HIOKI

POWER QUALITY ANALYZER
PQ3198, PQ3100

HIOKI PQ3100 POWER QUALITY ANALYZER
MONITOR
TREND
EVENT
WIRING
SET UP
FILE
MANUAL EVENT
QUICK SET
ENTER
ESC
COPY
F1
F2
F3
F4
F5

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

HIOKI PQ3198 POWER QUALITY ANALYZER
SYSTEM
TIMEPLOT
VIEW
EVENT
DF 1
DF 2
DF 3
DF 4
ENTER
ESC
DATA RESET
START STOP
MANU EVENT
COPY
POWER
F1
F2
F3
F4

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

HIOKI PQ3198 POWER QUALITY ANALYZER
SYSTEM
TIMEPLOT
VIEW
EVENT
ENTER
POWER

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

PQ3100

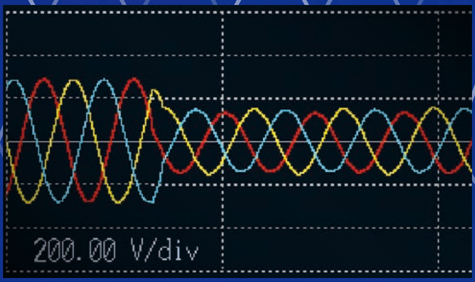
Mid-range model

HIOKI PQ3100 POWER QUALITY ANALYZER
ENTER

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

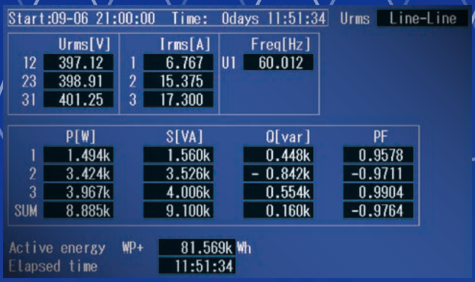
IEC 61000-4-30 Ed. 3 compliant

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.



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.

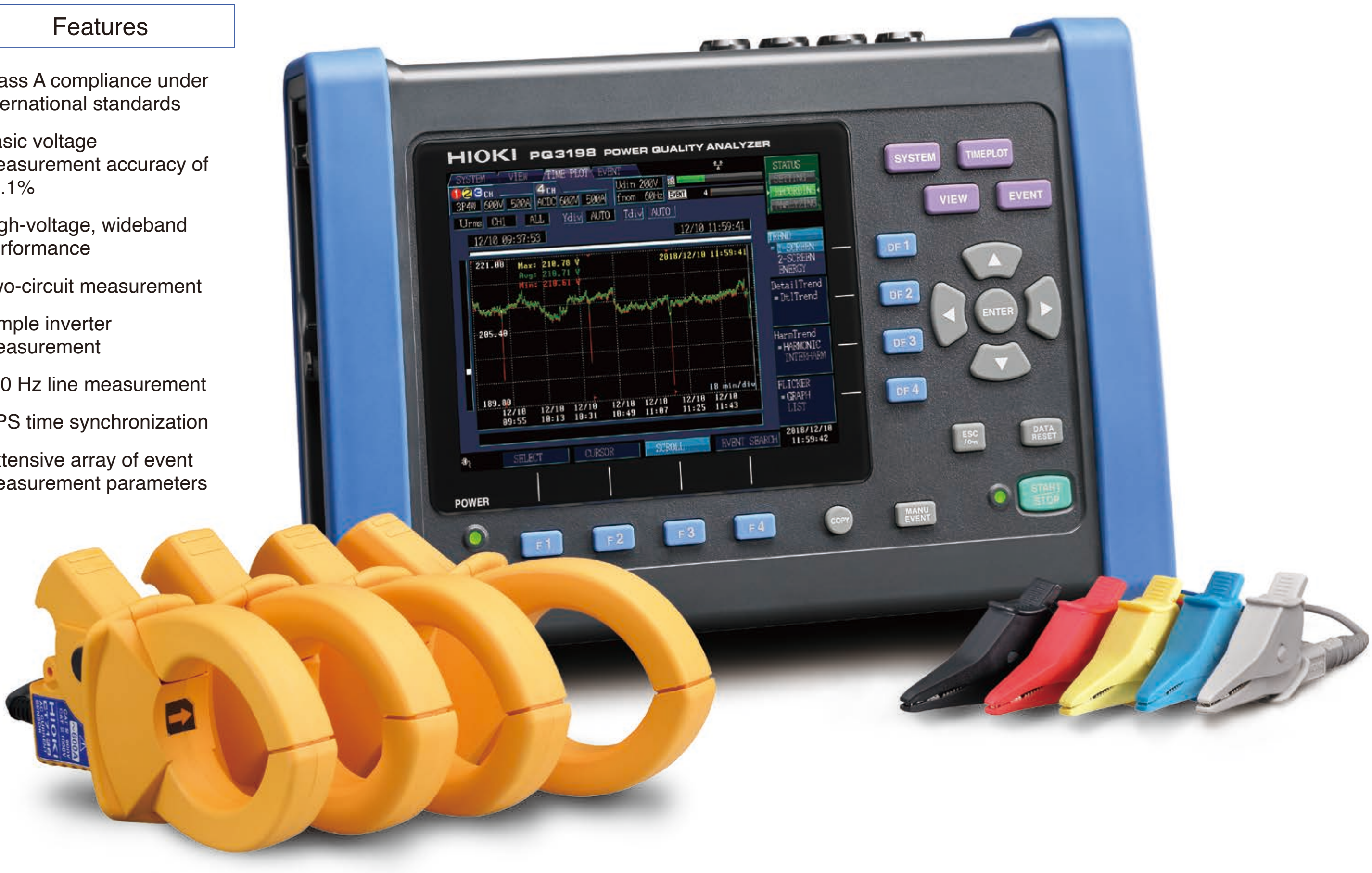
High-end model

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

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

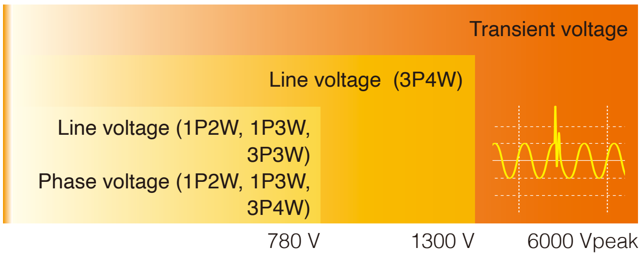
Thanks to basic measurement accuracy that is among the best of any instrument in the industry, the PQ3198 offers high-precision measurement without the need to switch voltage ranges.

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

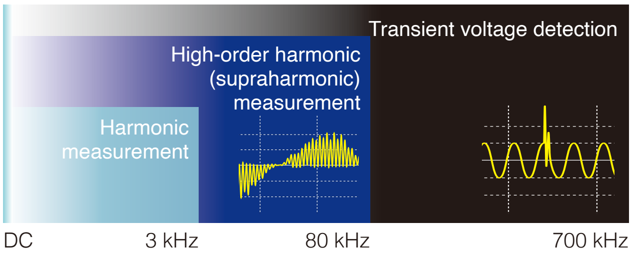
The PQ3198 can measure transient voltages of up to 6000 V lasting as little as 0.5 μs (2 MS/s). It can also measure high-order harmonic (supraharmonic) components from 2 kHz to 80 kHz. As inverters enter into widespread use, malfunctions and failures in that frequency band are becoming more common.

Voltage measurement range



The PQ3198 can measure voltages of all magnitudes using a single range.

Voltage frequency band



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

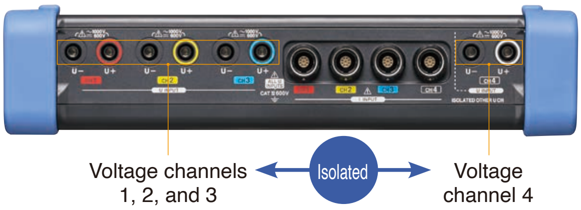
Two-circuit measurement

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

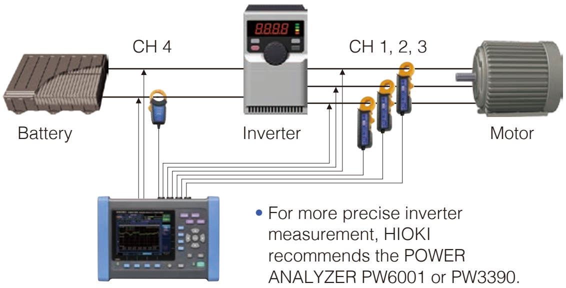


400 Hz line measurement

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

Simple inverter measurement

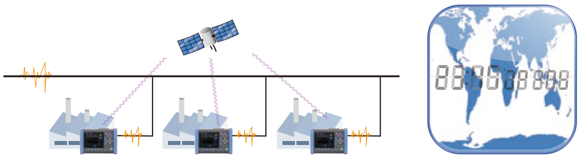
The PQ3198 can measure the secondary side of inverters with a fundamental frequency of 40 to 70 Hz and a carrier frequency of up to 20 kHz. It can also measure the efficiency of DC/3-phase inverters.



- 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.



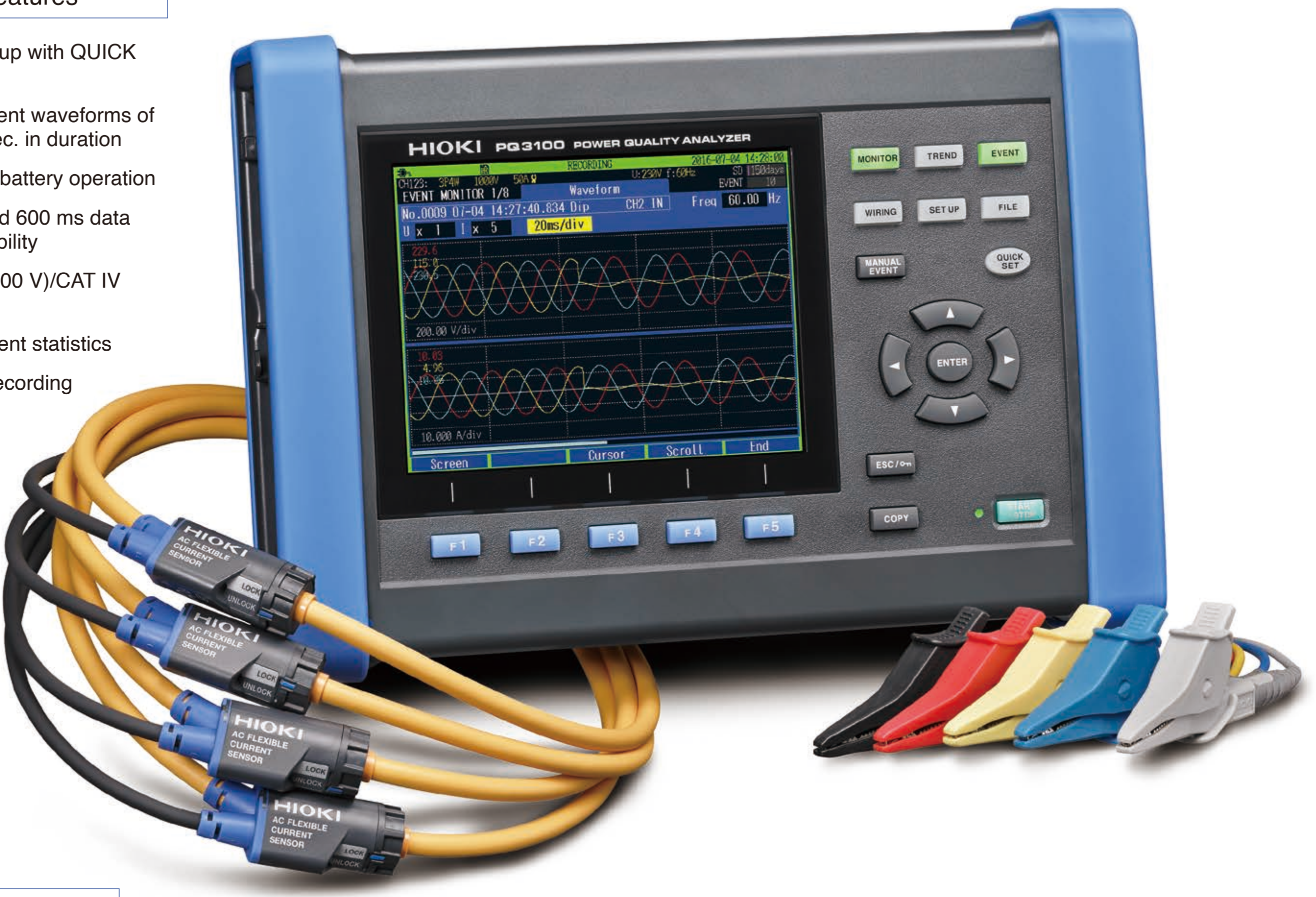
Mid-range model

Investigate power supply conditions and prevent problems

PQ3100

Features

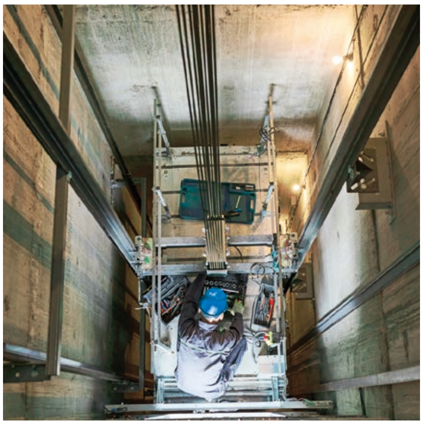
- Simple setup with QUICK SET
- Record event waveforms of up to 11 sec. in duration
- 8 hours of battery operation
- 200 ms and 600 ms data save capability
- CAT III (1000 V)/CAT IV (600 V)
- Display event statistics
- Demand recording


HIOKI PQ3100 POWER QUALITY ANALYZER
MONITOR
TREND
EVENT
WIRING
SET UP
FILE
MANUAL EVENT
QUICK SET
ENTER
ESC
COPY
F1
F2
F3
F4
F5
EVENT MONITOR 1/8
Waveform
Freq 60.00 Hz
20ms/div
200.00 V/div
10.000 A/div
Screen
Cursor
Scroll
End
HIOKI AC FLEXIBLE CURRENT SENSOR
LOCK
UNLOCK

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

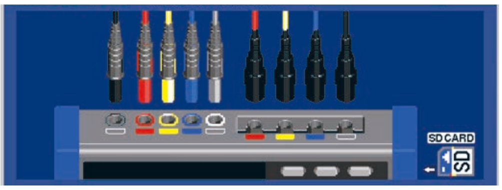
In load rejection testing, it's necessary to record transient changes in current and voltage when the system is taken offline. The PQ3100 can record anomalous waveforms for up to 11 seconds (1 second before and 10 after each event). Cursor measurement lets you verify peak values and duration as well.

QUICK SET: Easy-to-understand measurement guidance

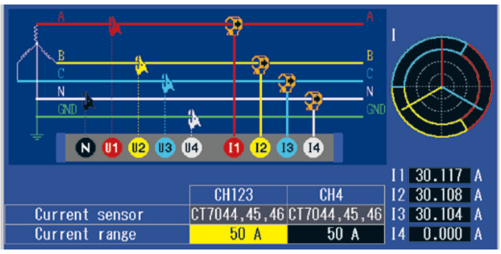
Launch QUICK SET to navigate the connection and setup processes so you can get started recording quickly.

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.



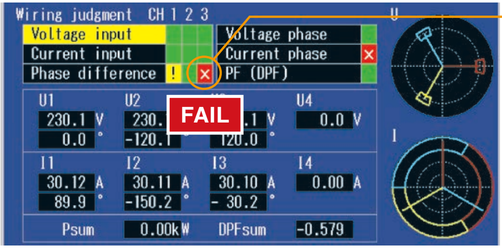
STEP 2 Connect the voltage cables and current sensors to the circuit to be measured.



	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.



Wiring judgment CH 1 2 3

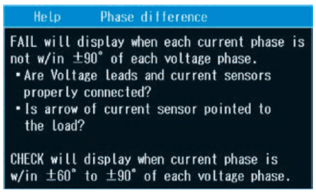
Voltage input	Voltage phase
Current input	Current phase ✗
Phase difference ! ✗	PF (DPF)

U1	U2	U3	U4
230.1 V	230.	.1 V	0.0 V
0.0 °	-120.1	120.0 °	

I1	I2	I3	I4
30.12 A	30.11 A	30.10 A	0.00 A
89.9 °	-150.2 °	- 30.2 °	

Psum 0.00kW DPFsum -0.579

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

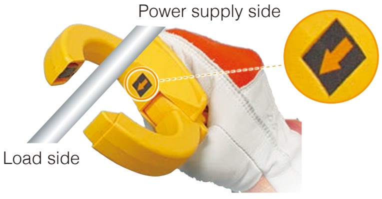


Help Phase difference

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.

QUICK SET
HIOKI PQ3100 POWER QUALITY ANALYZER
MONITOR
TREND
EVENT
WIRING
SETUP
FILE
ENTER
COPY

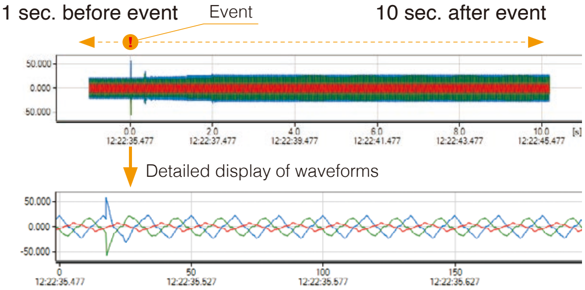


For example, you won't be able to measure power or power factor accurately if the clamp is oriented incorrectly.

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.



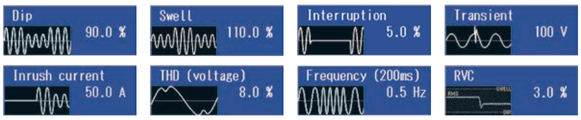
Up to 8 hours of battery operation

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

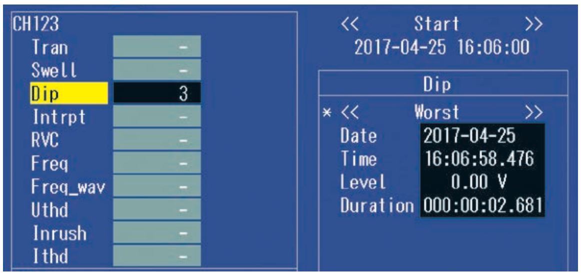
Display of event statistics

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



Dip	Swell	Interruption	Transient
90.0 %	110.0 %	5.0 %	100 V

Inrush current	THD (voltage)	Frequency (200ms)	RVC
50.0 A	8.0 %	0.5 Hz	3.0 %



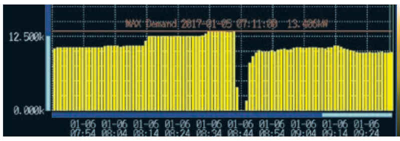
CH123	
Tran	-
Swell	-
Dip	3
Intrpt	-
RVC	-
Freq	-
Freq_wav	-
Uthd	-
Inrush	-
Ithd	-

<< Start >>
2017-04-25 16:06:00

Dip
* << Worst >>
Date 2017-04-25
Time 16:06:58.476
Level 0.00 V
Duration 000:00:02.681

Demand recording

Record power consumption over time.



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.

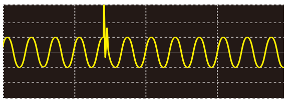
Extensive event parameters

Simple, one-touch setup

Capture power supply anomalies reliably

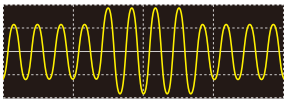
Transient voltages

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



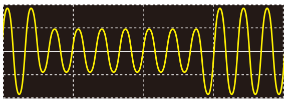
Voltage swells

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



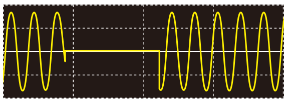
Voltage dips

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



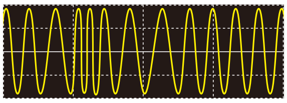
Interruptions

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.



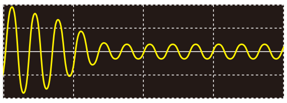
Frequency fluctuations

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



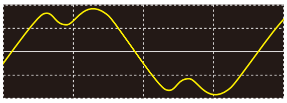
Inrush current

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



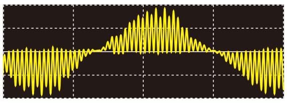
Harmonics

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



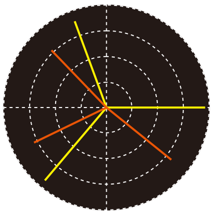
High-order harmonics (Supraharmonics)

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

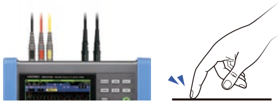
Simply choose the preset that suits your application, and the instrument will automatically configure the recording parameters.

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

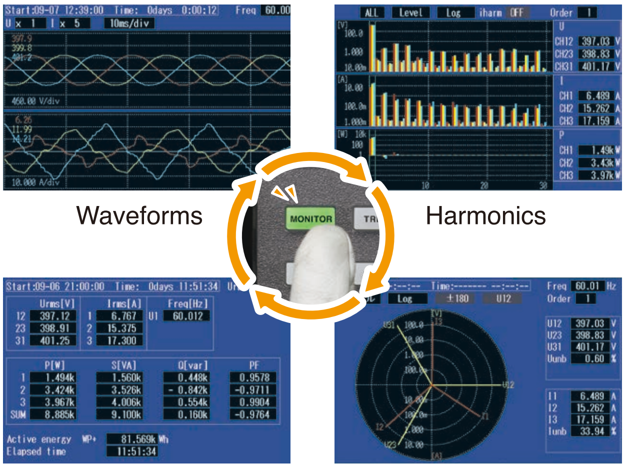
Simply connect current sensors, touch "Sensor" on the screen, and the instrument will automatically detect sensor types and maximum current ranges.



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

Start:09-07 12:39:00 Time: 0days 0:00:12 Freq 60.00
U x 1 I x 5 10ms/div
400.00 V/div
10.000 A/div

Harmonics

ALL Level Log iharm OFF Order 1

U
CH12 397.03 V
CH23 398.83 V
CH31 401.17 V

I
CH1 6.489 A
CH2 15.262 A
CH3 17.159 A

P
CH1 1.49k W
CH2 3.43k W
CH3 3.97k W

RMS values

Start:09-06 21:00:00 Time: 0days 11:51:34

	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

Vectors

Time:------- --:--:-- Freq 60.01 Hz
Log ±180 U12 Order 1

U12 397.03 V
U23 398.83 V
U31 401.17 V
Uunb 0.60 %

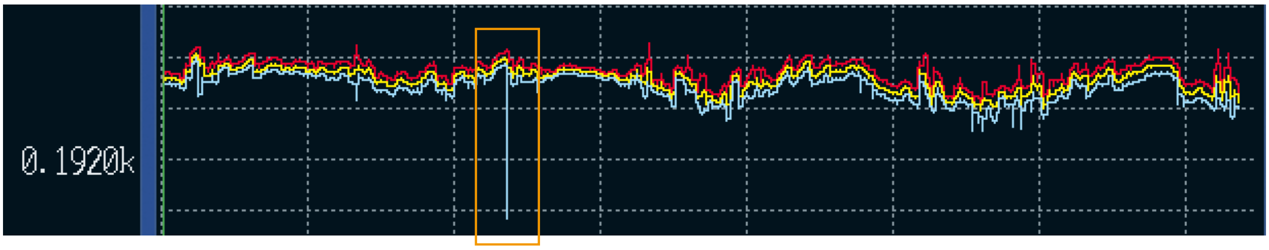
I1 6.489 A
I2 15.262 A
I3 17.159 A
Iunb 33.94 %

Simultaneously record event waveforms and trend graphs

Extensive range of recording parameters

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.

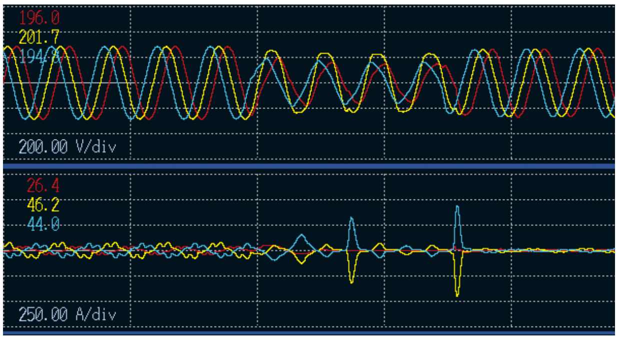
Example: Voltage dip



Simultaneous recording of waveforms and trend data

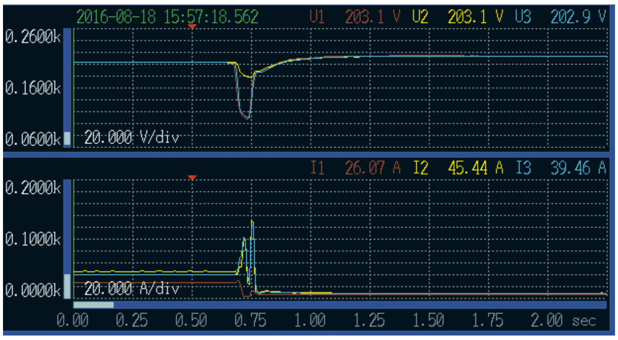
Event waveform

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

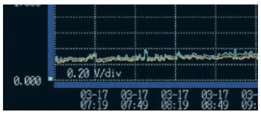
- Efficiency
- High-order harmonic (Supraharmonic) components
- Voltage waveform comparison

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.

Features shared by the PQ3198 and PQ3100

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.

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.

HIOKI
CT7136

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.

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.

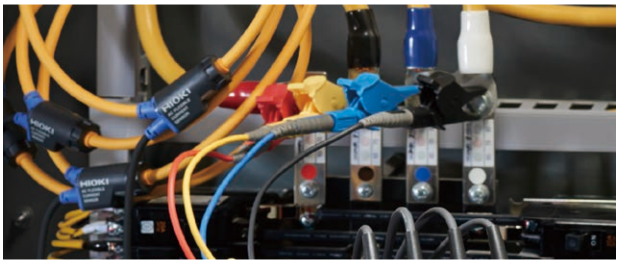
*PQ3100 (PQ3198: 2 ranges [50 A/500 A]).

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

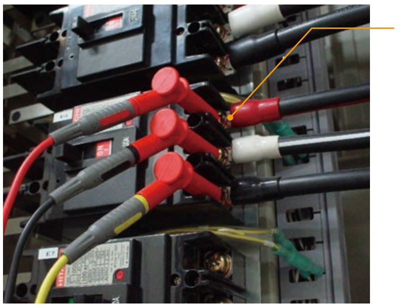
The PQ3198 complies with IEC 61000-4-30 Ed. 3 Class A, and the PQ3100 with IEC 61000-4-30 Class S, ensuring both instruments’ ability to deliver highly reliable, high-precision measurement.

	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 adapters are easy to affix to terminals in confined locations.

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

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

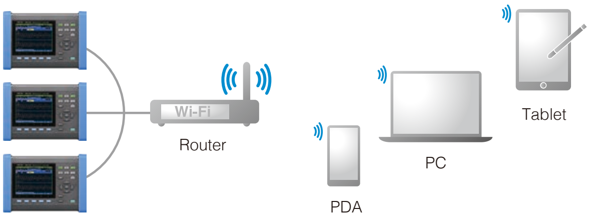
Magnetic straps can also be used to help keep voltage cords from coming loose.

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

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.

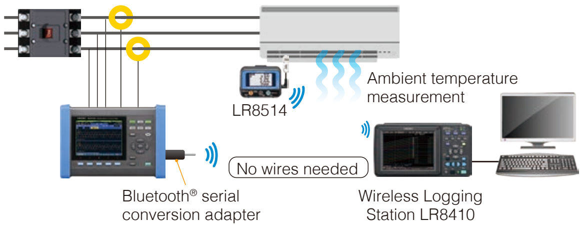


Email notification function*

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.



*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

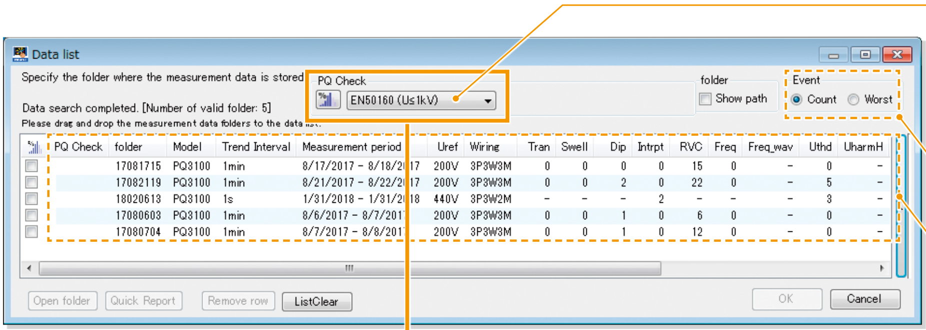
Standard accessory

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.



Specify the folder where the measurement data is stored

Data search completed. [Number of valid folder: 5]

Please drag and drop the measurement data folders to the data list.

PQ Check: EN50160 (U≤1kV)

folder: ☐ Show path

Event: ● Count ○ Worst

	PQ Check	folder	Model	Trend Interval	Measurement period	Uref	Wiring	Tran	Swell	Dip	Intrpt	RVC	Freq	Freq_wav	Uthd	UharmH
☐		17081715	PQ3100	1min	8/17/2017 – 8/18/2017	200V	3P3W3M	0	0	0	0	15	0	–	0	–
☐		17082119	PQ3100	1min	8/21/2017 – 8/22/2017	200V	3P3W3M	0	0	2	0	22	0	–	5	–
☐		18020613	PQ3100	1s	1/31/2018 – 1/31/2018	440V	3P3W2M	–	–	–	2	–	–	–	3	–
☐		17080603	PQ3100	1min	8/6/2017 – 8/7/201	200V	3P3W3M	0	0	1	0	6	0	–	0	–
☐		17080704	PQ3100	1min	8/7/2017 – 8/8/201	200V	3P3W3M	0	0	1	0	12	0	–	0	–

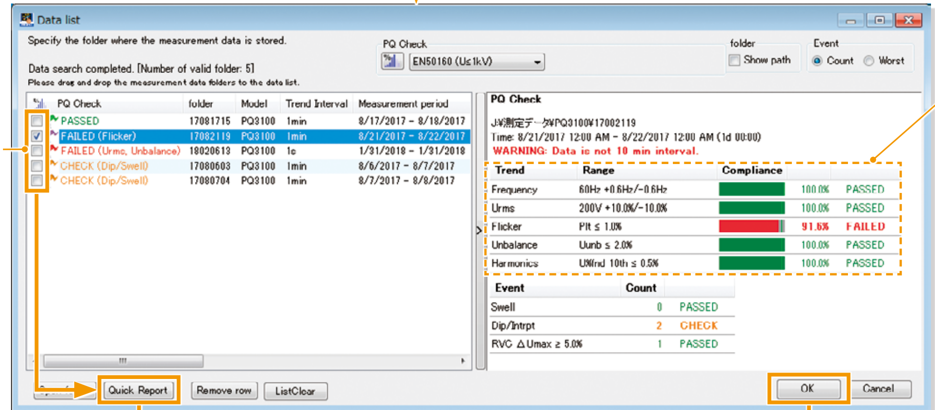
PQ Check function

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



Specify the folder where the measurement data is stored.

Data search completed. [Number of valid folder: 5]

Please drag and drop the measurement data folders to the data list.

PQ Check: EN50160 (U≤1kV)

folder: ☐ Show path

Event: ● Count ○ Worst

	PQ Check	folder	Model	Trend Interval	Measurement period
☐	PASSED	17081715	PQ3100	1min	8/17/2017 – 8/18/2017
☑	FAILED (Flicker)	17082119	PQ3100	1min	8/21/2017 – 8/22/2017
☐	FAILED (Urms, Unbalance)	18020613	PQ3100	1s	1/31/2018 – 1/31/2018
☐	CHECK (Dip/Swell)	17080603	PQ3100	1min	8/6/2017 – 8/7/2017
☐	CHECK (Dip/Swell)	17080704	PQ3100	1min	8/7/2017 – 8/8/2017

PQ Check

J:¥測定データ¥PQ3100¥17002119

Time: 8/21/2017 12:00 AM – 8/22/2017 12:00 AM (1d 00:00)

WARNING: Data is not 10 min interval.

Trend	Range	Compliance		
Frequency	60Hz +0.6Hz/–0.6Hz	🟩	100.0%	PASSED
Urms	200V +10.0%/–10.0%	🟩	100.0%	PASSED
Flicker	Plt ≤ 1.0%	🟥	91.6%	FAILED
Unbalance	Uunb ≤ 2.0%	🟩	100.0%	PASSED
Harmonics	U%Hnd 10th ≤ 0.5%	🟩	100.0%	PASSED

Event	Count	
Swell	0	PASSED
Dip/Intrpt	2	CHECK
RVC ΔUmax ≥ 5.0%	1	PASSED

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.

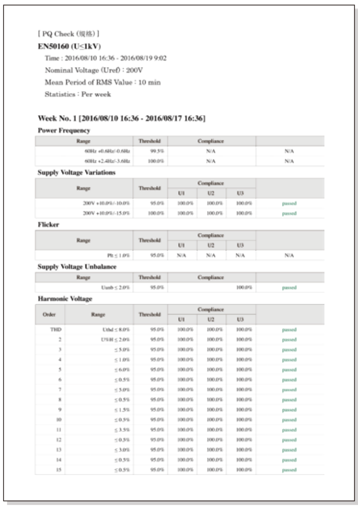
Generate a quick report

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.



[PQ Check (規格)]

EN50160 (U≤1kV)

Time : 2016/08/10 16:36 - 2016/08/19 9:02

Nominal Voltage (Uref) : 200V

Mean Period of RMS Value : 10 min

Statistics : Per week

Week No. 1 [2016/08/10 16:36 - 2016/08/17 16:36]

Power Frequency

Range	Threshold	Compliance	
60Hz +0.6Hz/-0.6Hz	99.5%	N/A	N/A
60Hz +2.4Hz/-3.6Hz	100.0%	N/A	N/A

Supply Voltage Variations

Range	Threshold	Compliance			
		U1	U2	U3	
200V +10.0%/-10.0%	95.0%	100.0%	100.0%	100.0%	passed
200V +10.0%/-15.0%	100.0%	100.0%	100.0%	100.0%	passed

Flicker

Range	Threshold	Compliance			
		U1	U2	U3	
Plt ≤ 1.0%	95.0%	N/A	N/A	N/A	N/A

Supply Voltage Unbalance

Range	Threshold	Compliance	
Uunb ≤ 2.0%	95.0%	100.0%	passed

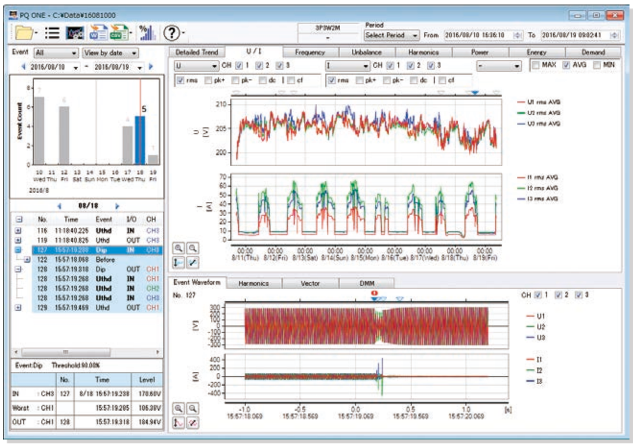
Harmonic Voltage

Order	Range	Threshold	Compliance			
			U1	U2	U3	
THD	Uthd ≤ 8.0%	95.0%	100.0%	100.0%	100.0%	passed
2	U%H ≤ 2.0%	95.0%	100.0%	100.0%	100.0%	passed
3	≤ 5.0%	95.0%	100.0%	100.0%	100.0%	passed
4	≤ 1.0%	95.0%	100.0%	100.0%	100.0%	passed
5	≤ 6.0%	95.0%	100.0%	100.0%	100.0%	passed
6	≤ 0.5%	95.0%	100.0%	100.0%	100.0%	passed
7	≤ 5.0%	95.0%	100.0%	100.0%	100.0%	passed
8	≤ 0.5%	95.0%	100.0%	100.0%	100.0%	passed
9	≤ 1.5%	95.0%	100.0%	100.0%	100.0%	passed
10	≤ 0.5%	95.0%	100.0%	100.0%	100.0%	passed
11	≤ 3.5%	95.0%	100.0%	100.0%	100.0%	passed
12	≤ 0.5%	95.0%	100.0%	100.0%	100.0%	passed
13	≤ 3.0%	95.0%	100.0%	100.0%	100.0%	passed
14	≤ 0.5%	95.0%	100.0%	100.0%	100.0%	passed
15	≤ 0.5%	95.0%	100.0%	100.0%	100.0%	passed

Detailed analysis

Display a list of analytical data

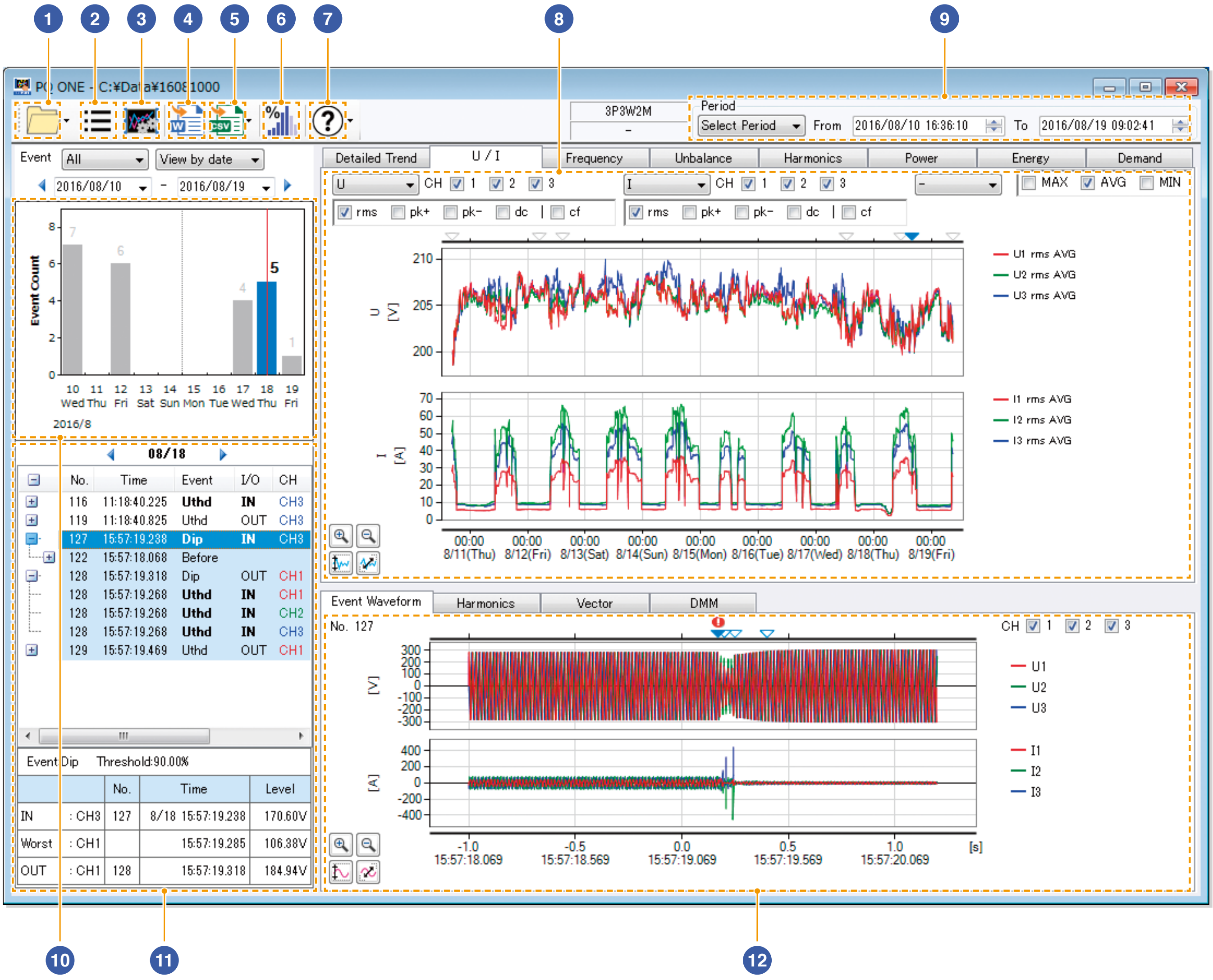
Display detailed measurement data, including event statistics, an event list, and event graphs. Simply choose the parameters you need to output to the report.



See pages 13 to 15 for more information.

PQ ONE main screen

Display a list of detailed information for an individual data set


1
2
3
4
5
6
7
8
9
PQ ONE - C:¥Data¥16081000
3P3W2M
Detailed Trend
U / I
Frequency
Unbalance
Harmonics
Power
Energy
Demand
CH 1 2 3
rms
pk+
pk−
dc
cf
MAX
AVG
MIN
U [V]
I [A]
U1 rms AVG
U2 rms AVG
U3 rms AVG
I1 rms AVG
I2 rms AVG
I3 rms AVG
Event Count
2016/8
Event Waveform
Harmonics
Vector
DMM
U1
U2
U3
I1
I2
I3
[V]
[A]
[s]
10
11
12

Period: Select Period From 2016/08/10 16:36:10 To 2016/08/19 09:02:41

Event: All View by date

2016/08/10 – 2016/08/19

08/18

No.	Time	Event	I/O	CH
116	11:18:40.225	**Uthd**	**IN**	CH3
119	11:18:40.825	Uthd	OUT	CH3
127	15:57:19.238	**Dip**	**IN**	CH3
122	15:57:18.068	Before		
128	15:57:19.318	Dip	OUT	CH1
128	15:57:19.268	**Uthd**	**IN**	CH1
128	15:57:19.268	**Uthd**	**IN**	CH2
128	15:57:19.268	**Uthd**	**IN**	CH3
129	15:57:19.469	Uthd	OUT	CH1

Event:Dip Threshold:90.00%

		No.	Time	Level
IN	: CH3	127	8/18 15:57:19.238	170.60V
Worst	: CH1		15:57:19.285	106.38V
OUT	: CH1	128	15:57:19.318	184.94V

No. 127

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.

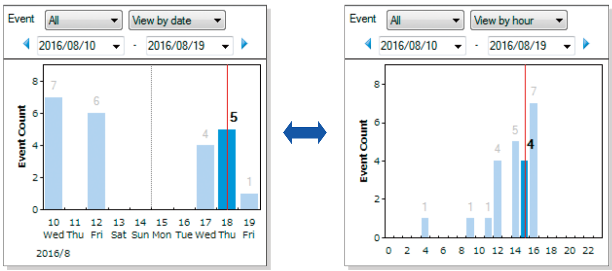
⑫ **Detailed event data**
Display detailed information about the event selected in the event list.

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.

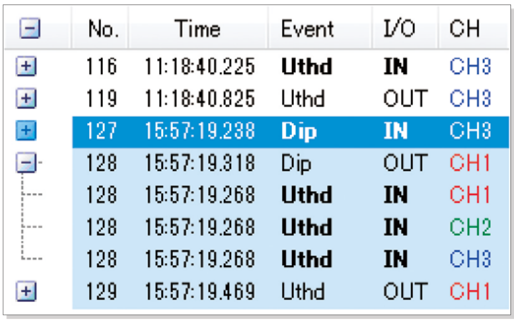


Date-based statistics

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.

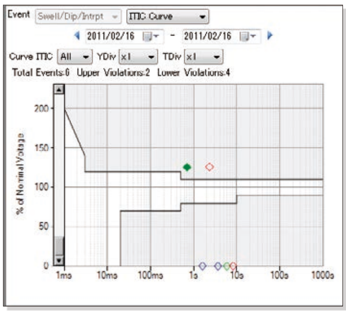


	No.	Time	Event	I/O	CH
⊞	116	11:18:40.225	**Uthd**	**IN**	CH3
⊞	119	11:18:40.825	Uthd	OUT	CH3
⊞	127	15:57:19.238	**Dip**	**IN**	CH3
⊟	128	15:57:19.318	Dip	OUT	CH1
	128	15:57:19.268	**Uthd**	**IN**	CH1
	128	15:57:19.268	**Uthd**	**IN**	CH2
	128	15:57:19.268	**Uthd**	**IN**	CH3
⊞	129	15:57:19.469	Uthd	OUT	CH1

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

ITIC curve

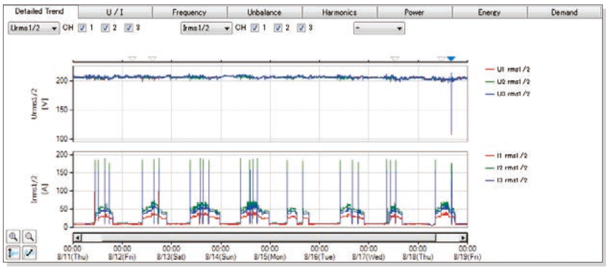
Perform ITIC (CBEMA) curve analyses (using tolerance curves), which are used by power quality management standards in the U.S. This feature lets you display the event duration and worst values for voltage swells, voltage dips, and interruptions.


Event
Swell/Dip/Intrpt
ITIC Curve
2011/02/16
2011/02/16
Curve ITIC
All
YDiv x1
TDiv x1
Total Events:6 Upper Violations:2 Lower Violations:4
% of Nominal Voltage
200
150
100
50
0
1ms
10ms
100ms
1s
10s
100s
1000s

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.

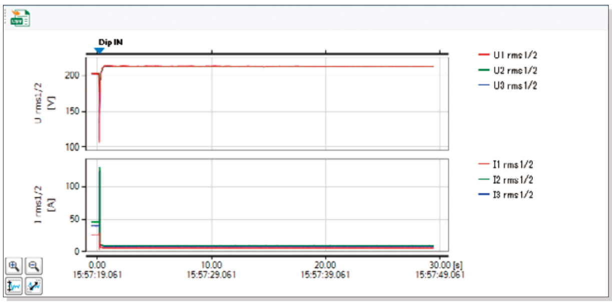

Detailed Trend
U/I
Frequency
Unbalance
Harmonics
Power
Energy
Demand
Urms1/2
Irms1/2
U1 rms1/2
U2 rms1/2
U3 rms1/2
I1 rms1/2
I2 rms1/2
I3 rms1/2
8/11(Thu)
8/12(Fri)
8/13(Sat)
8/14(Sun)
8/15(Mon)
8/16(Tue)
8/17(Wed)
8/18(Thu)
8/19(Fri)

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*2], high-order harmonic frequency analysis data[*1*2], and 11 sec. waveforms preceding events[*3].

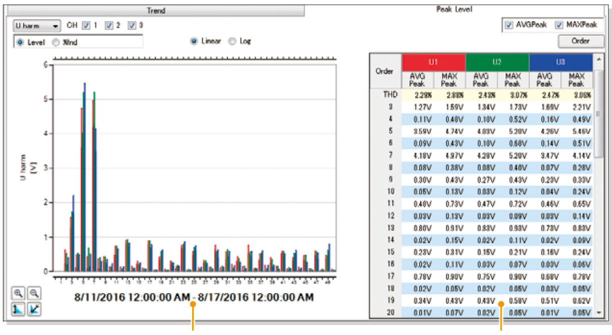
*1: PQ3198 only. *2: Supraharmonic *3: PQ3100 only.


Dip IN
U rms1/2 [V]
200
150
100
I rms1/2 [A]
100
50
0
U1 rms1/2
U2 rms1/2
U3 rms1/2
I1 rms1/2
I2 rms1/2
I3 rms1/2
0:00 15:57:19.061
10.00 15:57:29.061
20.00 15:57:39.061
30.00 [s] 15:57:49.061

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 values for the period of time selected with the cursor to the right of the graph.


Trend
Peak Level
U harm
CH
Level
%fnd
Linear
Log
U harm [V]
8/11/2016 12:00:00 AM - 8/17/2016 12:00:00 AM
☑ AVGPeak
☑ MAXPeak
Order

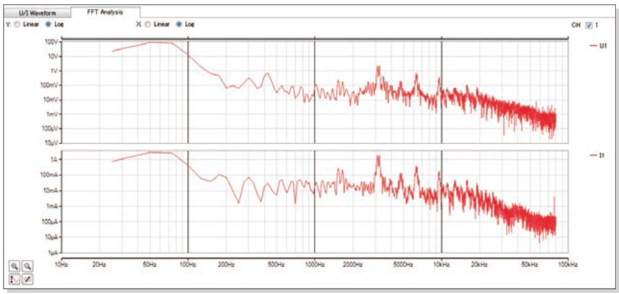
Order	U1		U2		U3	
	AVG Peak	MAX Peak	AVG Peak	MAX Peak	AVG Peak	MAX Peak
THD	2.29%	2.88%	2.43%	3.07%	2.47%	3.06%
3	1.27V	1.59V	1.34V	1.73V	1.69V	2.21V
4	0.11V	0.40V	0.10V	0.52V	0.16V	0.49V
5	3.59V	4.74V	4.03V	5.20V	4.26V	5.46V
6	0.09V	0.43V	0.10V	0.68V	0.14V	0.51V
7	4.18V	4.97V	4.28V	5.20V	3.47V	4.14V
8	0.08V	0.38V	0.08V	0.40V	0.07V	0.28V
9	0.30V	0.43V	0.27V	0.43V	0.23V	0.33V
10	0.05V	0.13V	0.03V	0.12V	0.04V	0.24V
11	0.40V	0.73V	0.47V	0.72V	0.46V	0.65V
12	0.03V	0.13V	0.03V	0.09V	0.03V	0.14V
13	0.80V	0.91V	0.83V	0.93V	0.73V	0.83V
14	0.02V	0.15V	0.02V	0.11V	0.02V	0.09V
15	0.23V	0.31V	0.15V	0.21V	0.16V	0.24V
16	0.02V	0.11V	0.03V	0.07V	0.03V	0.06V
17	0.78V	0.90V	0.75V	0.90V	0.68V	0.78V
18	0.02V	0.05V	0.02V	0.05V	0.03V	0.05V
19	0.34V	0.43V	0.43V	0.58V	0.51V	0.62V
20	0.01V	0.07V	0.02V	0.05V	0.01V	0.05V

Peak level detection interval

Average peak and maximum peak details

High-order harmonics (Supraharmonics) and frequency analysis display*1

Display high-order harmonics*2 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.


U/I Waveform
FFT Analysis
Y: ○ Linear ● Log
X: ○ Linear ● Log
CH ☑ I
U1
I1
100V
10V
1V
100mV
10mV
1mV
100μV
10μV
1A
100mA
10mA
1mA
100μA
10μA
1μA
10Hz
20Hz
50Hz
100Hz
200Hz
500Hz
1000Hz
2000Hz
5000Hz
10kHz
20kHz
50kHz
100kHz

Example high-order harmonics*2 and frequency analysis screen

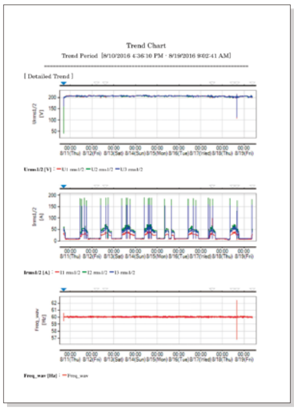
*1: PQ3198 only. *2: Supraharmonics.

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.

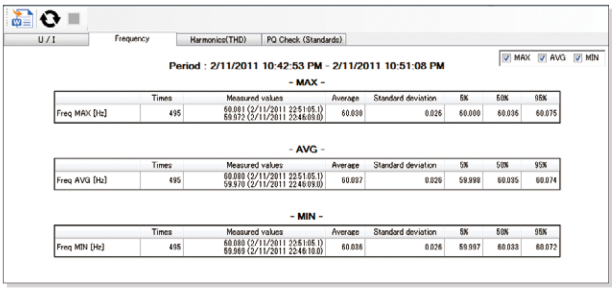
Choose report parameters


Trend Chart

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.


U / I
Frequency
Harmonics(THD)
PQ Check (Standards)
☑ MAX ☑ AVG ☑ MIN

Period : 2/11/2011 10:42:53 PM - 2/11/2011 10:51:08 PM

- MAX -

	Times	Measured values	Average	Standard deviation	5%	50%	95%
Freq MAX [Hz]	495	60.081 (2/11/2011 22:51:05.1) 59.972 (2/11/2011 22:46:09.0)	60.038	0.026	60.000	60.036	60.075

- AVG -

	Times	Measured values	Average	Standard deviation	5%	50%	95%
Freq AVG [Hz]	495	60.080 (2/11/2011 22:51:05.1) 59.970 (2/11/2011 22:46:09.0)	60.037	0.026	59.998	60.035	60.074

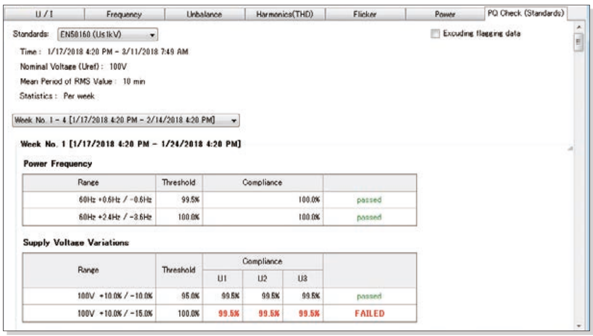
- MIN -

	Times	Measured values	Average	Standard deviation	5%	50%	95%
Freq MIN [Hz]	495	60.080 (2/11/2011 22:51:05.1) 59.969 (2/11/2011 22:46:10.0)	60.036	0.026	59.997	60.033	60.072

Example frequency 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.


U / I
Frequency
Unbalance
Harmonics(THD)
Flicker
Power
PQ Check (Standards)
☐ Excuding flagging data

Standards: EN50160 (Us1kV)

Time : 1/17/2018 4:20 PM - 3/11/2018 7:49 AM

Nominal Voltage (Uref) : 100V

Mean Period of RMS Value : 10 min

Statistics : Per week

Week No. 1 - 4 [1/17/2018 4:20 PM - 2/14/2018 4:20 PM]

Week No. 1 [1/17/2018 4:20 PM - 1/24/2018 4:20 PM]

Power Frequency

Range	Threshold	Compliance	
60Hz +0.6Hz / -0.6Hz	99.5%	100.0%	passed
60Hz +2.4Hz / -3.6Hz	100.0%	100.0%	passed

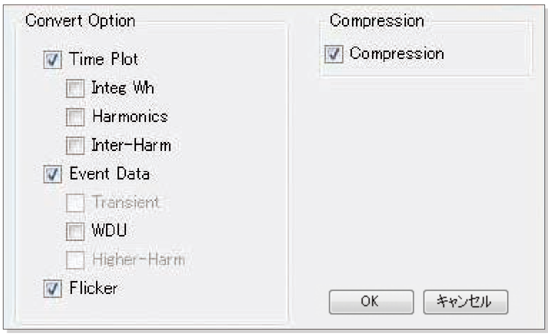
Supply Voltage Variations

Range	Threshold	Compliance			
		U1	U2	U3	
100V +10.0% / -10.0%	95.0%	99.5%	99.5%	99.5%	passed
100V +10.0% / -15.0%	100.0%	99.5%	99.5%	99.5%	FAILED

Display detailed settings and judgment results

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.



Convert Option
- ☑ Time Plot
  - ☐ Integ Wh
  - ☐ Harmonics
  - ☐ Inter-Harm
- ☑ Event Data
  - ☐ Transient
  - ☐ WDU
  - ☐ Higher-Harm
- ☑ Flicker

Compression
- ☑ Compression

PQDIF output settings screen

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

Calculate TDD using PQ ONE.

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

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.

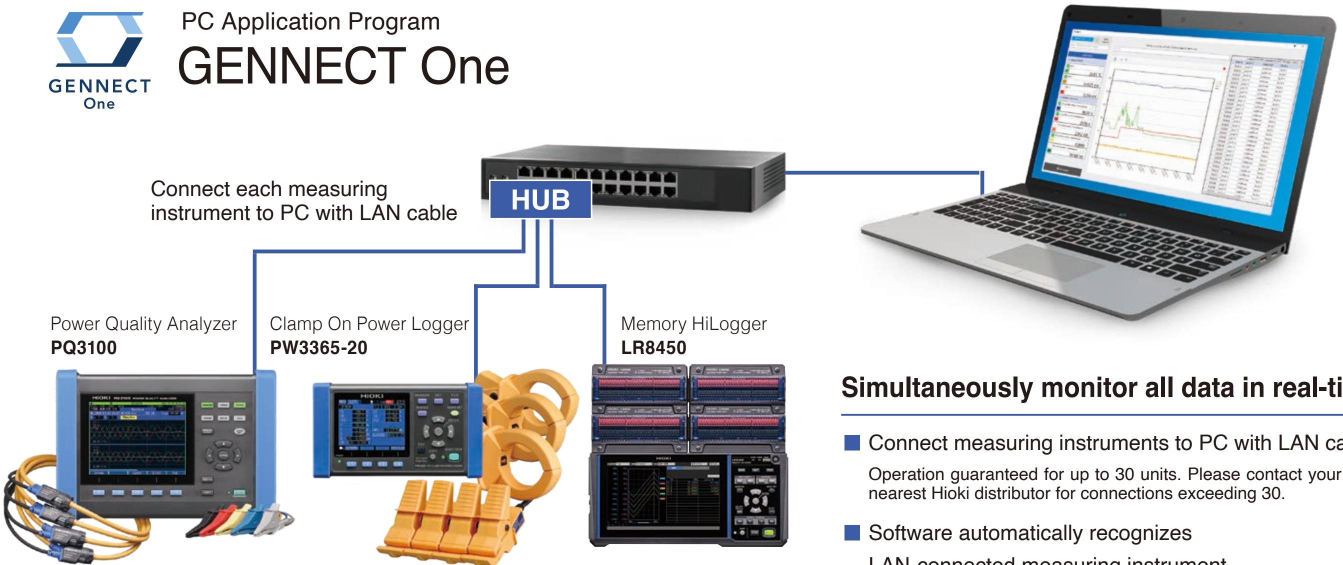
Δ⇔Y/PF/THD
Display
PQ Check
Other

Language: English

Choose “Automatic” to use the Windows language.

PC Application Program

GENNECT One



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				

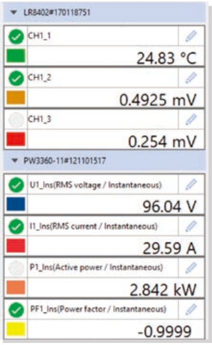
Get results from the job site in real-time

Present data from multiple sources as a graph or list together in real-time

Entire screen

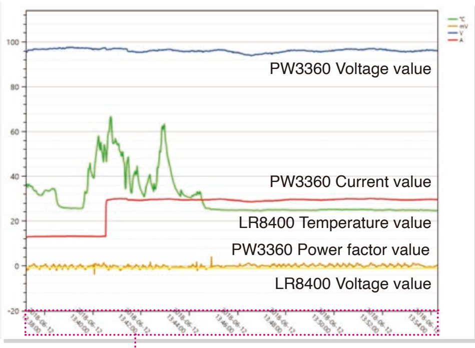
1. Monitor display (Max 512 items)
Display each measured data in real-time
2. Graph display (Max 32 items)
Display selected data as graphs
3. List display (Max 32 items)
Display selected data in list

1. Monitor

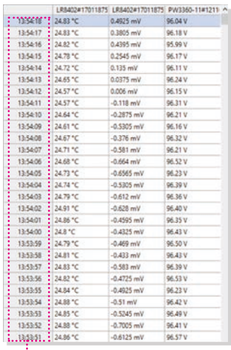


LR8402#170118751
CH1_1 24.83 °C
CH1_2 0.4925 mV
CH1_3 0.254 mV
PW3360-11#121101517
U1_Ins(RMS voltage / Instantaneous) 96.04 V
I1_Ins(RMS current / Instantaneous) 29.59 A
P1_Ins(Active power / Instantaneous) 2.842 kW
PF1_Ins(Power factor / Instantaneous) -0.9999

2. Graph



3. List

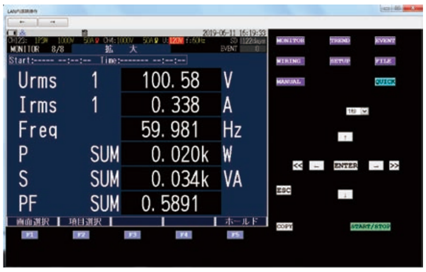


logging time (display up to 1024 points)

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.

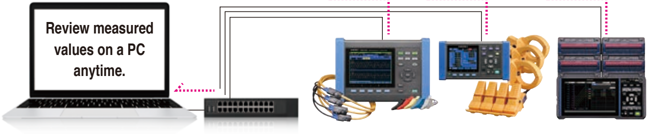


```
2019-06-11 16:19:33
MONITOR  8/8        拡 大
Start:---- --:--:--  Time:------ --:--:--
Urms   1     100. 58  V
Irms   1       0. 338 A
Freq          59. 981 Hz
P      SUM    0. 020k W
S      SUM    0. 034k VA
PF     SUM    0. 5891
画面選択 | 項目選択 | | | ホールド
```

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.



Download GENNECT One

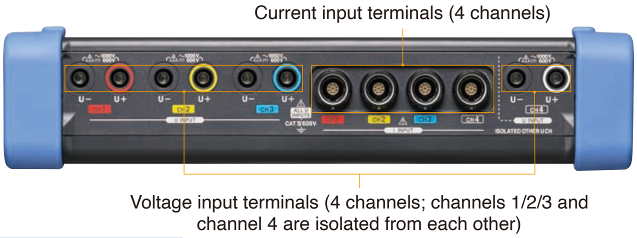
HIOKI website > Technical Support > Drivers, Firmware, Software

Model No. (Order code) **SF4000** **Search**

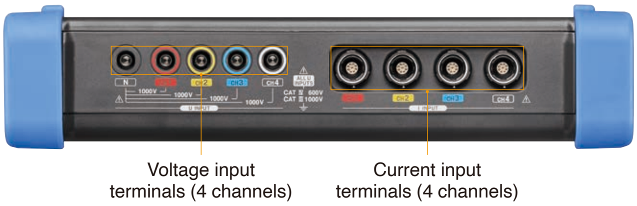
Enter the model number of any one of the compatible Hioki measuring instruments in the search field to download the software to get started!

Interfaces

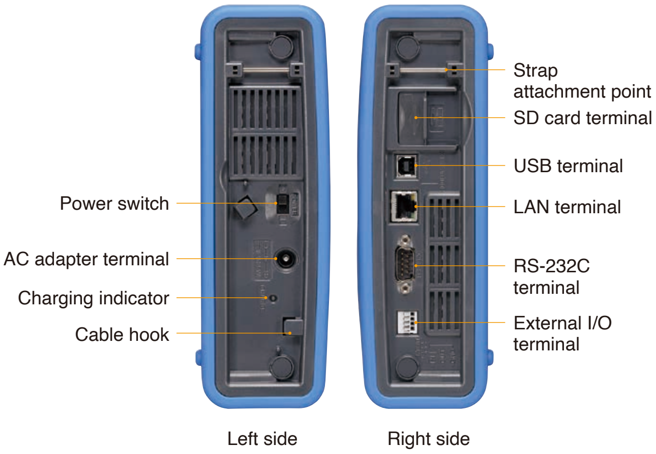
PQ3198 top


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 Voltage/current waveform peak Voltage waveform comparison Harmonics Unbalance factor Power Mains signaling voltage	Rapid voltage change (RVC)
	Transient voltage	2 MS/s 6 kV	200 kS/s 2.2 kV
Measurement parameters	Efficiency	CH 4 power calculation Efficiency calculation	N/A
	High-order harmonics (Supraharmonics)	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) 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/3-wire/3 power meter 3-phase/4-wire 3-phase/4-wire/2.5 element	
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 (Supraharmonic) components Voltage waveform comparison Mains signaling voltage	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 Measurement range Voltage: ±1200.0 Vpk Current: 400% current range Measurement accuracy Voltage: 5% of the nominal voltage (for input of 10% to 150% of the nominal voltage) 2% f.s. (for input other than above) Current: 5% rdg. (for input of at least 50% f.s.) 2% f.s. (for input other than above)	Maximum and minimum points in sampled data within 200 ms aggregate Measurement range Voltage: ±2200.0 Vpk Current: 400% current range Measurement accuracy Voltage: 5% of the nominal voltage (for input of 10% to 150% of the nominal voltage) 2% f.s. (for input other than above) Current: 5% rdg. (for input of at least 50% f.s.) 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. Comparison window width: 10 waves (for 50 Hz input) or 12 waves (for 60 Hz input) Number of window points: 4096 points synchronized with harmonic calculations	None
Mains signaling voltage	Measurement method: Levels or content rates compared to the nominal voltage are calculated based on the mid-harmonic bin of 10/12-cycle RMS values of up to two set signal frequencies or four midharmonic bins that most closely approximate those frequencies to display. Measurement accuracy: Within the range of 3% to 15% of nominal voltage: ±5% rdg. Within the range of 1% to 3% of nominal voltage: ±0.15% of nominal voltage	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. 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. 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) ±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. Apparent power Calculated from the voltage RMS value and the current RMS value. Reactive power Calculated from the apparent power S and the active power P. Measurement accuracy Active power DC: ±0.5% rdg. ±0.5% f.s. + current sensor accuracy (CH 4 only) AC: ±0.2% rdg. ±0.1% f.s. + current sensor accuracy 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 ±1 dgt. relative to calculation from measured values Reactive power During RMS value calculation: ±1 dgt. relative to calculation from measured values	Active power Measured every 200 ms. Apparent power RMS value calculation: Calculated from the voltage RMS value and the current RMS value. Fundamental wave calculation: Calculated from the fundamental wave active power and the fundamental wave reactive power. Reactive power RMS value calculation: Calculated from the apparent power S and the active power P. Fundamental wave calculation: Calculated from the fundamental wave voltage and current. Measurement accuracy Active power DC: ±0.5% rdg. ±0.5% f.s. + current sensor accuracy AC: ±0.2% rdg. ±0.1% f.s. + current sensor accuracy Power factor effects: 1.0% rdg. or less (for input from 40 Hz to 70 Hz with a power factor of 0.5) Apparent power ±1 dgt. relative to calculation from measured values Reactive power During RMS value calculation: ±1 dgt. relative to calculation from measured values 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) 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 Calculated as the ratio of the active power values for the channel pair. 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. Active energy: Calculated separately from the active power for consumption and regeneration. Reactive energy: Integrated separately from the reactive power for lag and lead. Apparent energy: Integrated from the apparent power. *PQ3100 only	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. *PQ3100 only Cumulative time accuracy: ±10 ppm
Energy cost (Ecost)	None	Calculated by multiplying active energy (consumption) (WP+) by the electricity unit cost (/kWh). 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. Power factor: Calculated from the apparent power S and the active power P. Displacement power factor measurement accuracy For input with a voltage of 100 V or greater and current of 10% of the range or greater 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(φ + 0.2865)/cos(φ)) × 100% rdg. + 50 dgt. (reference value), where φ represents the 1st-order display value for the harmonic voltage-current phase difference 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.) Measurement accuracy Active power demand amount (Dem_WP+, Dem_WP-): Active power measurement accuracy ±10 dgt. Reactive power demand amount (Dem_WQ_LAG, Dem_WQ_LEAD): Reactive power measurement accuracy ±10 dgt. Apparent power demand amount (Dem_WS): Apparent power measurement accuracy ±10 dgt. 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) Average power values are measured during each interval. 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). 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) 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) 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 Voltage 0th order: ±0.3% rdg. ±0.08% f.s. 1st order: ±5% rdg. 2nd to 50th order: ±5% rdg. (for input of at least 1% of the nominal input voltage) Measurement accuracy Current 0th order: ±0.5% rdg. ±0.5% f.s. + current sensor accuracy 1st to 20th order: ±0.5% rdg. ±0.2% f.s. + current sensor accuracy 21st to 50th order: ±1.0% rdg. ±0.3% f.s. + current sensor accuracy	Measurement accuracy Voltage 0th order: Same as voltage DC value 1st order: Same as voltage RMS value 2nd to 50th order: ±10% rdg. (for input of at least 1% of the nominal input voltage) Measurement accuracy Current 0th order: Same as current DC value 1st to 20th order: ±0.5% rdg. ±0.2% f.s. + current sensor accuracy 21st to 30th order: ±1.0% rdg. ±0.3% f.s. + current sensor accuracy 31st to 40th order: ±2.0% rdg. ±0.3% f.s. + current sensor accuracy 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. Measurement accuracy 0th order: ±0.5% rdg. ±0.5% f.s. + current sensor accuracy 1st to 20th order: ±0.5% rdg. ±0.2% f.s. + current sensor accuracy 21st to 30th order: ±1.0% rdg. ±0.3% f.s. + current sensor accuracy 31st to 40th order: ±2.0% rdg. ±0.3% f.s. + current sensor accuracy 41st to 50th order: ±3.0% 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) 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 Inter-harmonic voltage (defined for harmonic input with a nominal input voltage of at least 100 V) Harmonic input of 1% of the nominal input voltage or greater: ±5.0% rdg. Harmonic input of less than 1% of the nominal input voltage: ±0.05% of the nominal input voltage Inter-harmonic current: Accuracy not defined	Measurement accuracy Inter-harmonic voltage (defined for harmonic input with a nominal input voltage of 100 V to 440 V) Harmonic input of 1% of the nominal input voltage or greater: ±10.0% rdg. Harmonic input of less than 1% of the nominal input voltage: ±0.05% of the nominal input voltage Inter-harmonic current: Accuracy not defined
Voltage total harmonic distortion (Uthd), current total harmonic distortion (Ithd)	THD-F: Total harmonic distortion relative to wave THD-F: Total harmonic distortion relative to fundamental wave THD-R: Total harmonic distortion relative to total harmonics, including fundamental wave THD-R: Total harmonic distortion relative to total harmonics, including fundamental wave Measurement accuracy: 0.5% Defined for input as follows for a nominal input voltage of 100 V to 440 V: Voltage 1st order: 100% of nominal input voltage / 5th and 7th orders: 1% of nominal input voltage 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) *Supraharmonic	PQ3198 Measurement method 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). Sampling frequency: 200 kHz Display parameters High-order harmonic* voltage component value: Voltage RMS value for the waveform obtained by eliminating the fundamental wave component High-order harmonic* current component value: Current RMS value for the waveform obtained by eliminating the fundamental wave component 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) 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) High-order harmonic* voltage component interval: Interval extending from high-order harmonic voltage component event IN to event OUT High-order harmonic* current component interval: Interval extending from high-order harmonic current component event IN to event OUT Measurement band: 2 kHz to 80 kHz (-3 dB) Measurement accuracy 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) 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) Saved waveforms Event waveform, high-order harmonic* waveform (8000 points of data over 40 ms starting after the first 200 ms aggregate to exceed the threshold) *Supraharmonic	PQ3100 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 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. 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. ΔV10 1-minute values, 1-hour average value, 1-hour maximum value, 1-hour 4th largest value, overall maximum value (during measurement interval) 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) 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
40 Hz to 70 Hz	Defined by RMS value	Defined by RMS value	Defined by RMS value
70 Hz to 360 Hz	±1% rdg. ±0.2% f.s.	±1% rdg. ±0.5% f.s.	±1% rdg. ±0.5% f.s.
360 Hz to 440 Hz	Defined by RMS value	Defined by RMS value	Defined by RMS value
440 Hz to 5 kHz	±5% rdg. ±0.2% f.s.	±5% rdg. ±0.5% f.s.	±5% rdg. ±1% f.s.
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	

Frequency	Voltage	Current	Power
40 Hz to 70 Hz	Defined by RMS value	Defined by RMS value	Defined by active power
70 Hz to 1 kHz	±3% rdg. ±0.2% f.s.	±3% rdg. ±0.2% f.s.	±3% rdg. ±0.2% f.s.
1 kHz to 10 kHz	±10% rdg. ±0.2% f.s.	±10% rdg. ±0.2% f.s.	±10% rdg. ±0.2% f.s.
40 kHz	-3 dB	-3 dB	

Measurement settings

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 Power factor: PF / DPF THD: THD-F / THD-R Harmonics: All levels / All content percentages / Content percentages for U and P, levels for I	Urms: Phase voltage / Line voltage PF/Q/S: RMS value calculation / Fundamental wave calculation THD: THD-F / THD-R 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. 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 *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 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. External events: Events are detected by detecting a signal input to the EVENT IN terminal. 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. Transient waveform: Instantaneous waveforms are recorded for 2 ms before the transient voltage waveform detection point and for 2 ms after the detection point. 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. High-order harmonic* waveform: A 40 ms instantaneous waveform is recorded when a high-order harmonic* event occurs. * Supraharmonic	Event waveforms: A 200 ms instantaneous waveform is recorded when an event occurs. Transient waveform: Instantaneous waveforms are recorded for 1 ms before the transient voltage waveform detection point and 2 ms after the detection point. 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. Events are generated at the selected interval.	Off, 1/2/5/10/15/30 min., 1/2 hr. Events are generated at the selected interval.
Waveforms before events	2 waves	Off (0 sec.) / 200 ms / 1 sec. 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 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. 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 Manual downloading of data via the FTP server function	Remote operation via an Internet browser Manual downloading of data via the FTP server function Automatic transmission of data via the FTP client function 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 LR8410 Link support
External control	4 screwless terminals External event input, external start/stop, external event output (non-isolated), ΔV10 alarm	4 screwless terminals 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) 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 Power quality: IEC 61000-4-30, EN 50160, IEEE 1159 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) 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 50.000 A 0.4% rdg. + 0.112% f.s. 5.0000 A 0.4% rdg. + 0.22% f.s. 500.00 mA 0.4% rdg. + 1.3% f.s. [*2]	Current range Combined accuracy 100.00 A 0.4% rdg. + 0.12% f.s. 50.000 A 0.4% rdg. + 0.14% f.s. 5.0000 A 0.4% rdg. + 0.50% f.s. [*2]	Current range Combined accuracy 500.00 A 0.4% rdg. + 0.112% f.s. 50.000 A 0.4% rdg. + 0.22% f.s. 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 Combined amplitude accuracy 5000.0 A/500.00 A 1.6% rdg. + 0.4% f.s. 50.000 A 1.6% rdg. + 3.1% f.s.		
Phase accuracy (45 to 66 Hz)	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 100.00 A 1.5% rdg. + 1.0% f.s. 50.000 A 1.5% rdg. + 1.5% f.s. [*1] 10.000 A 1.5% rdg. + 5.5% f.s. [*2]	Current range Combined accuracy 500.00 A 2.5% rdg. + 1.1% f.s. 50.000 A 2.5% rdg. + 6.5% f.s.	Current range Combined accuracy 5000.0 A 2.0% rdg. + 0.7% f.s. [*1] 2000.0 A 2.0% rdg. + 1.75% f.s. [*2] 1000.0 A 2.0% rdg. + 1.5% f.s. [*2] 500.00 A 2.0% rdg. + 2.5% f.s.
	45 to 66 Hz	100.00 A 1.1% rdg. + 0.6% f.s. 50.000 A 1.1% rdg. + 1.1% f.s. [*1] 10.000 A 1.1% rdg. + 5.1% f.s. [*2]	500.00 A 2.1% rdg. + 0.7% f.s. 50.000 A 2.1% rdg. + 6.1% f.s.	5000.0 A [*1] I > 1800 A: 2.1% rdg. + 0.3% f.s. I ≤ 1800 A: 1.6% rdg. + 0.3% f.s. 2000.0 A 1.6% rdg. + 0.75% f.s. [*2] 1000.0 A 1.6% rdg. + 1.1% f.s. [*2] 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: Combined accuracy 5.0000 A: 1.1% rdg. + 0.16% f.s. 500.00 mA: 1.1% rdg. + 0.7% f.s. 50.000 mA: 1.1% rdg. + 6.1% f.s. [*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 (3P3W3M) connection, the voltage cord to be connected can be reduced from 6 to 3

WIRING ADAPTER PW9001
When three-phase 4-wire connection (3P4W), 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 C1002
Hard trunk type, Includes compartment for options

Waterproof box
For outdoor installation, IP65

Included 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

Product name **POWER QUALITY ANALYZER PQ3198**

Model (order code)	**PQ3198**	**PQ3198-92**	**PQ3198-94**
Bundle contents	 POWER QUALITY ANALYZER PQ3198 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 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 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 SD MEMORY CARD Z4001		

Related products

No-metal-contact voltage sensor

For details

Check power quality with a no-metal-contact logger

CLAMP ON POWER LOGGER

PW3365-20

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

New, more easily clampable design

For details

Clamp meters designed for exceptional ease of use

CLAMP METER

CM4375-50, CM4141-50

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

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All information correct as of Apr. 17, 2024. All specifications are subject to change without notice.

PQ3198_PQ3100E10-44E Printed in Japan