s. (for input other than above) | | Maximum and minimum points in sampled data within 200 ms aggregate<br>Measurement range<br>Voltage: ±2200.0 Vpk<br>Current: 400% current range<br>Measurement accuracy<br>Voltage: 5% of the nominal voltage (for input of 10% to 150% of the nominal voltage)<br>　2% f.s. (for input other than above)<br>Current: 5% rdg. (for input of at least 50% f.s.)<br>　2% f.s. (for input other than above) | |
| Voltage waveform comparison | Measurement method: A judgment area is automatically generated based on the previous 200 ms aggregate waveform and compared with the judgment waveform to trigger events. Waveform judgment is performed for one 200 ms aggregate at a time.<br>Comparison window width: 10 waves (for 50 Hz input) or 12 waves (for 60 Hz input)<br>Number of window points: 4096 points synchronized with harmonic calculations | | None | |
| Voltage CF value (Ucf), current CF value (Icf) | None | | Calculated from the voltage RMS value and voltage waveform peak value. | |
| Frequency 1 wave (Freq_wav) | Calculated as the reciprocal of the cumulative time of the whole cycles that occur during the duration of a single wave on voltage CH 1.<br>Measurement accuracy: ±0.200 Hz or less | | | |
| Frequency 200 ms (Freq) | Calculated as the reciprocal of the cumulative time of the whole cycles that occur during 200 ms on voltage CH 1.<br>Measurement accuracy: ±.0.020 Hz or less | | | |
| Frequency 10 sec. (Freq10s) | Calculated as the reciprocal of the cumulative time of the whole cycles that occur during the specified 10 sec. interval on voltage CH 1. | | | |
| | Measurement accuracy: ±0.003 Hz or less (45 Hz or more)<br>±0.010 Hz or less (less than 45 Hz) | | Measurement accuracy: ±0.010 Hz or less | |
| Active power (P), apparent power (S), reactive power (Q) | Active power | Measured every 200 ms. | Active power | Measured every 200 ms. |
| | Apparent power | Calculated from the voltage RMS value and the current RMS value. | Apparent power | RMS value calculation: Calculated from the voltage RMS value and the current RMS value.<br>Fundamental wave calculation: Calculated from the fundamental wave active power and the fundamental wave reactive power. |
| | Reactive power | Calculated from the apparent power S and the active power P. | Reactive power | RMS value calculation: Calculated from the apparent power S and the active power P.<br>Fundamental wave calculation: Calculated from the fundamental wave voltage and current. |
| | Measurement accuracy<br>　Active power | DC: ±0.5% rdg. ±0.5% f.s. + current sensor accuracy (CH 4 only)<br>AC: ±0.2% rdg. ±0.1% f.s. + current sensor accuracy<br>Power factor effects: 1.0% rdg. or less (for input from 40 Hz to 70 Hz with a power factor of 0.5) | Measurement accuracy<br>　Active power | DC: ±0.5% rdg. ±0.5% f.s. + current sensor accuracy<br>AC: ±0.2% rdg. ±0.1% f.s. + current sensor accuracy<br>Power factor effects: 1.0% rdg. or less (for input from 40 Hz to 70 Hz with a power factor of 0.5) |
| | Apparent power<br>Reactive power | ±1 dgt. relative to calculation from measured values<br>During RMS value calculation: ±1 dgt. relative to calculation from measured values | Apparent power<br>Reactive power | ±1 dgt. relative to calculation from measured values<br>During RMS value calculation: ±1 dgt. relative to calculation from measured values<br>During fundamental wave calculation: For fundamental frequencies of 45 Hz to 66 Hz ±0.3% rdg. ±0.1% f.s. + current sensor specifications (reactive factor = 1)<br>Reactive factor effects: 1.0% rdg. or less (for input from 40 Hz to 70 Hz with a power factor of 0.5) |
| Efficiency (Eff) | Measurement method<br>　Calculated as the ratio of the active power values for the channel pair.<br>　Measurement accuracy: ±0.1 dgt. relative to calculation from measured values | | None | |
| Active energy (WP+, WP-), reactive energy (WQ_LAG, WQ_LEAD), apparent energy (WS) | Energy is measured from the start of recording.<br>　Active energy: Calculated separately from the active power for consumption and regeneration.<br>　Reactive energy: Integrated separately from the reactive power for lag and lead.<br>　Apparent energy: Integrated from the apparent power. *PQ3100 only | | Measurement accuracy<br>　Active energy: Active power measurement accuracy ±10 dgt.<br>　Reactive energy: Reactive power measurement accuracy ±10 dgt.<br>　Apparent energy: Apparent power measurement accuracy ±10 dgt.<br>　　*PQ3100 only<br>　Cumulative time accuracy: ±10 ppm | |
| Energy cost (Ecost) | None | | Calculated by multiplying active energy (consumption) (WP+) by the electricity unit cost (/kWh).<br>Measurement accuracy: ±1 dgt. relative to calculation from measured values | |
| Power factor (PF), displacement power factor (DPF) | Displacement power factor (DPF): Calculated from the fundamental wave active power and reactive power.<br>Power factor: Calculated from the apparent power S and the active power P.<br>Displacement power factor measurement accuracy<br>　For input with a voltage of 100 V or greater and current of 10% of the range or greater<br>　When displacement power factor = 1: ±0.05% rdg.; when 0.8 ≤ displacement power factor < 1: ±1.50% rdg.; when 0 < displacement power factor < 0.8: ±(1 - cos($\varphi$ + 0.2865)/cos($\varphi$)) × 100% rdg. + 50 dgt. (reference value), where $\varphi$ represents the 1st-order display value for the harmonic voltage-current phase difference<br>　Add the current sensor phase accuracy to each. | | | |
| Demand amount | PQ3198 | PQ3100 | | |
| | Can be calculated using PQ ONE. | Energy is measured during each interval. (Values are recorded but not displayed.)<br>Measurement accuracy<br>　Active power demand amount (Dem_WP+, Dem_WP-): Active power measurement accuracy ±10 dgt.<br>　Reactive power demand amount (Dem_WQ_LAG, Dem_WQ_LEAD): Reactive power measurement accuracy ±10 dgt.<br>　Apparent power demand amount (Dem_WS): Apparent power measurement accuracy ±10 dgt.<br>　Cumulative time accuracy: ±10 ppm ±1 sec. (23°C) | | |
| Demand value | Can be calculated using PQ ONE. | Active power demand value (Dem_P+, Dem_P-), reactive power demand value (Dem_Q_LAG, Dem_Q_LEAD), apparent power demand value (Dem_S)<br>Average power values are measured during each interval.<br>Measurement accuracy: ±1 dgt. relative to calculation from measured values | | |
| Power factor demand value measurement specifications (Dem_PF) | N/A | Calculated from the active power demand value (consumption) (Dem_P+) and the reactive power demand value (lag) (Dem_Q_LAG).<br>Measurement accuracy: ±1 dgt. relative to calculation from measured values | | |
| Unbalance factor | Voltage unbalance factor, reverse-phase unbalance factor (Uunb), zero-phase unbalance factor (Uunb0)<br>For 3-phase/3-wire (3P3W2M, 3P3W3M) and 3-phase/4-wire circuits, calculated using the fundamental voltage component for each of the 3 phases. | | | |
| | Measurement accuracy: ±0.15% | | Defined accuracy: None | |
| | Current unbalance factor, reverse-phase current unbalance factor (Iunb), zero-phase unbalance factor (Iunb0)<br>For 3-phase/3-wire (3P3W2M, 3P3W3M) and 3-phase/4-wire circuits, calculated using the fundamental current component for each of the 3 phases. | | | |

| Measurement specifications | PQ3198 | PQ3100 |
|---|---|---|
| Harmonic voltage (Uharm), harmonic current (Iharm) | Measurement accuracy<br>  Voltage<br>    0th order: ±0.3% rdg. ±0.08% f.s.<br>    1st order: ±5% rdg.<br>    2nd to 50th order: ±5% rdg. (for input of at least 1% of the nominal input voltage)<br>Measurement accuracy<br>  Current<br>    0th order: ±0.5% rdg. ±0.5% f.s. + current sensor accuracy<br>  1st to 20th order: ±0.5% rdg. ±0.2% f.s. + current sensor accuracy<br>  21st to 50th order: ±1.0% rdg. ±0.3% f.s. + current sensor accuracy | Measurement accuracy<br>  Voltage<br>    0th order: Same as voltage DC value<br>    1st order: Same as voltage RMS value<br>    2nd to 50th order: ±10% rdg. (for input of at least 1% of the nominal input voltage)<br>Measurement accuracy<br>  Current<br>    0th order: Same as current DC value<br>  1st to 20th order: ±0.5% rdg. ±0.2% f.s. + current sensor accuracy<br>  21st to 30th order: ±1.0% rdg. ±0.3% f.s. + current sensor accuracy<br>  31st to 40th order: ±2.0% rdg. ±0.3% f.s. + current sensor accuracy<br>  41st to 50th order: ±3.0% rdg. ±0.3% f.s. + current sensor accuracy |
| Harmonic power (Pharm) | Displays the harmonic power for each channel as well as the sum of values for multiple channels.<br>Measurement accuracy<br>    0th order: ±0.5% rdg. ±0.5% f.s. + current sensor accuracy    31st to 40th order: ±2.0% rdg. ±0.3% f.s. + current sensor accuracy<br>  1st to 20th order: ±0.5% rdg. ±0.2% f.s. + current sensor accuracy    41st to 50th order: ±3.0% rdg. ±0.3% f.s. + current sensor accuracy<br>  21st to 30th order: ±1.0% rdg. ±0.3% f.s. + current sensor accuracy | |
| Harmonic phase angle | Harmonic voltage phase angle (Uphase), harmonic current phase angle (Iphase) | |
| Harmonic voltage-current phase difference (Pphase) | Measurement accuracy    1st order: ±1°    4th to 50th order: ±(0.05° × k + 2°) (k: Harmonic order)<br>                   2nd to 3rd order: ±2°    Add current sensor accuracy to each. | |
| Inter-harmonic voltage (Uiharm), inter-harmonic current (Iiharm) | Adds and displays the inter-harmonic component between whole number-order harmonic components following harmonic analysis, from the 0.5th to the 49.5th order. | |
| | Measurement accuracy<br>Inter-harmonic voltage (defined for harmonic input with a nominal input voltage of at least 100 V)<br>  Harmonic input of 1% of the nominal input voltage or greater: ±5.0% rdg.<br>  Harmonic input of less than 1% of the nominal input voltage: ±0.05%<br>  of the nominal input voltage<br>  Inter-harmonic current: Accuracy not defined | Measurement accuracy<br>Inter-harmonic voltage (defined for harmonic input with a nominal input voltage of 100 V to 440 V)<br>  Harmonic input of 1% of the nominal input voltage or greater: ±10.0% rdg.<br>  Harmonic input of less than 1% of the nominal input voltage: ±0.05%<br>  of the nominal input voltage<br>  Inter-harmonic current: Accuracy not defined |
| Voltage total harmonic distortion (Uthd), current total harmonic distortion (Ithd) | THD-F: Total harmonic distortion relative to wave<br>THD-F: Total harmonic distortion relative to fundamental wave<br>THD-R: Total harmonic distortion relative to total harmonics, including fundamental wave<br>THD-R: Total harmonic distortion relative to total harmonics, including fundamental wave<br>Measurement accuracy: 0.5%<br>  Defined for input as follows for a nominal input voltage of 100 V to 440 V:<br>  Voltage    1st order: 100% of nominal input voltage / 5th and 7th orders: 1% of nominal input voltage<br>  Current    1st order: 100% of current range / 5th and 7th orders: 1% of current range | |
| High-order harmonic voltage component (UharmH), high-order harmonic current component (IharmH) | PQ3198<br>Measurement method<br>Calculated using the true RMS method and the waveform obtained by eliminating the fundamental wave component from 10 waves (for a 50 Hz fundamental wave) or 12 waves (for a 60 Hz fundamental wave).<br>Sampling frequency: 200 kHz<br>Display parameters<br>  High-order harmonic voltage component value: Voltage RMS value for the waveform obtained by eliminating the fundamental wave component<br>  High-order harmonic current component value: Current RMS value for the waveform obtained by eliminating the fundamental wave component<br>  High-order harmonic voltage maximum value: Maximum RMS value for the voltage waveform obtained by eliminating the fundamental wave component for the interval extending from event IN to event OUT (leaving channel information)<br>  High-order harmonic current maximum value: Maximum RMS value for the current waveform obtained by eliminating the fundamental wave component for the interval extending from event IN to event OUT (leaving channel information)<br>  High-order harmonic voltage component interval: Interval extending from high-order harmonic voltage component event IN to event OUT<br>  High-order harmonic current component interval: Interval extending from high-order harmonic current component event IN to event OUT<br>Measurement band: 2 kHz to 80 kHz (-3 dB)<br>Measurement accuracy<br>  High-order harmonic voltage component: ±10% rdg. ±0.1% f.s. (defined for a 10 V sine wave at 5 kHz, 10 kHz, and 20 kHz)<br>  High-order harmonic current component: ±10% rdg. ±0.2% f.s. (defined for a 1% f.s. sine wave at 5 kHz, 10 kHz, and 20 kHz)<br>Saved waveforms<br>  Event waveform, high-order harmonic waveform (8000 points of data over 40 ms starting after the first 200 ms aggregate to exceed the threshold) | PQ3100<br>N/A |
| K factor (zoom factor) (KF) | Calculated using the harmonic current RMS values for the 2nd to 50th orders. | |
| Instantaneous flicker value measurement (Pinst) | Measurement method<br>  As per IEC 61000-4-15 | |
| IEC flicker (Pst·Plt) | Pst is calculated after measuring continuously for 10 min., while Plt is calculated after measuring continuously for 2 hours, as per IEC 61000-4-15.<br>Measurement accuracy:  Pst: ±5% rdg. (defined as Class F1 [PQ3198] or Class F3 [PQ3100] performance testing under IEC 61000-4-15) | |
| ΔV10 flicker (dV10) | Values calculated using the flicker visibility function curve are converted to 100 V and measured in a gap-less manner every minute.<br>ΔV10 1-minute values, 1-hour average value, 1-hour maximum value, 1-hour 4th largest value, overall maximum value (during measurement interval)<br>Measurement accuracy: ±2% rdg. ±0.01 V (with a fundamental wave of 100 Vrms [50/60 Hz], a fluctuation voltage of 1 Vrms [99.5 Vrms to 100.5 Vrms], and a fluctuation frequency of 10 Hz)<br>Alarm: Set from 0.00 to 9.99 V to generate contact output if the threshold value is exceeded during any given minute. | |

| RMS value frequency characteristics | Frequency | Voltage | Current | Power | Frequency | Voltage | Current | Power |
|---|---|---|---|---|---|---|---|---|
| | 40 Hz to 70 Hz | Defined by RMS value | Defined by RMS value | Defined by RMS value | 40 Hz to 70 Hz | Defined by RMS value | Defined by RMS value | Defined by active power |
| | 70 Hz to 360 Hz | ±1% rdg. ±0.2% f.s. | ±1% rdg. ±0.5% f.s. | ±1% rdg. ±0.5% f.s. | 70 Hz to 1 kHz | ±3% rdg. ±0.2% f.s. | ±3% rdg. ±0.2% f.s. | ±3% rdg. ±0.2% f.s. |
| | 360 Hz to 440 Hz | Defined by RMS value | Defined by RMS value | Defined by RMS value | 1 kHz to 10 kHz | ±10% rdg. ±0.2% f.s. | ±10% rdg. ±0.2% f.s. | ±10% rdg. ±0.2% f.s. |
| | 440 Hz to 5 kHz | ±5% rdg. ±0.2% f.s. | ±5% rdg. ±0.5% f.s. | ±5% rdg. ±1% f.s. | 40 kHz | -3 dB | -3 dB | |
| | 5 kHz to 20 kHz | ±5% rdg. ±0.2% f.s. | ±5% rdg. ±0.5% f.s. | ±5% rdg. ±1% f.s. | | | | |
| | 20 kHz to 50 kHz | ±20% rdg. ±0.4% f.s. | ±20% rdg. ±0.5% f.s. | | | | | |
| | 80 kHz | -3 dB | -3 dB | | | | | |

## Measurement settings

| | PQ3198 | PQ3100 |
|---|---|---|
| Current sensor and current range | See current sensor specifications. | |
| Power range | Determined automatically based on the current range being used. | |
| VT ratio, CT ratio | 0.01 to 9999.99 | |
| Nominal input voltage | 50 V to 780 V in 1 V increments | 50 V to 800 V in 1 V increments |
| Frequency | 50 Hz / 60 Hz / 400 Hz | 50 Hz / 60 Hz |
| Selection of calculation method | Urms: Phase voltage / Line voltage<br>Power factor: PF / DPF<br>THD: THD-F / THD-R<br>Harmonics: All levels / All content percentages / Content percentages for U and P, levels for I | Urms: Phase voltage / Line voltage<br>PF/Q/S: RMS value calculation / Fundamental wave calculation<br>THD: THD-F / THD-R<br>Harmonics: All levels / All content percentages / Content percentages for U and P, levels for I |
| Energy cost | N/A | Unit cost: 0.00000 to 99999.9 (per kwh) / Currency unit: 3 alphanumeric characters |
| Flicker | Pst, Plt / ΔV10 | Pst, Plt / ΔV10 / Off |
| Filter | Select Pst or Plt for flicker.<br>230 V lamp / 120 V lamp | |

| Recording settings | PQ3198 | PQ3100 |
|---|---|---|
| Recording interval | 1/3/15/30 sec., 1/5/10/15/30 min., 1/2 hr., 150 (50 Hz)/180 (60 Hz)/1200 (400 Hz) cycle | 200/600 ms, 1/2/5/10/15/30 sec., 1/2/5/10/15/30 min., 1/2 hr., 150/180 cycle <br>*When set to 200/600 ms, harmonic data saving (except total harmonic distortion and K factor), event recording, and copy key operation during recording are not available. |
| Saving of screenshots | Off/On <br>The display screen is saved as a BMP file for each recording interval. Min. interval: 5 min. | |
| Folder/file names | Not user-configurable | Set to either automatic or user-specified (5 single-byte characters). |

| Event specifications | | |
|---|---|---|
| Event detection method | The detection method for measured values for each event is noted in the measurement specifications. <br>External events: Events are detected by detecting a signal input to the EVENT IN terminal. <br>Manual events: Events are detected based on operation of the MANUAL EVENT key. | |
| Synchronized saving of events | Event waveforms: A 200 ms instantaneous waveform is recorded when an event occurs. <br>Transient waveform: Instantaneous waveforms are recorded for 2 ms before the transient voltage waveform detection point and for 2 ms after the detection point. <br>Fluctuation data: RMS value fluctuation data is recorded every half-wave for the equivalent of 0.5 sec. before the event occurs and 29.5 sec. after the event occurs. <br>High-order harmonic waveform: A 40 ms instantaneous waveform is recorded when a high-order harmonic event occurs. | Event waveforms: A 200 ms instantaneous waveform is recorded when an event occurs. <br>Transient waveform: Instantaneous waveforms are recorded for 1 ms before the transient voltage waveform detection point and 2 ms after the detection point. <br>Fluctuation data: RMS value fluctuation data is recorded every half-wave for the equivalent of 0.5 sec. before the event occurs and 29.5 sec. after the event occurs. |

| Event settings | | |
|---|---|---|
| Event hysteresis | 0% to 100% | |
| Timer event count | Off, 1/5/10/30 min., 1/2 hr. <br>Events are generated at the selected interval. | Off, 1/2/5/10/15/30 min., 1/2 hr. <br>Events are generated at the selected interval. |
| Waveforms before events | 2 waves | Off (0 sec.) / 200 ms / 1 sec. <br>The time for which to record instantaneous waveforms before events occur can be set. |
| Waveforms after events | Successive events: Off/1/2/3/4/5 <br>The set number of events is repeated each time an event occurs. | Off (0 sec.)/200 ms/400 ms/1 sec./5 sec./10 sec. <br>The time for which to record instantaneous waveforms after events occur can be set. |

| Other functionality | | |
|---|---|---|
| Copying of screenshots | Copy using the COPY key; results are saved to the SD card.    Data format: Compressed BMP | |
| Removal of SD card while recording data | Not supported | A messages is displayed if the user pressed the F key on the FILE screen while recording with a recording interval of 2 sec. or greater; the SD card can be removed once message is reviewed. |
| Automatic detection of current sensors | When selected on the settings screen, connected sensors that support the HIOKI PL 14 connector are automatically detected. | |
| Processing in the event of a power outage | If the instrument is equipped with a BATTERY PACK Z1003 with a remaining charge, the instrument will switch automatically to battery power and continue recording. If no charged BATTERY PACK Z1003 is installed, measurement will stop (settings will be preserved), and the instrument will start recording again when power is restored. However, integrated values and other data will be reset. | |

| Interfaces | | |
|---|---|---|
| SD memory card | Compatible cards: Z4001, Z4003 | |
| LAN | Remote operation via an Internet browser <br>Manual downloading of data via the FTP server function | Remote operation via an Internet browser <br>Manual downloading of data via the FTP server function <br>Automatic transmission of data via the FTP client function <br>Email notifications |
| USB | USB 2.0 (Full Speed, High Speed), Mass Storage Class | |
| RS-232C | Synchronization of clock with GPS (when using GPS BOX PW9005) | Acquisition of measurement and settings data via communications commands <br>LR8410 Link support |
| External control | 4 screwless terminals <br>External event input, external start/stop, external event output (non-isolated), ΔV10 alarm | 4 screwless terminals <br>External event input, external event output (isolated), ΔV10 alarm |

| General specifications | | |
|---|---|---|
| Operating location | Indoor use, Pollution Level 2, elevations of up to 3000 m (Measurement category is reduced to CAT III [600 V] at elevations in excess of 2000 m [6561.68 ft].) | Indoor use, Pollution Level 2, elevations of up to 3000 m (Measurement category is reduced to CAT II [1000 V] or CAT III [600 V] at elevations in excess of 2000 m [6561.68 ft].) |
| Operating temperature and humidity range | 0°C to 30°C, 95% RH or less (non-condensing) <br>30°C to 50°C, 80% RH or less (non-condensing) | -20°C to 50°C, 80% RH or less (non-condensing) |
| Storage temperature and humidity range | 10°C greater than operating temperature and humidity range | |
| Dustproofness and waterproofness | IP30 (EN 60529) | |
| Standard compliance | Safety: EN 61010    EMC: EN 61326 Class A | |
| Standard compliance | Harmonics: IEC 61000-4-7, IEC 61000-2-4 Class 3 <br>Power quality: IEC 61000-4-30, EN 50160, IEEE 1159 <br>Flicker: IEC 61000-4-15 | |
| Power supply | AC ADAPTER Z1002    100 V to 240 V AC, 50 Hz/60 Hz; anticipated transient overvoltage: 2500 V; maximum rated power: 80 VA (including AC adapter) <br>BATTERY PACK Z1003    Charging time: Max. 5 hr. 30 min. | |
| | Continuous battery operating time: About 3 hr. | Continuous battery operating time: About 8 hr. |
| Internal memory | N/A | 4 MB |
| Maximum recording time | 1 year | |
| Maximum number of recordable events | 9999 | |
| Time functions | Auto-calendar, automatic leap year detection, 24-hour clock | |
| Real time accuracy | Within ±0.3 sec./day (with instrument powered on at 23°C ±5°C) | Within ±0.5 sec./day (with instrument powered on and within operating temperature range) |
| Display | 6.5-inch TFT color LCD | |
| Display languages | English / Japanese / Chinese (simplified and traditional) / Korean / German / French / Italian / Spanish / Turkish / Polish | |
| External dimensions | 300 mm (11.81 in.) (W) × 211 mm (8.31 in.) (H) × 68 mm (2.68 in.) (D) (not including protruding parts) | |
| Weight | 2.6 kg (91.7 oz) (including BATTERY PACK Z1003) | 2.5 kg (88.2 oz) (including BATTERY PACK Z1003) |

# Options    [*1] PQ3198 only. [*2] PQ3100 only.

| Model | AC CURRENT SENSOR CT7126 | AC CURRENT SENSOR CT7131 | AC CURRENT SENSOR CT7136 |
|---|---|---|---|
| Appearance | | | |
| Rated measured current | 60 A AC | 100 A AC | 600 A AC |
| Measurable wire diameter | 15 mm (0.59 in.) or less | | 46 mm (1.81 in.) or less |
| Current range and combined amplitude accuracy (45 to 66 Hz) *Accuracy guaranteed up to 120% of range. | Current range   Combined accuracy<br>50.000 A    0.4% rdg. + 0.112% f.s.<br>5.0000 A    0.4% rdg. + 0.22% f.s.<br>500.00 mA 0.4% rdg. + 1.3% f.s. [*2] | Current range   Combined accuracy<br>100.00 A    0.4% rdg. + 0.12% f.s.<br>50.000 A    0.4% rdg. + 0.14% f.s.<br>5.0000 A    0.4% rdg. + 0.50% f.s. [*2] | Current range   Combined accuracy<br>500.00 A    0.4% rdg. + 0.112% f.s.<br>50.000 A    0.4% rdg. + 0.22% f.s.<br>5.0000 A    0.4% rdg. + 1.3% f.s. [*2] |
| Phase accuracy (45 to 66 Hz) | Within ±2° | Within ±1° | Within ±0.5° |
| Maximum allowable input (45 to 66 Hz) | 60 A continuous | 130 A continuous | 600 A continuous |
| Maximum rated terminal-to-ground voltage | CAT III (300 V) | | CAT III (1000 V), CAT IV (600 V) |
| Frequency band | Accuracy defined up to 20 kHz | | |
| Dimensions / weight / cord length | 46 mm (1.81 in.) (W) × 135 mm (5.31 in.) (H) × 21 mm (0.83 in.) (D) / 190 g / 2.5 m (8.20 ft.) | | 78 mm (3.07 in.) (W) × 152 mm (5.98 in.) (H) × 42 mm (1.65 in.) (D) / 350 g / 2.5 m (8.20 ft.) |

| Model | AC FLEXIBLE CURRENT SENSOR CT7044 | AC FLEXIBLE CURRENT SENSOR CT7045 | AC FLEXIBLE CURRENT SENSOR CT7046 |
|---|---|---|---|
| Appearance | | | |
| Rated measured current | 6000 A AC | | |
| Measurable wire diameter | 100 mm (3.94 in.) or less | 180 mm (7.09 in.) or less | 254 mm (10.00 in.) or less |
| Current range and combined amplitude accuracy (45 to 66 Hz) *Accuracy guaranteed up to 120% of range. | Current range<br>5000.0 A/500.00 A<br>50.000 A | Combined amplitude accuracy<br>1.6% rdg. + 0.4% f.s.<br>1.6% rdg. + 3.1% f.s. | |
| Phase accuracy (45 to 66 Hz) | Within ±1.0° | | |
| Maximum allowable input (45 to 66 Hz) | 10,000 A continuous | | |
| Maximum rated terminal-to-ground voltage | 1000 V AC (CAT III), 600 V AC (CAT IV) | | |
| Frequency band | 10 Hz to 50 kHz (within ±3 dB) | | |
| Dimensions / cord length | Flexible loop cross-sectional diameter: 7.4 mm (0.29 in.) / 2.5 m (8.20 ft.) | | |
| Weight | 160 g | 180 g | 190 g |

| Model | | AC/DC AUTO-ZERO CURRENT SENSOR CT7731 | AC/DC AUTO-ZERO CURRENT SENSOR CT7736 | AC/DC AUTO-ZERO CURRENT SENSOR CT7742 |
|---|---|---|---|---|
| Appearance | | | | |
| Rated measured current | | 100 A AC/DC | 600 A AC/DC | 2000 A AC/DC |
| Measurable wire diameter | | 33 mm (1.30 in.) or less | | 55 mm (2.17 in.) or less |
| Current range and combined amplitude accuracy *Accuracy guaranteed up to 120% of range. | DC | Current range   Combined accuracy<br>100.00 A    1.5% rdg. + 1.0% f.s.<br>50.000 A    1.5% rdg. + 1.5% f.s. [*1]<br>10.000 A    1.5% rdg. + 5.5% f.s. [*2] | Current range   Combined accuracy<br>500.00 A    2.5% rdg. + 1.1% f.s.<br>50.000 A    2.5% rdg. + 6.5% f.s. | Current range   Combined accuracy<br>5000.0 A 2.0% rdg. + 0.7% f.s. [*1]<br>2000.0 A 2.0% rdg. + 1.75% f.s. [*2]<br>1000.0 A 2.0% rdg. + 1.5% f.s. [*2]<br>500.00 A 2.0% rdg. + 2.5% f.s. |
| | 45 to 66 Hz | 100.00 A    1.1% rdg. + 0.6% f.s.<br>50.000 A    1.1% rdg. + 1.1% f.s. [*1]<br>10.000 A    1.1% rdg. + 5.1% f.s. [*2] | 500.00 A    2.1% rdg. + 0.7% f.s.<br>50.000 A    2.1% rdg. + 6.1% f.s. | 5000.0 A [*1]<br>I > 1800 A: 2.1% rdg. + 0.3% f.s.<br>I ≤ 1800 A: 1.6% rdg. + 0.3% f.s.<br>2000.0 A 1.6% rdg. + 0.75% f.s. [*2]<br>1000.0 A 1.6% rdg. + 1.1% f.s. [*2]<br>500.00 A 1.6% rdg. + 2.1% f.s. |
| Phase accuracy (45 to 66 Hz) | | Within ±1.8° | | Within ±2.3° |
| Offset drift | | Within ±0.5% f.s. | Within ±0.1% f.s. | Within ±0.1% f.s. |
| Maximum allowable input (45 to 66 Hz) | | 100 A continuous | 600 A continuous | 2000 A continuous |
| Maximum rated terminal-to-ground voltage | | 600 V AC/DC (CAT IV) | 1000 V AC/DC (CAT III), 600 V AC/DC (CAT IV) | |
| Frequency band | | DC to 5 kHz (-3 dB) | | |
| Dimensions / weight / cord length | | 58 mm (2.28 in.) (W) × 132 mm (5.20 in.) (H) × 18 mm (0.51 in.) (D) / 250 g / 2.5 m (8.20 ft.) | 64 mm (2.52 in.) (W) × 160 mm (6.30 in.) (H) × 34 mm (1.34 in.) (D) / 320 g / 2.5 m (8.20 ft.) | 64 mm (2.52 in.) (W) × 195 mm (7.68 in.) (H) × 34 mm (1.34 in.) (D) / 510 g / 2.5 m (8.20 ft.) |

| Model | AC LEAK CURRENT SENSOR CT7116 | | |
|---|---|---|---|
| Appearance | Designed specifically for leak current measurement | | For use with insulated conductors |
| Rated measured current | 6 A AC | | |
| Measurable conductor diameter | 40 mm or less (insulated conductor) | | |
| 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. [*2] | |
| Phase accuracy (45 to 66 Hz) | Within ±3° | | |
| Frequency band | 40 Hz to 5 kHz (±3.0% rdg. ±0.1% f.s.) | | |
| Residual current characteristics | 5 mA or less (for a pair of round-trip wires carrying 100 A) | | |
| External magnetic field effects | 5 mA equivalent, max. 7.5 mA (400 A/m, 50/60 Hz) | | |
| Dimensions / weight / cord length | 74 mm (2.91 in.) (W) × 145 mm (5.71 in.) (H) × 42 mm (1.65 in.) (D) / 340 g / 2.5 m (8.20 ft.) | | |

## Option for connecting legacy current sensor models

**CONVERSION CABLE L9910**
Output connector conversion:
BNC → PL 14
Use by connecting to one of the following legacy sensor models:

CLAMP ON SENSOR 9694/9660/9661/9669
AC FLEXIBLE CURRENT SENSOR CT9667-01/CT9667-02/CT9667-03
*Conversion cable does not supply power to the sensor.
CLAMP ON LEAK SENSOR 9657-10/9675

## Current sensor options

EXTENSION CABLE L0220-01
2 m (6.56 ft.)
EXTENSION CABLE L0220-02
5 m (16.50 ft.)
EXTENSION CABLE L0220-03
10 m (32.81 ft.)

## Voltage measurement options

HIOKI provides quotations for voltage cord extensions, terminal connector conversions, and other options on a case-by-case basis. Please contact your HIOKI distributor for details.

**MAGNETIC ADAPTER 9804-01**
Alternative tip for the L1000 series voltage cords, red ×1, φ11 mm (0.43 in)
**MAGNETIC ADAPTER 9804-02**
Alternative tip for the L1000 series voltage cords, black ×1, φ11 mm (0.43 in)

**GRABBER CLIP L9243**
Alternative tips for the L1000 series voltage cords

**OUTLET TEST LEAD L1020**
For Japan (3-prong, P/N/E), 2 m (6.56 ft) length,
*Please contact HIOKI for cords for use in countries other than Japan.

## Interfaces

**SD MEMORY CARD 2GB Z4001**
2 GB capacity

**SD MEMORY CARD Z4003**
8 GB capacity

**RS-232C CABLE 9637**
9 pin - 9 pin, cross, 1.8 m (5.91 ft) length

**LAN CABLE 9642**
Straight Ethernet cable, supplied with straight to cross conversion adapter, 5 m (16.41 ft) length

### About SD memory cards

Be sure to use genuine HIOKI SD memory cards with HIOKI instruments. Use of other SD memory cards may prevent data from being properly saved or loaded as proper operation is not guaranteed.

## Magnetic straps

**MAGNETIC STRAP Z5004**

**MAGNETIC STRAP Z5020**
Extra strength

## PQ3198 options

**WIRING ADAPTER PW9000**
When three-phase 3-wire connection, the voltage cord to be connected can be reduced from 6 to 3

**WIRING ADAPTER PW9001**
When three-phase 4-wire connection, the voltage cord to be connected can be reduced from 6 to 4

**PATCH CORD L1021-01**
Banana branch-banana, Red: 1, 0.5 m (1.64 ft) length, for branching from the L9438s or L1000s, CAT IV 600 V, CAT III 1000 V

**PATCH CORD L1021-02**
Banana branch-banana, Black: 1, 0.5 m (1.64 ft) length, for branching from the L9438s or L1000s, CAT IV 600 V, CAT III 1000 V

**GPS BOX PW9005**
To synchronize the PQ3198 / PW3198 clock to UTC

## Carrying cases and waterproof boxes

**CARRYING CASE C1009**
Bag type, Includes compartment for options

**CARRYING CASE C1001**
Soft type, Includes compartment for options

**CARRYING CASE C1002**
Hard trunk type, Includes compartment for options

**Waterproof box**
For outdoor installation, IP65

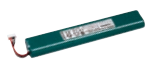## Standard accessories (also available for separate purchase)

### Comes with the PQ3198
**VOLTAGE CORD L1000**
Red/ Yellow/ Blue/ Gray each 1, Black 4, 3m (9.84ft) length, Alligator clip ×8

**AC ADAPTER Z1002**
For main unit, 100 to 240 V AC

### Comes with the PQ3100
**VOLTAGE CORD L1000-05**
Red/ Yellow/ Blue/ Gray/ Black each 1, 3 m (9.84 ft) length, Alligator clip ×5

**BATTERY PACK Z1003**
NiMH, Charges while installed in the main unit

# Models

**POWER QUALITY ANALYZER PQ3198**

| Model (order code) | PQ3198 | PQ3198-92 | PQ3198-94 |
|---|---|---|---|
| Bundle contents | | POWER QUALITY ANALYZER PQ3198 <br> VOLTAGE CORD L1000 / AC ADAPTER Z1002 / BATTERY PACK Z1003 / USB cable / Color clips / Spiral tubes / Strap / User manual / Measurement guide / PQ ONE (software CD) / SD MEMORY CARD Z4001 | |
| | — | AC CURRENT SENSOR CT7136 (×4) | AC FLEXIBLE CURRENT SENSOR CT7045 (×4) |
| | — | CARRYING CASE C1009 <br> PATCH CORD L1021-02 (×3) | |

Product name **POWER QUALITY ANALYZER PQ3100**

| Model (order code) | PQ3100 | PQ3100-91 | PQ3100-92 | PQ3100-94 |
|---|---|---|---|---|
| Bundle contents | | POWER QUALITY ANALYZER PQ3100 <br> VOLTAGE CORD L1000-05 / AC ADAPTER Z1002 / BATTERY PACK Z1003 / USB cable / Color clips / Spiral tubes / Strap / User manual / Measurement guide / PQ ONE (software CD) | | |
| | — | AC CURRENT SENSOR CT7136 (×2) | AC CURRENT SENSOR CT7136 (×4) | AC FLEXIBLE CURRENT SENSOR CT7045 (×4) |
| | — | CARRYING CASE C1009 <br> SD MEMORY CARD Z4001 | | |

## Related products

### No-metal-contact voltage sensor

Check power quality with a no-metal-contact logger

**CLAMP ON POWER LOGGER PW3365-20**

For details

- Record maximum, minimum, average, and energy values by time interval for parameters including voltage, current, power, frequency, and harmonics.

### New, more easily clampable design

Clamp meters designed for exceptional ease of use

**CLAMP METER CM4375-50, CM4141-50**

For details

- Ascertain transient current when power equipment starts up.
- Simultaneously measure RMS values and maximum crest values for inrush current.

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