# HIOKI

**New**

# POWER QUALITY ANALYZER PW3198

Power Measuring Instruments

*Record and Analyze Power Supply Problems Simultaneously with a Single Unit*

# *The New World Standard for Power Quality Analysis*

## ■ Never Miss the Moment
- Detect power supply problems and perform onsite troubleshooting
- Do preventive maintenance to avert accidents by managing the power quality

## ■ CAT IV-600V Safety Standard
- Meets the CAT IV safety rating required to check an incoming power line
- Safe enough to measure up to 6,000Vpeak of transient overvoltage

## ■ Easy Setup Function with PRESETS
- Just select the measurement course, wiring, and clamps
- Automatic one-step setup based on measurement conditions

## ■ Compliant with New International Standards
- International power quality measurement standard IEC 61000-4-30 Edition 2 Class A
- High precision with a basic voltage measurement accuracy of 0.1%

CE

INTERNET HIOKI Website
**www.hioki.com**

HIOKI company overview, new products, environmental considerations and other information are available on our website.

# One Single Unit Can Solve All Your Power Supply Problems

*The number of power supply problems is increasing as power systems are becoming more and more complicated - all due to the rising use of power electronics devices plus a growing installed base of large systems and distributed power supplies. The quickest way to approach these problems is to understand the situation quickly and accurately. The PW3198 Power Quality Analyzer is ready to effectively solve your power supply problems.*

## Troubleshooting

✔ Understand the actual power situation at the site where the problem is occurring (e.g., the equipment malfunction, failure, reset, overheating, or burning damage).

✔ Ideal for troubleshooting solar and wind power generation systems, EV charge stations, smart grids, tooling machines, OA equipment (e.g., computers, printers, and UPS), medical equipment, server rooms, and electrical equipment (e.g., transformers and phase-advancing capacitors).

## Field Survey and Preventive Maintenance

✔ Perform long-term measurements of the power quality and study problems that are difficult to detect or that occur intermittently.

✔ Maintain electrical equipment and check the operation of solar and wind power generation systems.

✔ Manage the parameters with a control set point, such as a voltage fluctuation, flicker, and harmonic voltage.

## Power (Load) Survey

✔ Study the power consumption and confirm system capacity before adding load.

# Advanced Features for Safe, Simple, and Accurate Measurements

## 1  International Standard IEC61000-4-30 Edition 2 Class A

Class A is defined in the international standard IEC61000-4-30, which specifies compatibility with power quality parameters, accuracy, and standards to enable comparison and discussion of the measurement results of different measuring instruments.

The PW3198 is compliant with the latest IEC61000-4-30 Edition 2 Class A standard. The instrument can perform measurements in accordance with the standard, including continuous gapless calculation, methods to detect events such as dip, swell, and instantaneous power failure, and time synchronization using the optional GPS box.
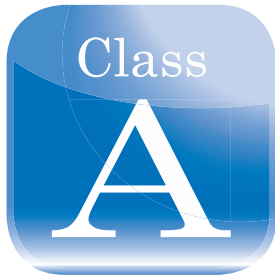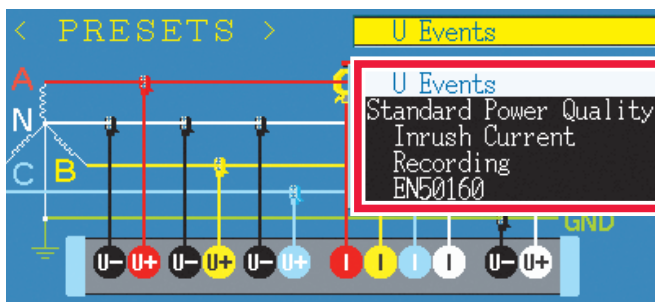
## 2  CAT Ⅳ-600V Safety

The PW3198 is compliant with the measurement category CAT IV - 600V and can also safely test the incoming lines for both single-phase and three-phase power supplies.

## 3  Easy to set up - Just select the measurement course and the PW3198 will do the rest
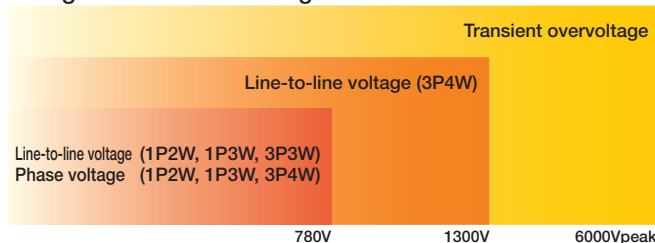
Simply choose the course based on the measurement objective and the necessary configurations will be set automatically.

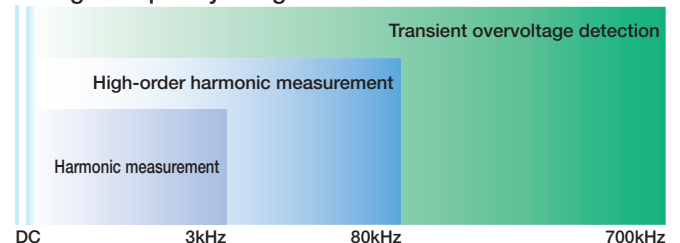| U Events | Record voltage and frequency and detect errors simultaneously. |
|---|---|
| Standard Power Quality | Record voltage, current, frequency, and harmonic, and detect errors simultaneously. |
| Inrush current | Measure the inrush current. |
| Recording | Record only the TIME PLOT Data but do not detect errors. |
| EN50160 | Perform measurements in accordance with EN50160. |

## 4  Highly Accurate, Broadband, Wide Dynamic Range Makes for Reliable Measurements

### Voltage Measurement Range

Transient overvoltage
Line-to-line voltage (3P4W)
Line-to-line voltage (1P2W, 1P3W, 3P3W)
Phase voltage (1P2W, 1P3W, 3P4W)
780V  1300V  6000Vpeak

Both low and high voltages can be measured in a single range.

### Voltage Frequency Range

Transient overvoltage detection
High-order harmonic measurement
Harmonic measurement
DC  3kHz  80kHz  700kHz

Wide range from DC voltage to 700 kHz

### Basic Measurement Accuracy (50/60 Hz)

| Voltage | ±0.1% of nominal voltage |
|---|---|
| Current | ±0.2% rdg. ±0.1% f.s. + Clamp-on sensor accuracy |
| Power | ±0.2% rdg. ±0.1% f.s. + Clamp-on sensor accuracy |

World's highest level of basic measurement accuracy. Extremely accurate voltage measurement without the need to switch ranges.
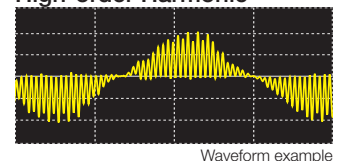
### Transient Overvoltage
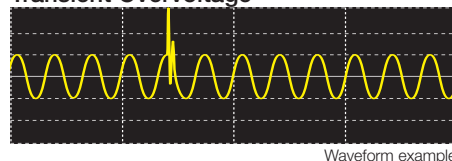
Waveform example

Transient overvoltage can also be measured in a range between the maximum 6,000 V and minimum 1 μs (2 MS/s).

### High-order Harmonic

Waveform example

The PW3198 is the first power quality analyzer that can measure the high-order harmonic component of up to 80 kHz.

# PW3198 Never Misses the Moment a Power Supply Failure Occurs

The PW3198 can measure all waveforms of power, harmonic, and error events simultaneously. When a problem occurs with the equipment or system on your site, the PW3198 will help you detect the cause of the problem early and solve it quickly. You can depend on the PW3198 to monitor all aspects of your power supplies.

# Measure All Parameters at the Same Time

## Acquire the Information You Need Quickly by Switching Pages (RMS Value)

Just connect to the measurement line, and the PW3198 will simultaneously measure all parameters, such as power and harmonic. You can then switch pages to view the needed information immediately.
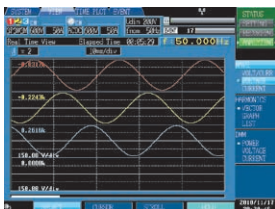


**With a single button**

Switch windows with one touch
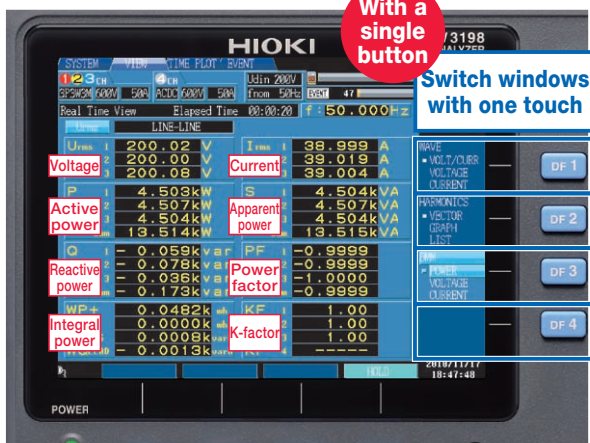
**DMM Display**
Display parameters such as voltage, current, power, power factor, and integral power in a single window.

DF 1 → Switch windows with one touch

DF 2 → Switch windows with one touch
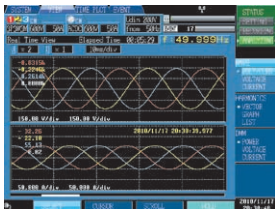
**Waveform Display**
Display the voltage and current waveforms on channels 1 to 4 one above the other in a single window.

**Vector Display**
Display the measured value and vector of the voltage and current of each order harmonic.

DF 1 → Switch windows with one touch

DF 2 → Switch windows with one touch

**4-channel Waveform Display**
Display the voltage and current waveforms on channels 1 to 4 individually.

**Harmonic Bar Graph Display**
Display the RMS value and phase angle of harmonics from the 0th order to the 50th either in a graph or as numerical values.

## Reliably Detect Power Supply Failures (Event)

To detect power supply failures, measurement does not need to be performed multiple times under different conditions. The PW3198 can always monitor and reliably detect all power supply failures for which detection is enabled.
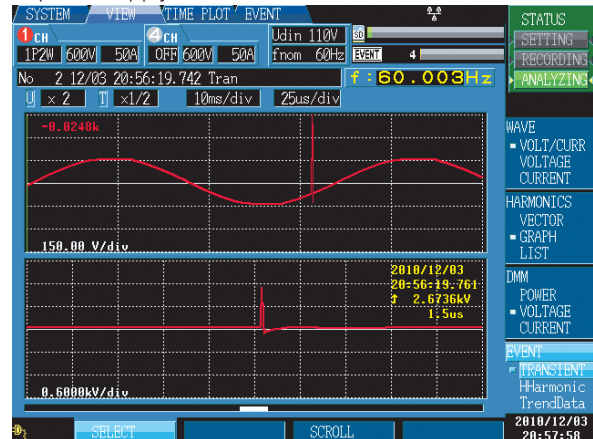


**Transient Overvoltage (Impulse)**
A transient overvoltage is generated by a lightning strike or a contact fault or closed contact of a circuit breaker and relay, and often causes a steep voltage change and a high voltage peak.
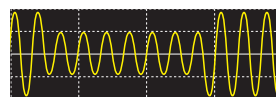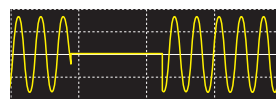
**Voltage Dip (Voltage Drop)**
Voltage drops for a short time as a result of large inrush current generated in the load by, for example, a starting motor.
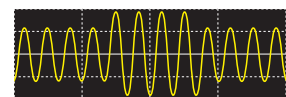
**Voltage Swell (Voltage Rise)**
A voltage swell is generated by a lightning strike or a heavily loaded power line being opened or closed, causing the voltage to rise instantaneously.

**Interruption**
The power supply stops instantaneously or for a short or long time because electrical power transmission is stopped as a result of a lightning strike, or because the circuit breaker is tripped by a power supply short circuit.
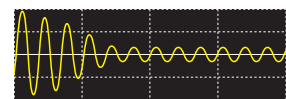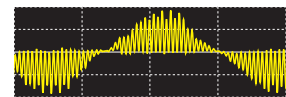
**Inrush Current**
A large current flows instantaneously at the moment electrical equipment, a motor, or similar devices are powered on.
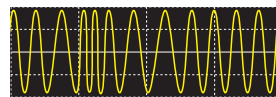
**Frequency Fluctuations**
An excessive increase or decrease of the load causes the operation of a generator to become unstable, resulting in frequency fluctuations.

**High-order Harmonic**
Voltage and current waveforms are distorted by noise components generated by a semiconductor control device or the like installed in the power supply of electronic equipment.
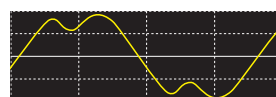
**Harmonic**
Harmonic is generated by a semiconductor control device installed in the power supply of equipment, causing distortion of voltage and current waveforms.
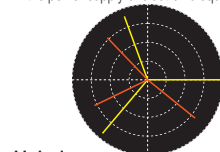
**Unbalance**
An increase or decrease in the load connected to each phase of the three-phase power supply or an unbalanced operation of equipment and devices causes the load of a particular phase to become heavy so that voltage and current waveforms are distorted, voltage drops, or negative phase sequence voltage is generated.

# Simultaneous Recording of TIME PLOT Data and Event Waveforms

## TIME PLOT Data — TIME PLOT Recording of All Parameters

The PW3198 can simultaneously record 8,000 or more parameters, such as voltage, current, power, power factor, frequency, integral power, harmonic, and flicker, at the specified recording interval. The PW3198 never fails to capture the peak because it performs calculations continuously and records the maximum, minimum, and average values within the recording interval.
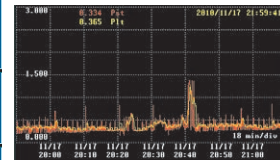
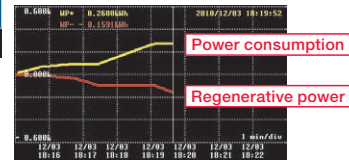Voltage drop occurred!
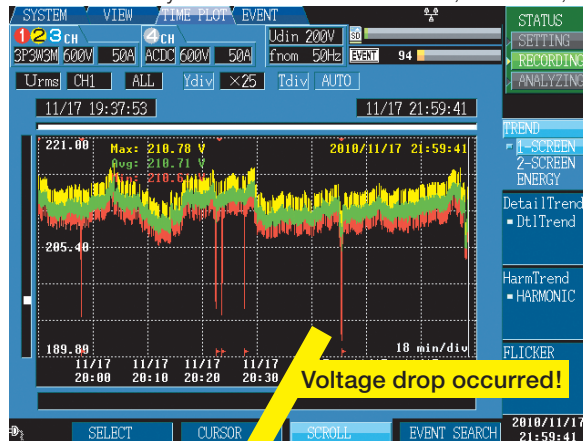
Trend Recording
(TIME PLOT Recording)

EVENT — Switch windows with one touch
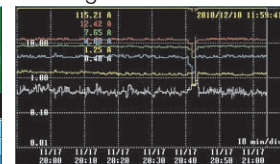
Harmonic Recording

Flicker and ΔV10 Recording

Power consumption
Regenerative power

Integral Power Recording

## Event Waveforms — Capture up to 55,000 Instantaneous Waveforms of Power Supply Failures

The PW3198 can record up to 1,000 instantaneous waveforms of power supply failures (up to 55,000 when repeat recording is set to ON) while performing TIME PLOT recording.

Event recording of waveforms

Event list
Event details
Event waveforms

View waveforms during measurement

ENTER
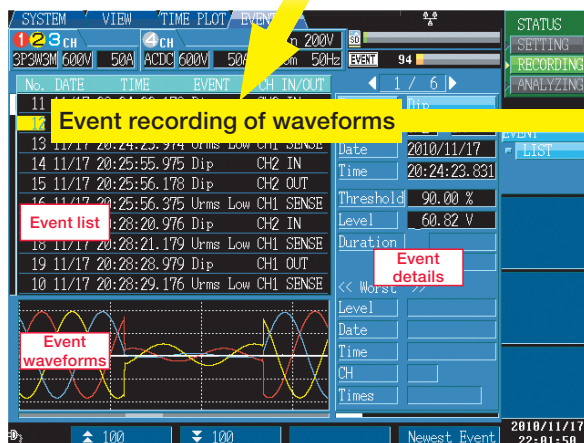
### Event List

This list records instantaneous waveforms of power supply failures (events), such as a voltage drop or inrush current, along with the time or other information. Events are always monitored, regardless of the recording interval of the TIME PLOT recording.
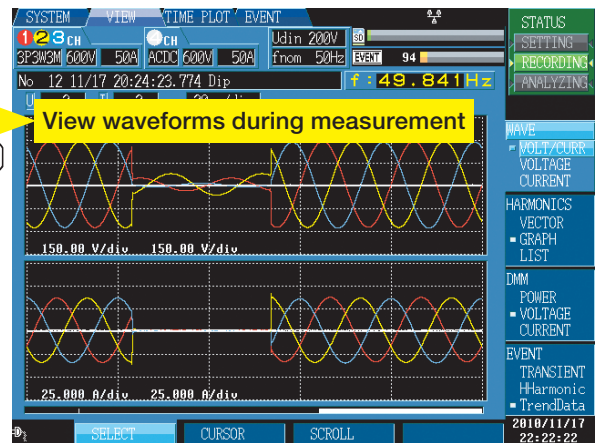
### Event Waveform

The PW3198 lets you view the instantaneous waveform (200 ms) of a power supply failure in the window.

Inrush current occurs

Voltage drop caused by inrush current
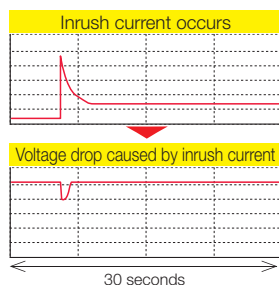
30 seconds

**RMS value changes over 30 seconds**

When a voltage drop or inrush current occurs, RMS value changes are recorded over 30 seconds simultaneously. This function can also be used to check the voltage drop caused by inrush current generated by the start of the motor.

# Analyze Recorded Data with a PC Using Application Software 9624-50 PQA-HiVIEW PRO

**Use Model 9624-50 PQA-HiVIEW PRO (version 2.00 or later) with a PC to analyze the data collected by the PW3198.**

## Viewer Function

Display and analyze the data recorded by the **PW3198 POWER QUALITY ANALYZER**.

### Event List Window
Display a list of power supply failures (events) that occurred.

### TIME PLOT Window
Display the TIME PLOT (recorded trend) data as well as changes in the voltage/current RMS values, harmonic, and many other parameters.

### Event Waveform Window
Display the waveform of an event that occurred, plus the vector, harmonic, DMM, and instantaneous harmonic values.

### ITIC Curve Display Window
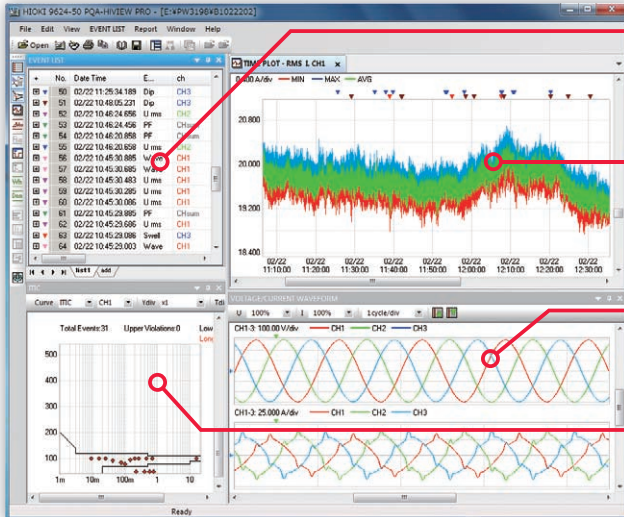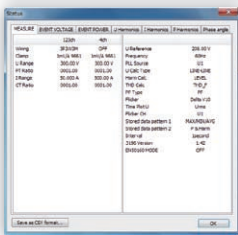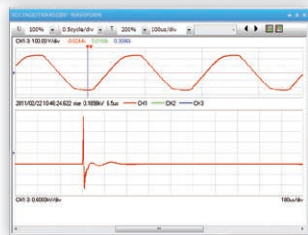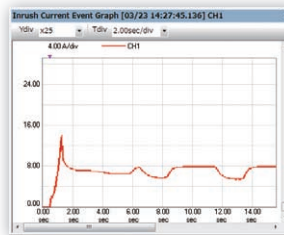Analyze the ITIC (CBEMA) curve (tolerance curve) used in the power quality standards in the United States.

Status Window

Transient Waveform Window

Inrush Current Event Graph Window
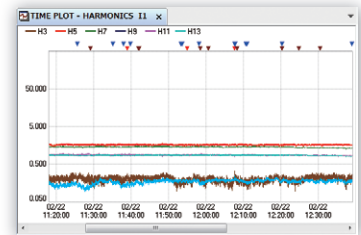
Harmonics TIME PLOT Window

## Report Creation Function

Automatically and effortlessly create rich reports for compliance and record management.

Report output items: Voltage/current RMS value fluctuation graph, harmonic fluctuation graph, inter-harmonics fluctuation graph, flicker graph, integral power graph, demand graph, total harmonic voltage/current distortion rate list, EN50160 window (Overview, Harmonic, Measurement Results Category), worst case, transient waveform, maximum/minimum value list, all event waveforms/detailed list, and setup list

### Print Examples
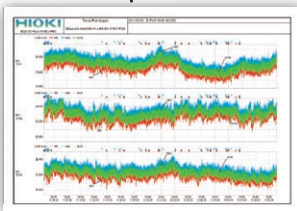
RMS Value Voltage Fluctuations
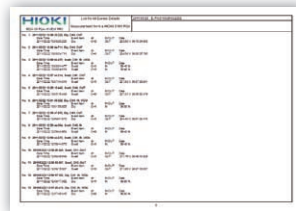
All Event Detailed List
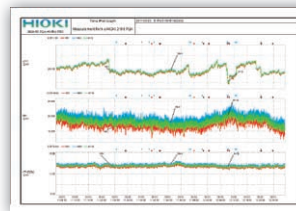
TIME PLOT Recording of Parameters
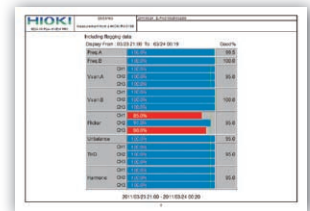
EN50160

## Other Functions

### CSV Conversion of Measurement Data
Convert data in the range specified in the TIME PLOT window into CSV format and then save for further processing. The 9624-50 can also convert event waveforms into CSV format. Open CSV data using any commercially available spreadsheet software for advanced data management and analysis.

### Even Analyze Data Recorded with Models 3196 and 3197 PQAs
Data recorded with the HIOKI 3196 and 3197 Power Quality Analyzers can also be analyzed.

### Download Measurement Data via USB/LAN
Data in the SD card inserted in the PW3198 can be downloaded to a PC via USB or LAN.

### EN50160 Display Function
EN50160 is a power quality standard for the EU. In this mode, evaluate and analyze power quality in accordance with the standard. You can display the Overview, Harmonic, and Measurement Results Category windows.

### 9624-50 Specifications

| Delivery media | CD-R |
|---|---|
| Operating environment | AT-compatible PC |
| OS | WindowsXP, WindowsVista(32-bit), Windows7(32/64-bit) |
| Memory | 512 MB or more |

# Useful Functions for a Wide Variety of Applications

## Large Capacity Recording with SD Card

Data is recorded to a large capacity SD card. The data can be transferred to a PC and analyzed using dedicated application software. If your PC is not equipped with an SD card slot, simply connect a USB cable between the PW3198 and the PC. The PC will then recognize the SD card as removable media.

| Repeat record | Recording period |
|---|---|
| OFF | **Max. 35 days** <br> Reference value: ALL DATA (all items recorded), repeat recording OFF, and TIME PLOT interval 1 minute or longer) |
| ON | **Max. 55 weeks (about 1 year)** <br> Reference value: ALL DATA (all items recorded), repeat recording ON (1 week x 55 times), and TIME PLOT interval 10 minutes or longer) |

## Remote Measurement Using HTTP Server Function

You can use any Internet browser to remotely operate the PW3198, plus download the data stored in the SD card using dedicated software (LAN access required).

**Conduct off-site remote control with a tablet PC using a wireless LAN router**

## GPS Time Synchronization

The PW9005 GPS BOX lets you synchronize the clock on the PW3198 to the UTC standard time. Eliminate time differences between multiple PQAs and correctly analyze measurement data taken by several instruments.
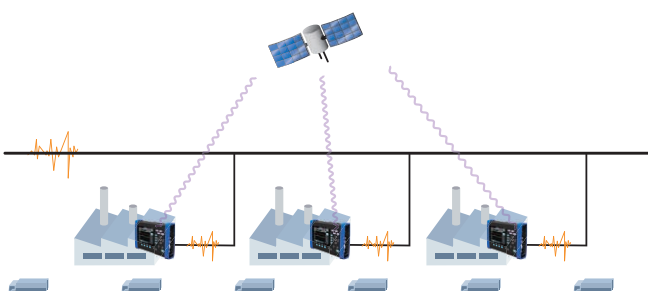
## Simultaneously Measure Three-phase Lines and Grounding Wire

Apart from the main measurement line, you can also measure the AC/DC voltage on another line using Channel 4.

### Yes! Simultaneously!

- **Measure the primary and secondary sides of UPS**
- **Two-line voltage analysis**
- **Measure three-phase lines and grounding wire**
- **Measure neutral lines to detect short circuits**
- Measure the input and output of a DC-AC converter for solar power generation

ch1, ch2, ch3          ch4
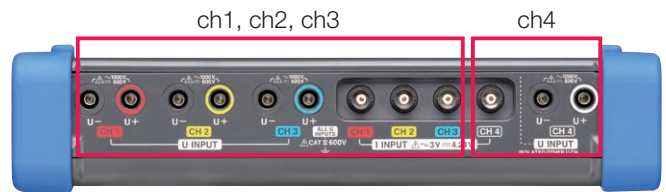
## An Assortment of Clamp-on Sensors Covers a Broad Range of Measurements

Model 9694 (5A) sensor has been added to the existing CLAMP ON SENSOR offerings: Models 9660 (100A), 9661 (500A), 9669 (1000A), and 9667 (5000A). You can also use a 9657-10 or 9675 CLAMP ON LEAK SENSOR to measure leakage currents in the milliampere range.
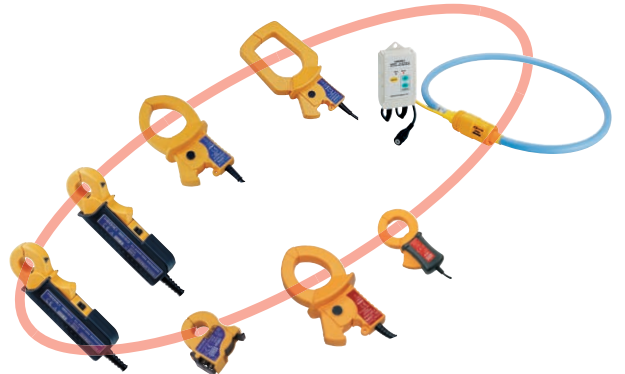
## Backup and Recovery from Power Failure

The PW3198 uses the new large capacity BATTERY PACK Z1003, enabling continuous measurement for three hours even if a power failure occurs. In addition, a power failure processing function restarts measurement automatically even if the power is cut off completely during measurement.

Previous model          6 times the battery life!

PW3198

30 minutes          180 minutes
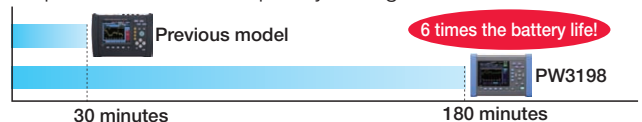
## Other Measurement Applications

**Flicker measurement**
Measure flicker in conformance with IEC 61000-4-15 Ed2.
**Phase voltage check for Δ connection**
Use the Δ-Y and Y-Δ conversion function to measure phase voltage using a virtual neutral point.
**400 Hz line measurement**
Measure at a power line frequency of 50/60 Hz as well as 400 Hz.

# Power Quality Survey Applications

## The power supply of the office equipment sometimes shuts down

**Survey Objective**
The power supply of a printer at the office shuts down even though it is not operated. Equipment other than the printer can also sometimes perform a reset unexpectedly.

**Measurement Method**
Setup is very easy. Just install the PW3198 on the site, and measure the voltage, current, and power. To troubleshoot, just select the clamp-on sensor and wiring, and then select the "U Events" course.

Voltage Fluctuation Graph
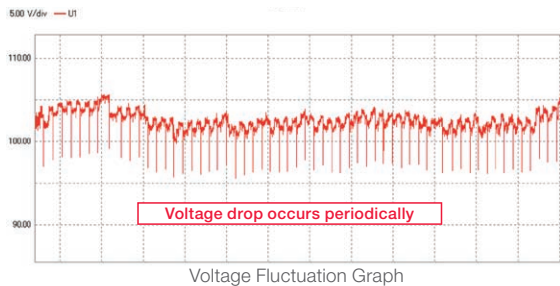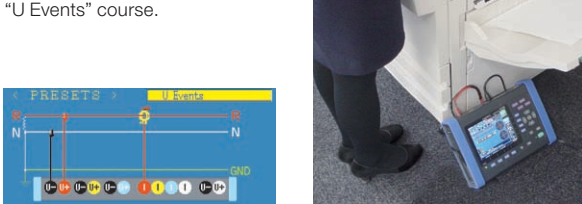
**Analysis Report**
No failure occurred during the measurement period, but a periodic voltage drop was confirmed. The voltage drop may have been caused by the periodic start and operation of the electrical equipment connected to the power supply line. **Equipment, such as a laser printer, copier, and electrical heater, may start themselves periodically due to residual heat. An instantaneous voltage drop is likely to have been caused by inrush current from equipment that consumes a large amount of power.**

## Medical equipment malfunctions

**Survey Objective**
Replacing the equipment with a new one by the service provider did not improve the malfunction. A survey of the power supply was required to clarify the cause.

**Measurement Method**
Select the "U Events" course in the PW3198 in the same way as with the office equipment example.

Voltage and Current Waveforms at the Time Voltage Dip Occurs
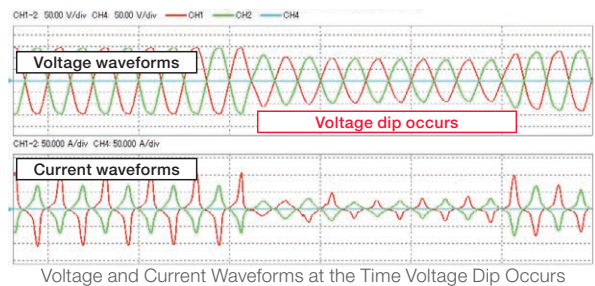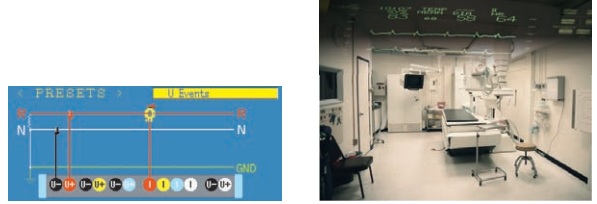
**Analysis Report**
It was determined that a voltage dip (voltage drop) occurred and impacted the operation of the equipment. **If a voltage dip occurs every day on a regular basis, the probable cause is the start of a large air-conditioning unit, pump, heater, or similar equipment.**

## Surveying a Solar Power Generation System

**Survey Objective**

- Maintain a solar power generation system and check its operation (verify the power quality)
- Troubleshoot (impact on the peripheral equipment, operation shutdown, etc.)

**Measurement Method**
Set up the PW3198 on the site and measure the voltage, current, and power. To survey the power quality, select the "Standard power quality measurement" course in the PRESETS menu. To measure the DC voltage, connect channel 4 to the primary side of the solar panel.
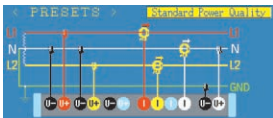
**Connection Example**
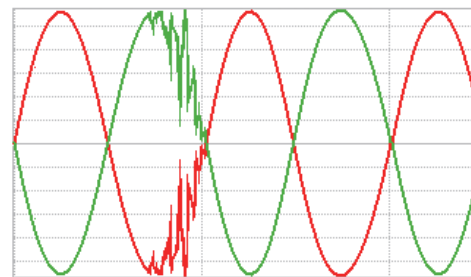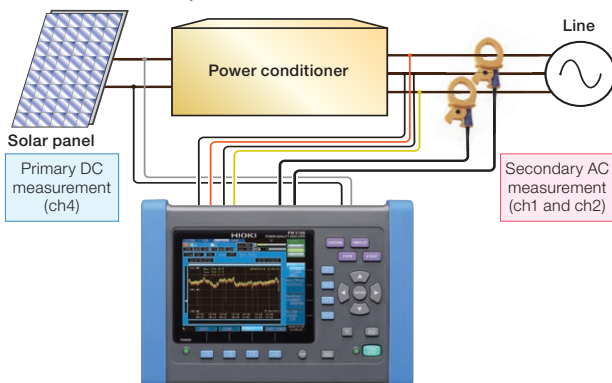
Example of Voltage Waveforms at the Time of Line Switching
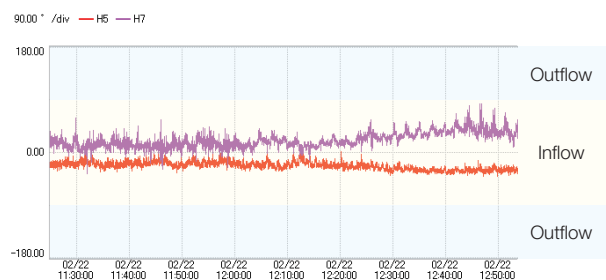
Example of Determining Inflow or Outflow
(Inflow of 5th and 7th Order Harmonic)

**Analysis Report**
All parameters can be recorded simultaneously with a single measurement.

- Identify changes in the output voltage of the power conditioner
- Presence or absence of the occurrence of a transient overvoltage
- Frequency fluctuation important for system interconnection
- Identify changes in the harmonic voltage and current included in the output
- Power, integral power, etc.

## PW3198 Specifications

(Accuracy guaranteed for one year)

### Measurement items

| | | |
|---|---|---|
| **Voltage** measurement items (TIME PLOT Recording) | RMS voltage<br>Frequency<br>Voltage DC<br>Harmonic voltage (0 to 50th order)<br>Inter-harmonic voltage (0.5 to 49.5th)<br>Total harmonic voltage distortion factor | Waveform voltage peak<br>Frequency (1 cycle, 10-sec)<br>IEC Flicker (Pst, Plt)<br>Harmonic voltage phase angle (0 to 50th)<br>High order harmonic voltage component<br>Voltage Unbalance factor<br>   (Zero-phase /Negative-phase) |
| **Current** measurement items (TIME PLOT Recording) | RMS current<br>Waveform current peak<br>Harmonic current phase angle (0 to 50th)<br>Harmonic current (0 to 50th)<br>Inter-harmonic current (0.5 to 49.5th) | High order harmonic current component<br>Total harmonic current distortion factor<br>Current Unbalance factor<br>   (Zero-phase /Negative-phase)<br>K factor<br>Current DC (with release of new clamp-on sensor) |
| **Power** measurement items (TIME PLOT Recording) | Active power<br>Reactive power<br>Apparent power<br>Power factor | Harmonic power (0 to 50th)<br>Harmonic voltage-current phase angle (0 to 50th)<br>Active energy<br>Reactive energy |
| **EVENT** measurement items (EVENT Recording) | Transient overvoltage<br>Voltage swell<br>Voltage dip<br>Interruption<br>Inrush current | Frequency fluctuations<br>Voltage waveform comparison<br>Timer<br>External events |
| | Event detection using upper and lower thresholds available with other voltage, current and power measurement parameters (excluding Integrated power, Unbalance, Inter-harmonic, Harmonic phase angle, IEC Flicker) | |

### Input specifications

| | |
|---|---|
| Measurement circuits | Single-phase 2-wire (1P2W), single-phase 3-wire (1P3W), three-phase 3-wire (3P3W2M, 3P4W2.5E) or three-phase 4-wire (3P4W) plus one extra input channel (must be synchronized to reference channel during AC/DC measurement) |
| Fundamental frequency of measurement circuit | 50Hz, 60Hz, 400Hz |
| Input channels | Voltage: 4 channels (U1 to U4), Current: 4 channels (I1 to I4) |
| Input methods | Voltage: Isolated and differential inputs (channels not isolated between U1, U2 and U3; channels isolated between U1 to U3 and U4)<br>Current: Insulated clamp-on sensors (voltage output) |
| Measurement ranges (Ch1 to Ch4 can be configured the same way; only CH4 can be configured separately) | Voltage measurement ranges |

| Voltage measurement items | Ranges |
|---|---|
| Voltage measurement | 600.00V rms |
| Transient measurement | 6.0000kV peak |

Current measurement ranges (Using clamp-on sensors )

| Using clamp-on sensors | Ranges | |
|---|---|---|
| 9694 | 5.0000A / | 50.000A |
| 9660 | 50.000A / | 100.00A |
| 9661 | 50.000A / | 500.00A |
| 9667 | 50.000A / | 500.00A |
| (range switchable also at sensor) | 500.00A / | 5.0000kA |
| 9669 | 100.00A / | 1.0000kA |
| 9695-02 | 5.0000A / | 50.000A |
| 9695-03 | 50.000A / | 100.00A |
| 9657-10 | 500.00mA / 5.0000A | |
| 9675 | 500.00mA / 5.0000A | |

Current measurement ranges
(automatically configured based on voltage and current range)

| Voltage measurement range<br><br>Current measurement range | 600.00V |
|---|---|
| 500.00mA | 300.00W |
| 5.0000A | 3.0000kW |
| 50.000A | 30.000kW |
| 100.00A | 60.000kW |
| 500.00A | 300.00kW |
| 1.0000kA | 600.00kW |
| 5.0000kA | 3.0000MW |

### Basic specifications

| | |
|---|---|
| Maximum recording period | 55 weeks (with repeated recording set to [1 Week], 55 iterations)<br>55 days (with repeated recording set to [1 Day], 55 iterations)<br>35 days (with repeated recording set to [OFF]) |
| Maximum recordable events | 55,000 events (with repeated recording on)<br>1000 events (with repeated recording off) |
| TIME PLOT data settings | TIME PLOT interval (MAX/MIN/AVG within each interval recorded)<br>  1s, 3s, 15s, 30s, 1m, 5m, 10m, 15m, 30m,1h, 2h,<br>  150 cycle (at 50Hz), 180 cycle (at 60Hz), 1200 cycle (at 400Hz)<br>Screen copy interval (screen shot at each interval saved to SD card)<br>  OFF, 5m, 10m, 30m, 1h, 2h<br>Timer EVENT interval (200ms instantaneous waveform saved at each interval)<br>  OFF, 1m, 5m, 10m, 30m, 1h, 2h<br>Time start and End<br>  OFF: Start recording manually<br>  ON: Start time and End time can be configured<br>Repeated recording settings (maximum 55 iterations)<br>  OFF: Recording is not repeated<br>  1Week: 55 weeks maximum in 1week segmentations<br>  1Day: 55 days maximum in 1day segmentations<br>  Repeat time<br>    Daily Start time and End time can be configured<br>    when Repeated recording set to 1Day. |
| Recording items settings | Power (Small):    Recording basic parameters<br>P&Harm (Normal): Recording basic parameters and harmonics<br>All Data (Full):    Recording P&Harm items and inter-harmonics |
| Memory data capacity | 2GB SD memory card |

### PRESETS function

| | |
|---|---|
| PRESETS function | **U Events**<br>  Record and monitor voltage elements and frequency, plus detect events<br>**Standard Power Quality**<br>  Record and monitor voltage and current elements, frequency, and harmonics, plus detect events<br>**Inrush Current**<br>  Measure inrush current (basic voltage measurement required)<br>**Recording**<br>  Record only trend data, no event detection<br>**EN50160**<br>  Measure according to EN50160 standards |
| Real-Time Clock function | Auto-calendar, leap-year correcting 24-hour clock |
| Real-time clock accuracy | ±0.3 s per day (with instrument on, 23°C±5°C (73°F±9°F) |
| Power supply | **AC ADAPTER Z1002** (12 VDC, Rated power supply 100VAC to 240VAC, 50/60Hz)<br>**BATTERY PACK Z1003** (Ni-MH 7.2VDC 4500 mAh) |
| Maximum rated power | 15VA (when not charging), 35VA (when charging) |
| Continuous battery operation time | Approx. 180 min. [@23°C (@73.4°F), when using **BATTERY PACK Z1003**] |
| Recharge function | **BATTERY PACK Z1003** charges regardless of whether the instrument is on or off; charge time: max. 5 hr. 30 min. @23°C (@73.4°F) |
| Power outage processing | In the event of a power outage during recording, instrument resumes recording once the power is back on (integral power starts from 0). |
| Power supply quality measurement method | IEC61000-4-30 Ed.2 :2008<br>IEEE1159<br>EN50160 (using Model **PQA-HiVIEW PRO 9624-50**) |
| Dimensions | Approx. 300 W× 211 H × 68 D mm (11.81" W × 8.31" H × 2.68" D) (excluding protrusions) |
| Mass | Approx. 2.6 kg (91.7 oz.) (including battery pack) |
| Accessories | Instruction manual, Measurement guide, **VOLTAGE CORD L1000** (8 cords, approx. 3 m each: 1 each red, yellow, blue, and gray plus 4 black; 8 alligator clips: 1 each red, yellow, blue, and gray plus 4 black), Spiral Tube, Input Cable Labels (for identifying channel of voltage cords and clamp-on sensors), **AC ADAPTER Z1002**, Strap, USB cable (1 m length), **BATTERY PACK Z1003**, **SD MEMORY CARD (2GB) Z4001** |

### Display specifications

| | |
|---|---|
| Display | 6.5-inch TFT color LCD (640 × 480 dots) |

### External Interface Specifications

| | |
|---|---|
| SD card Interface | Saving of binary data, Saving and Loading setting files, Saving and Loading screen copies<br>Slot:                 SD standard compliant<br>Compatible card:      SD memory card/ SDHC memory card<br>Supported memory capacity: 2GB<br>Media full processing:   Saving of data to SD memory card is stopped |
| RS-232C Interface | Measurement and control using GPS-synchronized time (connecting GPS BOX)<br>Connector:              D-sub9pin<br>Connection destination: GPS box (cannot be connected to computer) |
| LAN Interface | 1. HTTP server function (compatible software: Internet Explorer Ver.6 or later, Remote operation application function, measurement start and stop control functions, system configuration function, event list function (capable of displaying event waveforms, event vectors, and event harmonic bar graphs)<br>2. Downloading of data from the SD memory card using the 9624-50 PQA-HiView Pro<br>Connector:              RJ-45<br>Transmission method:   10BASE-T,100BASE-TX |
| USB2.0 Interface | 1. Recognizes the SD memory card as a removable disk when connected to a computer. *The instrument cannot be connected during recording (including standby operation) or analysis.*<br>2. Download data from the SD memory card using the 9624-50 PQA-HiView Pro *The instrument cannot be connected during recording (including standby operation) or analysis.*<br>Connector:              Series B receptacle<br>Connection destination: Computer [WindowsXP, WindowsVista(32bit), Windows7 (32/64bit)] |
| External control interface | Connector:              4-pin screwless terminal block<br>External event input:   External event input at TTL low level (at falling edge of 1.0 V or less and when shorted) between GND terminal and EVENT IN terminal Min. pulse width: 30 ms; rated voltage: -0.5 V to +6.0 V<br>External event output: |

| External event output item setting | Operation |
|---|---|
| Short pulse output | TTL low output at event generation<br>Low level for 10 ms or more |
| Long pulse output | TTL low output at event generation<br>(No external event output at START event)<br>Low level for approx. 2.5 s |
| ΔV10 alarm | TTL low output at ΔV10 alarm |

### Environment and safety specifications

| | |
|---|---|
| Operating environment | Indoors, altitude up to 3000 m (measurement category is lowered to 600 V CAT III when above 2000m), Pollution degree 2 |
| Storage temperature and humidity | -20 to 50°C (-4 to 122°F) 80% RH or less (non-condensating)<br>(If the instrument will not be used for an extended period of time, remove the battery pack and store in a cool location [from -20 to 30°C (-4 to 86°F)].) |
| Operating temperature and humidity | 0 to 50°C (32 to 122°F) 80% RH or less (non-condensating) |
| Dust and water resistance | IP30 (EN60529) |
| Maximum input voltage | Voltage input section 1000 VAC, DC±600 V, max. peak voltage ±6000 Vpeak |
| Maximum rated voltage to earth | Voltage input terminal 600 V<br>(Measurement Categories IV, anticipated transient overvoltage 8000 V) |
| Dielectric strength | 6.88 kVrms (@50/60 Hz, 1 mA sense current):<br>Between voltage measurement terminals (U1 to U3) and voltage measurement terminals (U4)<br>4.30 kVrms (1 mA@50/60 Hz, 1 mA sense current):<br>Between voltage input terminal (U1 to U3) and current input terminals/interfaces<br>Between voltage (U4) and current measurement terminals, and interfaces |
| Applicable standards | Safety    EN61010<br>EMC      EN61326 Class A, EN61000-3-2, EN61000-3-3 |

## Measurement Specifications
(For specifications when measuring 400Hz circuits, please inquire with your HIOKI distributor.)

**TIME PLOT** :The MAX/MIN/AVG of each recording interval for each parameter are recorded.

**EVENT** :When a power anomaly occurs, the 200ms instantaneous waveform is recorded.

**TRANSIENT** :When a transient overvoltage is detected, the 2ms instantaneous waveforms before and after the occurrence are recorded.

**FLUCTUATION** :The RMS fluctuation 0.5s before and 29.5s after an event has occurred are recorded.

**HIGH-ORDER HARM** :When a high order harmonic event occurs, the 40ms instantaneous waveform is recorded.

### Transient overvoltage  **TRANSIENT**  **EVENT**

| | |
|---|---|
| Display items | For single transient incidents and continuous transient incidents<br>　Transient voltage value, Transient width<br>For continuous transient incidents<br>　Transient period (Period from transient IN to transient OUT)<br>　Max. transient voltage value (Max. peak value during the period)<br>　Transient count during period |
| Measurement method | Detected from waveform obtained by eliminating the fundamental component (50/60/400 Hz) from the sampled waveform |
| Sampling frequency | 2MHz |
| Measurement range, resolution | ±6.0000kVpeak, 0.0001kV |
| Measurement bandwidth | 5 kHz (-3dB) to 700 kHz (-3dB) |
| Min. detection width | 0.5 μs |
| Measurement accuracy | ±5.0% rdg.±1.0%f.s. |

### RMS voltage/ RMS current refreshed each half-cycle  **TIME PLOT**  **EVENT**

| | |
|---|---|
| Measurement method | RMS voltage refreshed each half-cycle:<br>　True RMS type, RMS values are calculated using sample data for<br>　1 waveform derived by overlapping the voltage waveform every half-cycle<br>RMS current refreshed each half-cycle:<br>　RMS current is calculated using current waveform data sampled every half-cycle |
| Sampling frequency | 200kHz |
| Measurement range, resolution | RMS voltage refreshed each half-cycle: 600.00V, 0.01V<br>RMS current refreshed each half-cycle: Based on clamp-on sensor in use; see Input specifications |
| Measurement accuracy | RMS voltage refreshed each half-cycle:<br>　±0.2% of nominal voltage<br>　(With 1.666% f.s. to 110% f.s. input and a nominal input voltage of at least 100 V)<br>　±0.2%rdg.±0.08%f.s.<br>　(With input outside the range of 1.666% f.s. to 110% f.s. or a nominal<br>　 input voltage of less than 100 V)<br>RMS current refreshed each half-cycle:<br>　±0.3% rdg.±0.5%f.s. + clamp-on sensor accuracy |

### Swell/ Dip/ Interruption  **FLUCTUATION**  **EVENT**

| | | |
|---|---|---|
| Display item | Swell:<br>Dip:<br>Interruption: | Swell height, Swell duration<br>Dip depth, Dip duration<br>Interruption depth, Interruption duration |
| Measurement method | Swell:<br><br>Dip:<br><br>Interruption: | A swell is detected when the RMS voltage refreshed each half-cycle exceeds the threshold in the positive direction<br>A dip is detected when the RMS voltage refreshed each half-cycle exceeds the threshold in the negative direction<br>An interruption is detected when the RMS voltage refreshed each half-cycle exceeds the threshold in the negative direction |
| Range and accuracy | See RMS voltage refreshed each half-cycle | |

### Inrush current  **FLUCTUATION**  **EVENT**

| | |
|---|---|
| Display item | Maximum current of RMS current refreshed each 1/2 cycle |
| Measurement method | Detected when the RMS current refreshed each 1/2 cycle exceeds the threshold in a positive direction |
| Range and accuracy | See RMS current refreshed each half-cycle |

### RMS voltage, RMS current  **TIME PLOT**  **EVENT**

| | |
|---|---|
| Display items | RMS voltage:<br>　RMS voltage for each channel and AVG (average) RMS voltage for multiple channels<br>RMS current:<br>　RMS current for each channel and AVG (average) RMS current for multiple channels |
| Measurement method | AC+DC True RMS type (Current DC value: with release of new clamp-on sensor)<br>RMS value calculated from 10 cycles (50 Hz) or 12 cycles (60 Hz) |
| Sampling frequency | 200kHz |
| Measurement range, resolution | RMS voltage:　　　　　　600.00V, 0.01V<br>RMS current: Based on clamp-on sensor in use; see Input specifications |
| Measurement accuracy | RMS voltage:<br>　±0.1% of nominal voltage<br>　(With 1.666% f.s. to 110% f.s. input and a nominal input voltage of at least 100 V)<br>　±0.2%rdg.±0.08%f.s.<br>　(With input outside the range of 1.666% f.s. to 110% f.s. or a nominal<br>　 input voltage of less  than 100 V)<br>RMS current:<br>　±0.2% rdg.±0.1%f.s. + clamp-on sensor accuracy |

### Voltage waveform peak/ Current waveform peak  **TIME PLOT**  **EVENT**

| | |
|---|---|
| Display item | Positive peak value and negative peak value |
| Measurement method | Measured every 10 cycles (50 Hz) or 12 cycles (60 Hz)<br>maximum and minimum points sampled during approx. 200 ms aggregation |
| Sampling frequency | 200kHz |
| Measurement range, resolution | Voltage waveform peak:<br>　±1200.0 Vpeak, 0.1V<br>Current waveform peak:<br>　The quadruple of RMS current measurement range<br>　Due to using clamp-on sensor; See Input specifications |

### Voltage waveform comparison  **EVENT**

| | |
|---|---|
| Display item | Event detection only |
| Measurement method | A judgment area is automatically generated from the previous 200 ms aggregation waveform, and events are generated based on a comparison with the judgment waveform. Waveform judgments are performed once for each 200 ms aggregation. |
| Comparison window width | 10 cycles (50 Hz), 12 cycles (60 Hz) |
| No. of window points | 4096 points synchronized with harmonic calculations |

### Frequency cycle  **TIME PLOT**  **EVENT**

| | |
|---|---|
| Measurement method | Calculated as the reciprocal of the accumulated whole-cycle time during one U1 (reference channel) cycle |
| Measurement range, resolution | 70.000Hz, 0.001Hz |
| Measurement bandwidth | 40.000 to 70.000Hz |
| Measurement accuracy | ±0.200 Hz or less (for input from 10% f.s. to 110% f.s.) |

### Frequency  **TIME PLOT**  **EVENT**

| | |
|---|---|
| Measurement method | Calculated as the reciprocal of the accumulated whole-cycle time during approx. 200ms period of 10 or 12 U1 (reference channel) cycles |
| Measurement range, resolution | 70.000Hz, 0.001Hz |
| Measurement bandwidth | 40.000 to 70.000Hz |
| Measurement accuracy | ±0.020 Hz or less |

### 10-sec frequency  **TIME PLOT**

| | |
|---|---|
| Measurement method | Calculated as the reciprocal of the accumulated whole-cycle time during the specified 10s period for U1 (reference channel) as per IEC61000-4-30 |
| Measurement range, resolution | 70.000Hz, 0.001Hz |
| Measurement bandwidth | 40.000 to 70.000Hz |
| Measurement accuracy | ±0.010 Hz or less |

### Voltage DC value (ch4 only)  **TIME PLOT**  **EVENT**

| | |
|---|---|
| Measurement method | Average value during approx. 20ms aggregation synchronized with the reference channel (CH4 only) |
| Sampling frequency | 200kHz |
| Measurement range, resolution | 600.00V, 0.01V |
| Measurement accuracy | ±0.3%rdg. ±0.08%f.s. |

### Current DC value (ch4 only; with release of new clamp-on sensor)  **TIME PLOT**  **EVENT**

| | |
|---|---|
| Measurement method | Average value during approx. 200ms aggregation synchronized to reference channel (CH4 only) |
| Sampling frequency | 200kHz |
| Measurement range, resolution | Based on clamp-on sensor in use (with release of new clamp-on sensor) |
| Measurement accuracy | ±0.5% rdg.±0.5%f.s. + clamp-on sensor accuracy |

### Active power/ Apparent power/ Reactive power  **TIME PLOT**  **EVENT**

| | | |
|---|---|---|
| Display items | Active power:<br><br>Apparent power:<br><br>Reactive power: | Active power for each channel and sum value for multiple channels<br>Sink (consumption) and Source (regeneration)<br>Apparent power of each channel and its sum for multiple channels<br>No polarity<br>Reactive power of each channel and its sum for multiple channels<br>Lag phase (LAG: current lags voltage) and Lead phase (LEAD: current leads voltage) |
| Measurement method | Active power:<br>Apparent power:<br>Reactive power: | Measured every 10 cycles (50 Hz) or 12 cycles (60 Hz)<br>Calculated from RMS voltage U and RMS current I<br>Calculated using apparent power S and active power P |
| Sampling frequency | 200kHz | |
| Measurement range, resolution | Depends on the voltage × current range combination; see Input specifications | |
| Measurement accuracy | Active power:<br>Apparent power:<br>Reactive power: | ±0.2% rdg.±0.1%f.s. + clamp-on sensor accuracy<br>±1 dgt. for calculations derived from the various measurement values<br>±1 dgt. for calculations derived from the various measurement values |

### Active energy /Reactive energy  **TIME PLOT**

| | |
|---|---|
| Display items | Active energy:　WP+ (consumption), WP- (regeneration); Sum of multiple channels<br>Reactive energy:WQLAG (lag), WQLEAD (lead); Sum for multiple channels Elapsed time |
| Measurement method | Measured every 10 cycles (50 Hz) or 12 cycles (60 Hz)<br>Integrated separately by consumption and regeneration from active power<br>Integrated separately by lag and lead from reactive power<br>Integration starts at the same time as recording<br>Recorded at the specified TIMEPLOT interval |
| Sampling frequency | 200kHz |
| Measurement range, resolution | Depends on the voltage × current range combination; see Input specifications |
| Measurement accuracy | Active energy:　Active power measurement accuracy ±10 dgt.<br>Reactive energy:Reactive power measurement accuracy ±10 dgt. |

### Power factor /Displacement power factor  **TIME PLOT**  **EVENT**

| | |
|---|---|
| Display items | Displacement power factor of each channel and its sum value for multiple channels |
| Measurement method | Power factor:<br>　Calculated from RMS voltage U, RMS current I, and active power P<br>Displacement power factor :<br>　Calculated from the phase difference between the fundamental voltage wave<br>　and the fundamental current wave<br>Lag phase (LAG: current lags voltage) and Lead phase (LEAD: current leads voltage) |
| Sampling frequency | 200kHz |
| Measurement range, resolution | -1.0000 (lead) to 0.0000 to 1.0000 (lag) |

### Voltage unbalance factor/ Current unbalance factor (negative-phase, zero-phase)  **TIME PLOT**

| | |
|---|---|
| Display items | Voltage unbalance factor:<br>　Negative-phase unbalance factor, zero-phase unbalance factor<br>Current unbalance factor:<br>　Negative-phase unbalance factor, zero-phase unbalance factor |
| Measurement method | Calculated using various components of the three-phase fundamental wave (line-to-line voltage) for three-phase 3-wire (3P3W2M, 3P3W3M) and three-phase 4-wire connections |
| Sampling frequency | 200kHz |
| Measurement range | Voltage unbalance factor:<br>　Component is V and unbalance factor is 0.00% to 100.00%<br>Current unbalance factor:<br>　Component is V and unbalance factor is 0.00% to 100.00% |
| Measurement accuracy | Voltage unbalance factor: ±0.15%<br>Current unbalance factor: — |

### High-order harmonic voltage component/ High-order harmonic current component  **HIGH-ORDER HARM**  **TIME PLOT**  **EVENT**

| | |
|---|---|
| Display items | For single incidents and continuous transient incidents<br>　High-order harmonic voltage component value<br>　High-order harmonic current component value<br>For continuous incidents<br>　High-order harmonic voltage component maximum value<br>　High-order harmonic current component maximum value<br>　High-order harmonic voltage component period<br>　High-order harmonic current component period |
| Measurement method | The waveform obtained by eliminating the fundamental component is calculated using the true RMS method during 10 cycles (50 Hz) or 12 cycles (60 Hz) of the fundamental wave |
| Sampling frequency | 200kHz |
| Measurement range, resolution | High-order harmonic voltage component: 600.00V, 0.01V<br>High-order harmonic current component: Based on clamp-on sensor in use; See Input specifications |
| Measurement bandwidth | 2kHz (-3dB) to 80kHz (-3dB) |
| Measurement accuracy | High-order harmonic voltage component: ±10%rdg. ±0.1%f.s.<br>High-order harmonic current component: ±10% rdg.±0.2%f.s. + clamp-on sensor accuracy |

### Harmonic voltage/ Harmonic current (including fundamental component) `TIME PLOT` `EVENT`

| | |
|---|---|
| Display items | Select either RMS or content percentage; From 0 to 50th order |
| Measurement method | Uses IEC61000-4-7:2002. |
| Comparison window width | 10 cycles (50 Hz), 12 cycles (60 Hz) |
| No. of window points | 4096 points synchronized with harmonic calculations |
| Measurement range, resolution | Harmonic voltage:600.00V, 0.01V<br>Harmonic current:Based on clamp-on sensor in use; see Input specifications |
| Measurement accuracy | See measurement accuracy with a fundamental wave of 50/60 Hz<br>When using an AC-only clamp sensor, 0th order is not specified for current and power |

### Total harmonic voltage/ Total harmonic current distortion factor `TIME PLOT` `EVENT`

| | |
|---|---|
| Display items | THD-F (total harmonic distortion factor for the fundamental wave)<br>THD-R (total harmonic distortion factor for the total harmonic including the fundamental wave) |
| Measurement method | Based on IEC61000-4-7:2002; Max. order: 50th |
| Comparison window width | 10 cycles (50 Hz), 12 cycles (60 Hz) |
| No. of window points | 4096 points synchronized with harmonic calculations |
| Measurement range, resolution | 0.00 to 100.00%(Voltage), 0.00 to 500.00%(Current) |
| Measurement accuracy | — |

### Harmonic power (including fundamental component) `TIME PLOT` `EVENT`

| | |
|---|---|
| Display item | Select either RMS or content percentage; From 0 to 50th order |
| Measurement method | Uses IEC61000-4-7:2002. |
| Comparison window width | 10 cycles (50 Hz), 12 cycles (60 Hz) |
| No. of window points | 4096 points synchronized with harmonic calculations |
| Measurement range, resolution | Depends on the voltage × current range combination; See Input specifications |
| Measurement accuracy | See measurement accuracy with a fundamental wave of 50/60 Hz<br>When using an AC-only clamp sensor, order 0 is not specified for current and power |

#### Measurement accuracy with a fundamental wave of 50/60 Hz

| Harmonic input | Measurement accuracy | |
|---|---|---|
| Voltage (At least 1% of nominal voltage) | Specified with a nominal voltage of at least 100 V | |
| | Order 0: | ±0.3%rdg.±0.08%f.s. |
| | Order 1+: | ±5.00%rdg |
| Voltage (<1% of nominal voltage) | Specified with a nominal voltage of at least 100 V | |
| | Order 0: | ±0.3%rdg.±0.08%f.s. |
| | Order 1+: | ±0.05% of nominal voltage |
| Current | Order 0: | ±0.5%rdg.±0.5%f.s. +clamp-on sensor accuracy |
| | Order 1 to 20th: | ±0.5%rdg.±0.2%f.s. +clamp-on sensor accuracy |
| | Order 21 to 50th: | ±1.0%rdg.±0.3%f.s. +clamp-on sensor accuracy |
| Power | Order 0: | ±0.5%rdg.±0.5%f.s. +clamp-on sensor accuracy |
| | Order 1 to 20th: | ±0.5%rdg.±0.2%f.s. +clamp-on sensor accuracy |
| | Order 21 to 30th: | ±1.0%rdg.±0.3%f.s. +clamp-on sensor accuracy |
| | Order 31 to 40th: | ±2.0%rdg.±0.3%f.s. +clamp-on sensor accuracy |
| | Order 41 to 50th: | ±3.0%rdg.±0.3%f.s. +clamp-on sensor accuracy |

### Harmonic voltage phase angle/ Harmonic current phase angle (including fundamental component) `TIME PLOT`

| | |
|---|---|
| Display item | Harmonic phase angle components for whole orders |
| Measurement method | Uses IEC61000-4-7:2002. |
| Comparison window width | 10 cycles (50 Hz), 12 cycles (60 Hz) |
| No. of window points | 4096 points synchronized with harmonic calculations |
| Measurement range, resolution | -180.00° to 0.00° to 180.00° |
| Measurement accuracy | — |

### Harmonic voltage-current phase angle (including fundamental component) `TIME PLOT` `EVENT`

| | |
|---|---|
| Display item | Indicates the difference between the harmonic voltage phase angle and the harmonic current phase angle.<br>Harmonic voltage-current phase difference for each channel and sum (total) value for multiple channels |
| Measurement method | Uses IEC61000-4-7:2002. |
| Comparison window width | 10 cycles (50 Hz), 12 cycles (60 Hz) |
| No. of window points | 4096 points synchronized with harmonic calculations |
| Measurement range, resolution | -180.00° to 0.00° to 180.00° |
| Measurement accuracy | 1st to 3rd orders:   ± 2° +clamp-on sensor accuracy<br>4th to 50th orders: ±(0.05° × k+2°) +clamp-on sensor accuracy; (k: harmonic orders)<br>Specified with a harmonic voltage of 1 V for each order and a current level of at 1% f.s. or greater. |

### Inter-harmonic voltage and inter-harmonic current `TIME PLOT`

| | |
|---|---|
| Display item | Select either RMS or content percentage; 0.5 to 49.5th orders |
| Measurement method | Uses IEC61000-4-7:2002. |
| Comparison window width | 10 cycles (50 Hz), 12 cycles (60 Hz) |
| No. of window points | 4096 points synchronized with harmonic calculations |
| Measurement range, resolution | Inter-harmonic voltage:  600.00V, 0.01V<br>Inter-harmonic current:  Due to using clamp-on sensor; See Input specifications |
| Measurement accuracy | Inter-harmonic voltage (Specified with a nominal voltage of at least 100 V):<br>    At least 1% of harmonic input nominal voltage: ±5.00% rdg.<br>    <1% of harmonic input nominal voltage: ±0.05% of nominal voltage<br>Inter-harmonic current: Unspecified |

### K Factor (multiplication factor) `TIME PLOT` `EVENT`

| | |
|---|---|
| Measurement method | Calculated using the harmonic RMS current of the 2nd to 50th orders |
| Comparison window width | 10 cycles (50 Hz), 12 cycles (60 Hz) |
| No. of window points | 4096 points synchronized with harmonic calculations |
| Measurement range, resolution | 0.00 to 500.00 |
| Measurement accuracy | — |

### Instantaneous flicker value `TIME PLOT`

| | |
|---|---|
| Measurement method | As per IEC61000-4-15<br>User-selectable from 230 Vlamp/120 Vlamp (when Pst and Plt are selected for flicker measurement)/4 types of Ed2 filter (230 Vlamp 50/60 Hz, 120 Vlamp 60/50 Hz) |
| Measurement range, resolution | 99.999, 0.001 |

### IEC Flicker `TIME PLOT`

| | |
|---|---|
| Display items | Short interval flicker Pst, long interval flicker Plt |
| Measurement method | Based on IEC61000-4-15:1997 +A1:2003 Ed1/Ed2.<br>Pst is calculated after 10 minutes of continuous measurement and Plt after 2 hours of continuous measurement |
| Measurement range | 0.0001 to 10000 P.U. broken into 1,024 segments with a logarithm |
| Measurement accuracy | Pst ±5% rdg. (Specified within range 0.1000 to 20.000 using IEC61000-4-15 Ed1.1 and IEC61000-4-15 Ed2 Class F1 performance test.) |
| Flicker filter | Select 230 V lamp Ed1, 120 V lamp Ed1, 230 V lamp Ed2, or 120 V lamp Ed2. |

### Δ V10 Flicker `TIME PLOT`

| | |
|---|---|
| Display items | ΔV10 measured at one minute intervals, average value for one hour, maximum value for one hour, fourth largest value for one hour, total (within the measurement interval) maximum value |
| Measurement method | Calculated values are subject to 100 V conversion following gap-less measurement once each minute |
| Measurement range, resolution | 0.000 to 99.999V |
| Measurement accuracy | ±2% rdg.±0.01 V (with a fundamental wave of 100 Vrms [50/60 Hz], a fluctuation voltage of 1 Vrms, and a fluctuation frequency of 10 Hz) |
| Threshold | 0.00 to 9.99V alarm output is generated when the reading for each minute is compared to the threshold and found to be greater |

### Clamp-on sensors specifications (Options)

| Clamp-on sensor | CLAMP ON SENSOR 9694 | CLAMP ON SENSOR 9660 | CLAMP ON SENSOR 9661 |
|---|---|---|---|
| Primary current rating | 5A AC | 100A AC | 500A AC |
| Output voltage | 10mV/A AC | AC 1mV/A AC | AC 1mV/A AC |
| Measurement range | See input specifications | | |
| Amplitude accuracy * | ±0.3%rdg.±0.02%f.s. * | ±0.3%rdg.±0.02%f.s. * | ±0.3%rdg.±0.01%f.s * |
| Phase accuracy * | ±2°  or less * | ±1° or less * | ±0.5° or less * |
| Maximum allowable input * | 50 A continuous * | 130 A continuous * | 550 A continuous * |
| Maximum rated voltage to earth | CAT III 300Vrms | | CAT III 600 Vrms |
| Frequency characteristics | ±1.0% or less for 66Hz to 5kHz (deviation from specified accuracy) | | |
| Cord length | 3m (9.84ft) | | |
| Measurable conductor diameter | Max.φ15mm (0.59") | | Max.φ46mm (1.81") |
| Dimensions & weight | 46W(1.81")×135H(5.31")×21D(0.83")mm, 230g(8.1oz.) | | 78W(3.07")×152H(5.98")×42D(1.65")mm, 380g(13.4oz.) |
| Appearance | See "Options, Current measurement (p.12)" | | |

* :   45 to 66Hz

| Clamp-on sensor | CLAMP ON SENSOR 9669 | CLAMP ON SENSOR 9667 |
|---|---|---|
| Primary current rating | 1000 A AC | 500A AC, 5000A AC |
| Output voltage | 0.5mV/A AC |  500 mV AC f.s. |
| Measurement range | See input specifications | |
| Amplitude accuracy * | ±1.0%rdg.±0.01%f.s. * | ±2.0%rdg.±1.5mV (for input 10% or more of the range) * |
| Phase accuracy * | ±1° or less * | ±1° or less * |
| Maximum allowable input * | 1000 A continuous * | 10000 A continuous * |
| Maximum rated voltage to earth | CATIII 600Vrms | CATIII 1000 Vrms (insulated conductor) |
| Frequency characteristics | Within ±2% at 40Hz to 5kHz (deviation from accuracy) | ±3dB or less for 10 Hz to 20kHz (deviation from accuracy) |
| Cord length | 3m (9.84ft) | Sensor to circuit: 2m (6.56ft)<br>Circuit to connector: 1m (3.28ft) |
| Measurable conductor diameter | Max. φ55 mm(2.17"), 80 (3.15")×20(0.79") mm busbar | Max. φ254mm(10") |
| Dimensions and weight | 99.5W (3.92") × 188H (7.40") × 42D (1.65") mm, 590g (20.8 oz.) | Sensor length: 910 mm (2.99 ft), 240 g (8.5 oz.), Circuit: 57W (2.24") × 86H (3.39") × 30D (1.18") mm, 140 g (4.9 oz.) |
| Power supply | — | LR03 alkaline battery × 4 (continuous operation max. 168 hours) or AC ADAPTER 9445 (sold separately) |
| Appearance | See "Options, Current measurement (p.12)" | |

* :   45 to 66Hz

| Clamp-on sensor | CLAMP ON SENSOR 9695-02 | CLAMP ON SENSOR 9695-03 |
|---|---|---|
| Primary current rating | 50A AC | 100A AC |
| Output voltage | 10mV/A AC | 1mV/A AC |
| Measurement range | See input specifications | |
| Amplitude accuracy * | ±0.3%rdg.±0.02%f.s. * | ±0.3%rdg.±0.02%f.s. * |
| Phase accuracy * | Within ±2° * | Within ±1° * |
| Maximum allowable input * | 130 A continuous * | 130 A continuous * |
| Maximum rated voltage to earth | CATIII 300Vrms (insulated conductor) | |
| Frequency characteristic | Within ±2% at 40Hz to 5kHz (deviation from accuracy) | |
| Cord length | CONNECTION CORD 9219 (sold separately) is required. | |
| Measurable conductor diameter | Max.φ15mm(0.59") | |
| Dimensions and weight | 51W(2.01")×58H(2.28")×19D(0.75")mm, 50g(1.8oz.) | |
| Appearance | See "Options, Current measurement (p.12)" | |

Note: CONNECTION CORD 9219 (sold separately) is required.
* :   45 to 66Hz

| Clamp-on leak sensor | CLAMP ON LEAK SENSOR 9657-10 | CLAMP ON LEAK SENSOR 9675 |
|---|---|---|
| Primary current rating | 10A AC | 10A AC |
| Output voltage | 100 mV/A AC | 100 mV/A AC |
| Measurement range | See input specifications | |
| Amplitude accuracy * | ±1.0%rdg.±0.05%f.s. * | ±1.0%rdg.±0.005%f.s. * |
| Residual current characteristics | Max. 5mA (in 100A go and return electric wire) | Max. 1mA (in 10A go and return electric wire) |
| Effect of external magnetic fields | 400A AC/m corresponds to 5mA, Max. 7.5mA | |
| Maximum rated voltage to earth | CATIII 300Vrms (insulated conductor) | |
| Cord length | 3m (9.84ft) | |
| Measurable conductor diameter | Max. φ40 mm(1.57") | Max. φ30 mm(1.18oz") |
| Dimensions and weight | 74W(2.91")×145H(5.71")× 42D(1.65)mm, 380g(13.4oz.) | 60W(2.36")×112.5H(4.43")× 23.6D(23.6")mm, 160g(5.6oz.) |
| Appearance | See "Options, Current measurement (p.12)" | |

* :   45 to 66Hz

# Options

## Current measurement  (see P.11 Clamp-on sensors specifications for details)

### CLAMP ON SENSOR (Load current)

**9694**
5A AC, φ15mm(0.59"),
Cord length : 3m(9.84ft)

**9661**
500A AC, φ46mm(1.81"),
Cord length : 3m(9.84ft)

**9695-02** (50A AC)
**9695-03** (100A AC)
φ15mm(0.59"),
**CONNECTION CORD 9219**
is required (sold separately)

**9667**
500A AC / 5000A AC (selectable),
φ254mm (10"),
Cord length : Sensor to circuit: 2m (6.56ft)
Circuit to connector: 1m (3.28ft)
Power supply: LR03 alkaline battery
or **AC ADAPTER 9445-02/03** (sold separately)

### CLAMP ON ADAPTER

**9290-10**
CT ratio 10:1, AC1000A,
φ55mm(2.17"),
80(3.15")×20(0.79")mm busbar,
Cord length : 3m(9.84ft)

**9660**
100A AC, φ15mm(0.59"),
Cord length : 3m(9.84ft)

**9669**
1000A AC, φ55mm(2.17"),
80(3.15")×20(0.79")mm busbar,
Cord length : 3m(9.84ft)

**CONNECTION CORD 9219**
For connecting 9695-02,9695-03
Cord length : 3m(9.84ft)

### CLAMP ON LEAK SENSOR (Leak Current)

**9657-10**
10A AC, φ40mm(1.57"),
Cord length : 3m(9.84ft)

**9675**
10A AC, φ30mm(1.18"),
Cord length : 3m(9.84ft)

## Voltage measurement

**WIRING ADAPTER
PW9000**
For 3P3W WIRING

**WIRING ADAPTER
PW9001**
For 3P4W WIRING

Reduce voltage
cords for easy wiring

φ11mm(0.43")

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

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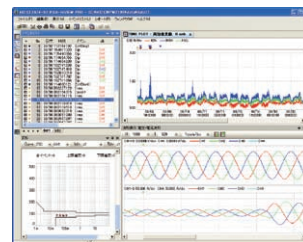(Example: 3P3W - 3 adapters; 3P4W - 4 adapters)

**GRABBER CLIP
9243**
For use with the standard
Voltage Cord **L1000**

## Application software

**PQA-HiVIEW PRO
9624-50**

Use Model 9624-50 PQA-HiVIEW PRO
(version 2.00 or later) with a PC to analyze
the data collected by the PW3198.

## Case

**CARRYING CASE
C1001**
Soft case
450W× 345W× 210Dmm
(17.7"W× 13.6"H× 8.3"D)
3.4kg (120oz.)

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

## Clock synchronization

**GPS BOX PW9005**
To synchronize the PW3198 clock,
Accessory: Connection cable set

**POWER QUALITY ANALYZER PW3198**
(Bundled accessories)
**SD MEMORY CARD 2GB Z4001,
VOLTAGE CORD L1000, AC ADAPTER Z1002,
BATTERY PACK Z1003,** Instruction manual,
Measurement guide, Strap, USB cable (Approx.
1m in length)

## POWER QUALITY ANALYZER PW3198-90

(Set with PQA HiVIEW PRO 9624-50
and bundled accessories)

### IMPORTANT
**Use Model PQA-HiVIEW PRO 9624-50
(version 2.00 or later) with a PC to analyze
the data collected by the PW3198.**

## Bundled accessories

**Voltage Cord L1000**
8 cords, approx. 3 m each:
1 each red, yellow, blue,
and gray plus 4 black;
8 alligator clips: 1 each red,
yellow, blue, and gray plus
4 black

**AC ADAPTER Z1002**
Power supply for the PW3198
100V AC to 240V AC

**SD MEMORY CARD 2GB
Z4001**

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

### IMPORTANT
Use only the SD Card
**Z4001** sold by HIOKI.

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## ● Combination example: For three-phase 4-wire circuits containing leak current

| PW3198-90 | + | 9661 × 3 | + | 9675 | + | PW9001 | + | C1001 |
|---|---|---|---|---|---|---|---|---|
| POWER QUALITY ANALYZER PW3198 set with PQA HiVIEW PRO 9624-50 | | CLAMP ON SENSOR (500A) | | CLAMP ON LEAK SENSOR | | WIRING ADAPTER | | CARRYING CASE |

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

All information correct as of Aug. 10, 2011.  All specifications are subject to change without notice.

PW3198E2-18M-00H   Printed in Japan