POWER QUALITY ANALYZER PW3198

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%
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.
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.

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.

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

World’s highest level of basic measurement accuracy. Extremely accurate voltage measurement without the need to switch ranges.

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

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

**PW3198 Never Misses the Moment a Power Supply Failure Occurs**

**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.

**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.

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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.

**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.

**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.

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**
- 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.

- **Voltage drop caused by inrush current**
  - 30 seconds
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**
  Display the status window.

- **Transient Waveform Window**
  Display the transient waveform window.

- **Inrush Current Event Graph Window**
  Display the inrush current event graph window.

- **Harmonics TIME PLOT Window**
  Display the harmonics TIME PLOT window.

- **RMS Value Voltage Fluctuations**
  Display the RMS value voltage fluctuations.

- **All Event Detailed List**
  Display all event detailed list.

- **TIME PLOT Recording of Parameters**
  Display the TIME PLOT recording of parameters.

- **ENS0160**
  Display the ENS0160 display 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
- ENS0160 window (Overview, Harmonic, Measurement Results Category)
- Worst case, transient waveform
- Maximum/minimum value list
- All event waveforms/detailed list
- Setup list

**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.

**ENS0160 Display Function**

ENS0160 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**

<table>
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<tr>
<th>Specification</th>
<th>Requirement</th>
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<tbody>
<tr>
<td>Delivery media</td>
<td>CD-ROM</td>
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<tr>
<td>Operating environment</td>
<td>All compatible PC</td>
</tr>
<tr>
<td>OS</td>
<td>WindowsXP, WindowsVista(32-bit),</td>
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<td></td>
<td>Windows7(32/64-bit)</td>
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<tr>
<td>Memory</td>
<td>512 MB or more</td>
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</table>
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.

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<tr>
<th>Repeat record</th>
<th>Recording period</th>
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<tr>
<td>OFF</td>
<td>Max. 35 days, Reference value: ALL DATA (all items recorded), repeat recording OFF, and TIME PLOT interval 1 minute or longer</td>
</tr>
<tr>
<td>ON</td>
<td>Max. 55 weeks (about 1 year), Reference value: ALL DATA (all items recorded), repeat recording ON (1 week x 53 times), and TIME PLOT interval 10 minutes or longer</td>
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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).

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

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.

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.
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.

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.

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.

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**

**Measurement items**

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<th>Value</th>
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<td>1.0000kA, 500.00A</td>
</tr>
<tr>
<td>Input resistance</td>
<td>5.0000A, 3.0000kW</td>
</tr>
<tr>
<td>Input power factor</td>
<td>0.5000A, 3.0000kW</td>
</tr>
<tr>
<td>Input current</td>
<td>50.000A, 300.00kW</td>
</tr>
</tbody>
</table>
The MAX/MIN/AVG of each recording interval for each parameter are recorded.

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

When a high order harmonic event occurs, the 40ms instantaneous waveform is recorded.

### Measurements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMS Voltage / Current</td>
<td>Refreshed each half-cycle</td>
</tr>
<tr>
<td>Voltage waveform</td>
<td>Harmonic voltage component / Harmonic current component</td>
</tr>
<tr>
<td>Frequency</td>
<td>Calculated as the reciprocal of the accumulated whole cycle-time during</td>
</tr>
<tr>
<td></td>
<td>one U1 (reference channel) cycle</td>
</tr>
</tbody>
</table>

### Sampling Frequency

- 200kHz
- 400kHz
- 800kHz
- 1.6MHz

### Measurement Accuracy

- ±0.01% rdg. ±0.01% fs
- ±0.01% rdg. ±0.01% fs + clamp-on sensor accuracy
- ±0.1dgt. for calculations derived from various measurement values

### Active Energy / Reactive energy

- Active energy: ±0.1% rdg. ±0.2% fs + clamp-on sensor accuracy
- Reactive energy: ±0.5% rdg. ±0.6% fs + clamp-on sensor accuracy

### Power Factor / Displacement power factor

- Active power factor: ±0.1dgt. for calculations derived from various measurement values
- Reactive power factor: ±0.5dgt. for calculations derived from various measurement values

### Voltage Unbalance factor

- Voltage unbalance factor: ±0.15dgt. ±clamp-on sensor accuracy

### Display Items

- Voltage waveform peak: Voltage unbalance factor, zero-phase unbalance factor
- Current unbalance factor: ±0.00% to 100.00%
- Current unbalance factor: ±0.00% to 100.00%
- Reactive energy: ±0.1dgt. for calculations derived from various measurement values

### Notes

- Displacement power factor is calculated using the true RMS method during 10 cycles (50 Hz) or 12 cycles (60 Hz) of the fundamental wave.
### Harmonic Voltage/Current (including fundamental component)

**Display items:** Select either RMS or current percentage; From 0 to 50th order

**Measurement method:**
- Uses IEC61000-4-7:2002

**Comparison window with:**
- 10 cycles (50 Hz), 12 cycles (60 Hz)

**No. of window points:** 4096 points synchronized with harmonic calculations

**Measurement range, resolution:**
- Harmonic voltage: 0.005 V to 500 V
- Harmonic current: 0.05 A to 20 A
- Inter-harmonic input: 10% of nominal voltage

**Measurement accuracy:**
- Volts: ±(0.5% rdg. + ±(0.02% x k) + clamp-on sensor accuracy)
- Amperes: ±(1.0% rdg. + 0.1% of current) or ±((1.0% of current) + 0.5 mA)

**Harmonic power (including fundamental component)**

**Display items:**
- Select either RMS or current percentage; From 0 to 50th order

**Measurement method:** Uses IEC61000-4-7:2002

**Comparison window with:**
- 10 cycles (50 Hz), 12 cycles (60 Hz)

**No. of window points:** 4096 points synchronized with harmonic calculations

**Measurement range, resolution:**
- Harmonic voltage: 0.005 V to 500 V
- Harmonic current: 0.05 A to 20 A
- Inter-harmonic input: 10% of nominal voltage

**Measurement accuracy:**
- Volts: ±(0.5% rdg. + ±(0.02% x k) + clamp-on sensor accuracy)
- Amperes: ±(1.0% rdg. + 0.1% of current) or ±((1.0% of current) + 0.5 mA)

### Harmonic Power (including fundamental component)

**Display items:**
- Select either RMS or current percentage; From 0 to 50th order

**Measurement method:**
- Uses IEC61000-4-7:2002

**Comparison window with:**
- 10 cycles (50 Hz), 12 cycles (60 Hz)

**No. of window points:** 4096 points synchronized with harmonic calculations

**Measurement range, resolution:**
- Harmonic voltage: 0.005 V to 500 V
- Harmonic current: 0.05 A to 20 A
- Inter-harmonic input: 10% of nominal voltage

**Measurement accuracy:**
- Volts: ±(0.5% rdg. + ±(0.02% x k) + clamp-on sensor accuracy)
- Amperes: ±(1.0% rdg. + 0.1% of current) or ±((1.0% of current) + 0.5 mA)

### Inter-harmonic voltage and inter-harmonic current

**Display items:** Select either RMS or current percentage; 0.5 to 49.5th orders

**Measurement method:**
- Uses IEC61000-4-7:2002

**Comparison window with:**
- 10 cycles (50 Hz), 12 cycles (60 Hz)

**No. of window points:** 4096 points synchronized with harmonic calculations

**Measurement range, resolution:**
- Inter-harmonic voltage: 0.000 1 V to 100 V
- Inter-harmonic current: 0.05 A to 10 A

**Measurement accuracy:**
- Inter-harmonic voltage: ±(0.5% rdg. + ±(0.05% rdg. + 0.21% of voltage) + clamp-on sensor accuracy)
- Inter-harmonic current: ±(1.0% rdg. + 1% of current) or ±(1.0% rdg. + 0.5 mA)

### K Factor (multiplication factor)

**Display items:**
- Calculated using the harmonic RMS current of the 2nd to 50th orders

**Measurement method:**
- Uses IEC61000-4-7:2002

**Comparison window with:**
- 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:**
- 99.99, 0.001

### Instantaneous flicker value

**Display items:**
- As per IEC61000-4-15

**Measurement method:**
- Uses IEC61000-4-15

**Comparison window with:**
- 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:**
- 99.99, 0.001

---

### IEC Flicker

**Display items:**
- CLAMP ON SENSORS: 9694, 9695, 9669

**Measurement method:**
- Uses IEC61000-4-7:2002

**Comparison window with:**
- 10 cycles (50 Hz), 12 cycles (60 Hz)

**No. of window points:** 4096 points synchronized with harmonic calculations

**Measurement range, resolution:**
- Harmonic voltage: 0.005 V to 500 V
- Harmonic current: 0.05 A to 20 A
- Inter-harmonic input: 10% of nominal voltage

**Measurement accuracy:**
- Volts: ±(0.5% rdg. + ±(0.02% x k) + clamp-on sensor accuracy)
- Amperes: ±(1.0% rdg. + 0.1% of current) or ±((1.0% of current) + 0.5 mA)
## Options

### Current measurement

- **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) φ50mm (2.0")
    - **CONNECTION CORD 9219** is required (sold separately)
- **CLAMP ON ADAPTER**
  - **9667** 500A AC / 5000A AC (selectable), φ254mm (10"), Cord length : 3m (9.84ft)
  - **9290-10** CT ratio 10:1, AC1000A, φ55mm (2.17"), 80 (3.15") × 20 (0.79") mm busbar, Cord length : 3m (9.84ft)

### Voltage measurement

- **WIRING ADAPTER** PW9000 For 3P3W WIRING
- **WIRING ADAPTER** PW9001 For 3P4W WIRING
- **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

### Case

- **CARRYING CASE** C1001 Soft case
- **CARRYING CASE** C1002 Hard case

### Clock synchronization

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

### Application software

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

### Bundled accessories

- **Voltage Cord L1000**
  - 8 cords, approx. 1 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

### Combination example:

For three-phase 4-wire circuits containing leak current

<table>
<thead>
<tr>
<th>Power Quality Analyzer PW3198 (Bundled accessories)</th>
<th>SD Memory Card 2GB Z4001</th>
<th>AC Adapter Z1002 Power Supply for the PW3198 100V AC to 240V AC</th>
<th>Voltage Cord L1000 8 cords, approx. 1 m each: 1 each red, yellow, blue, and gray plus 4 black</th>
<th>8 alligator clips: 1 each red, yellow, blue, and gray plus 4 black</th>
<th>10A AC, φ30mm (1.18&quot;) Cord length : 3m (9.84ft)</th>
<th>10A AC, φ25mm (1.18&quot;) Cord length : 3m (9.84ft)</th>
<th>Use Model 9624-50 POA-HIVIEW PRO (version 2.00 or later) with a PC to analyze the data collected by the PW3198.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW3198</td>
<td>9661 x 3</td>
<td>9675</td>
<td>PW9001</td>
<td>C1001</td>
<td>9624-50</td>
<td>POA-HIVIEW PRO</td>
<td></td>
</tr>
<tr>
<td>POWER QUALITY ANALYZER</td>
<td>CLAMP ON SENSOR (500A)</td>
<td>CLAMP ON LEAK SENSOR</td>
<td>WIRING ADAPTER</td>
<td>CARRYING CASE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>