POWER QUALITY ANALYZER 3196

Investigate All Your Power Quality Problems

- New Safety Grip Feature for Easy Handling
- New HiVIEW PRO Software
- Now with Simple & Easy Report Generation!

- Power waveform observation
- Abnormal waveform recording
- Harmonic measurement
- Flicker measurement
- Power measurement
  All in a single unit!

EN50160
IEC61000-4-30
Compatible to 400Hz Circuits!

PQA-HiVIEW PRO 9624-50

www.hioki.com

ISO 9001 JMI-0216
ISO14001 JQA-E-90091
HIOKI company overview, new products, environmental considerations and other information are available on our website.
Capture all power anomalies without fail!

Problems with power quality are all around us

Have you ever experienced any of the following?

- Flickering lights
- Light bulbs burn out quickly
- Electronic office equipment does not function properly
- Sometimes devices operate abnormally
- Overheating in facilities using condensers fitted with reactors
- 3E (electrical overload, reverse phase, or phase loss) relays sometimes trip

These types of problems and others are often due to degraded power quality.

Discovering the cause can be difficult

The quickest way to solve power problems is to have a clear understanding of the cause, and be able to determine where the phenomenon occurred. However, it is not always possible to accurately grasp all of the various types of anomalies that may occur on power lines, even when using recording or harmonic analysis devices to investigate them.

Dedicated measuring instruments are required in order to accurately grasp these kinds of anomalies.

Overlooking the smallest of power anomalies can lead to enormous financial loss. Checking the quality of your power lines is the best way to prevent problems before they occur.

Fully identify the many phenomena hiding in your power lines

- **Transient Overvoltage (Impulse)**
  
  **Phenomenon:**
  Occurs due to lightning or circuit breaker/relay contact damage or closure. Often involves radical changes in voltage with high voltage peaks.
  
  **Damage:**
  In the vicinity of the event, high voltage often damages equipment power supplies or causes devices to reset.

- **Voltage Dip**
  
  **Phenomenon:**
  Caused by momentary voltage drops resulting from large rush current in loads, such as when starting up a motor.
  
  **Damage:**
  The drop in voltage may cause devices to stop operating or reset.

- **Voltage Swell**
  
  **Phenomenon:**
  Caused by lightning strikes or opening/closing power lines with heavy loads, causing the voltage to swell momentarily.
  
  **Damage:**
  The surge in voltage may damage equipment power supplies or cause devices to reset.

- **Flicker (IEC, ΔV10)**
  
  **Phenomenon:**
  Caused by blast furnaces, arc welding, and thyristor-controlled loads, and involving regularly repeated voltage impulses spanning one or more cycles.
  
  **Damage:**
  Because this phenomenon is cyclically repeated, it may cause lights to flicker or devices to malfunction.

These types of phenomena can be difficult to identify and address without dedicated measuring instruments. The 3196 can simultaneously measure, record, and analyze all of the above phenomena.

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  **Damage:**
  In the vicinity of the event, high voltage often damages equipment power supplies or causes devices to reset.

- **Harmonics**
  
  **Phenomenon:**
  Often occurs due to voltage/current waveform distortion when a semiconductor control device is used in a device's power supply.
  
  **Damage:**
  When harmonic components become too large, they can cause serious malfunctions, such as overheating in motor transformers, or burn-out of reactors connected to phase advance capacitors.

- **Unbalance factor**
  
  **Phenomenon:**
  Voltage/current waveform distortion and voltage drops or voltage phase reversals can occur when the load on a particular power line phase increases due to load fluctuations or imbalances.
  
  **Damage:**
  Voltage imbalance, reverse phase voltage, and harmonics can result in events such as uneven motor rotation, tripping of 3E breakers, and overheating due to transformer overloading.

The 3196 can simultaneously measure, record, and analyze all of the above phenomena.
Supports data analysis with a wide range of functions!

The 3196 measures, records and analyzes power line quality

Features

- Supports single-phase 2-wire, single-phase 3-wire, three-phase 3-wire and three-phase 4-wire systems. Further, the unit has an extra input channel providing enhanced analysis capabilities.
- An isolated CH4 terminal is provided for AC and DC measurement.
- Neutral line measurement you can use for ground fault detection!
- Analyze DC power supplies
- Performs simultaneous analysis of two isolated systems, such as single phase and three phase lines
- Comes equipped with Δ-Y and Y-Δ conversion functions
  - Supports Δ-Y voltage conversion for three-phase, 3-wire systems, and Y-Δ voltage conversion for three-phase, 4-wire systems. Selectable display of inter-line voltage and phase voltage.
- Wide selection of clamp on current sensors
  - In addition to clamp-on current sensors Models 9660 (100 A), 9661(500 A), 9669 (1000 A), and 9667 (5000 A, flexible), HIOKI also provides the 9694 (5 A) sensor, which is ideal for CT terminal measurement, as well as two other clamps for 5A leak measurement, Models 9657-10 and 9675, to suit every application need.
- Three-phase voltage wiring adapter (optional)
  - Use the wiring adapter to simplify voltage wiring procedures.
    - 9264-01 for three-phase, 3-wire systems
    - 9264-02 for three-phase, 4-wire systems

- Full compatibility to 400Hz circuits
  (Please specify inspection data sheet requirements for 400 Hz test points at time of order.)
- Simultaneous measurement and continuous processing
  All data are measured simultaneously and processing is performed continuously, so important fault data is not missed.
  Further, transient overvoltages up to 2000 V with durations as low as 0.5 μs are captured without fail.
- Seven different display languages
  Select a display language from Japanese, English, German, French, Spanish, Italian or Chinese . You can switch between the different display languages to suit your location.
- 6.4-inch color LCD
  The unit uses a TFT color LCD screen, providing bright display with a wide viewing angle. The color display provides easy viewing of waveforms, both indoors and out.
- Extended measurement of up to one month with internal memory
  The unit’s internal memory (13 MB) supports up to one month of continuous recording.
  *The amount of time available for continuous measurement can be checked when setting the measurement interval.
  *Use a PC card to record at shorter measurement intervals over longer periods in conjunction with the internal memory.

<table>
<thead>
<tr>
<th>Storage Media</th>
<th>Storage of Events (Usage capacity)</th>
<th>Interval time</th>
<th>Power</th>
<th>P&amp;Harm</th>
<th>ALL DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Memory</td>
<td>Max. 100 (approx. 1MB)</td>
<td>1 s</td>
<td>2 h 01 m</td>
<td>8 m</td>
<td>5 m</td>
</tr>
<tr>
<td></td>
<td>Max. 5000 (approx. 3MB) Fixed</td>
<td>1 m</td>
<td>5 days 1 hour</td>
<td>8 h 29 m</td>
<td>5 h 45 m</td>
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<tr>
<td></td>
<td>Max. 1000 (approx. 1MB) Fixed</td>
<td>1 h</td>
<td>31 days</td>
<td>21 days 5 h</td>
<td>14 days 9 h</td>
</tr>
<tr>
<td>PC Card (128MB)</td>
<td>Max. 100 (approx. 0.1MB)</td>
<td>1 m</td>
<td>31 days</td>
<td>8 days 8 h</td>
<td>5 days 16 h</td>
</tr>
<tr>
<td></td>
<td>Max. 5000 (approx. 3MB Fixed)</td>
<td>1 m</td>
<td>31 days</td>
<td>2 days 13 h</td>
<td>1 days 17 h</td>
</tr>
<tr>
<td></td>
<td>Max. 1000 (approx. 1MB) Fixed</td>
<td>1 s</td>
<td>14 h 40 m</td>
<td>1 h 1 m</td>
<td>41 m</td>
</tr>
</tbody>
</table>

*When recording Time Series data, select MAX/MIN/AVE
*Refer to the specifications for details regarding the recordable items.
*Max. continuous save: 31 days
*During the measurement period, all dips, swells and interruptions are calculated.

- PC card slot
  Flash ATA cards up to 528 MB can be used to allow more detailed data collection.
  Compact flash cards can also be used with an adapter.
- LAN and RS-232C interfaces
  The 3196 features an HTTP server to enable easy configuration and data analysis through a Web browser from a remote location.
- Synchronize the 3196 clock
  Connect the optional XD112 GPS Box to make sure the time recorded for measured events is based on the global standard time.

- Two types of carrying case available (optional)
  Choose from the soft (9339) or hard (9340) carrying cases, or the XD112 GPS Box to make sure the time is accurate.
- Extended data collection
  Select the 3196 with extended measurement capability and extended data collection.

- Optional printer for easy hard copy output
  Connect the optional 9670 printer to the RS-232C terminal for easy hard copy output of screens.

- External event input/output terminals
  Event output : Outputs a signal when events occur either as an alarm or device control signal.
  Event input : Accepts a trigger signal to initiate measurement.

- Small and Lightweight
  Compact A4 size, and weighing only 2.25 kg (79.4 oz).
Real-time data display for power supplies

Display waveform, vector, DMM, and harmonic data in real-time

The VIEW screen displays voltage/current waveforms, vector diagrams, DMM values (voltage, current, and power), and harmonic data. All data can be measured and processed simultaneously, and power conditions such as distortion factor, K factor, and the unbalance factor for three-phase lines can be monitored using the various data displays.

Connect the 3196 to a power source to display power line data in real-time!

All power line conditions can be monitored from the VIEW screen!

- Display data in real-time
  - 1. Waveform display (voltage/current display, 4-channel voltage display, 4-channel current display)
  - 2. Vector display
  - 3. DMM display (power, voltage, and current displays)
  - 4. Harmonics (graph and list displays)

- Power management through a rich array of information
  - 1. Check the distortion of power waveforms using electronic devices and electrical overloads.
  - 2. Manage the phase of power lines. Check the phase and wiring of the VT (PT) and CT terminals.
  - 3. Manage, maintain and check the unbalance factor, peak values, and distortion factor of power lines.
  - 4. Assess and develop countermeasures to prevent the occurrence of harmonic power flow.

Check for proper instrument connection using the numerical value or vector display

Connect the 3196 to the power line to be monitored while viewing the connection diagram. Upon connection, you can confirm voltage, current, and power values. Further, through the vector display, you can verify proper connection of clamp-on current sensors to the VT (PT) and CT terminals.

Waveform display

This displays the voltage and current waveforms for each phase. Waveform display makes it easy to understand distortion conditions that (as with harmonics) are difficult to grasp from numerical values alone.

DMM display

This displays detailed data for voltage, current, and power. View the data necessary for power management or maintenance and inspection of power lines at a single glance.

Vector display

This displays the voltage and current vectors for each phase, as well as RMS values and phase angles as numerical values. Easily check the phase of three-phase lines and harmonics.

DMM display

This displays detailed data for voltage, current, and power. View the data necessary for power management or maintenance and inspection of power lines at a single glance.

Harmonics display

This displays harmonics and inter-harmonics data in a graph or list. You can also display the phase difference for each harmonic order, and work out the current direction for harmonics.

- Display the fundamental voltage waveform for the 1st order (U1, U2, and U3) as a phase angle of 360° as a standard. Ideal for checking three-phase power lines.
- Displays the unbalance factor when measuring three-phase power lines. (For 3P3W3M and 3P4W settings)
- The harmonic order cursor value is displayed.
- Inter-harmonics display (light blue) Detailed numerical data for up to the 50th harmonic order is displayed in a list.
Capture anomalies while using time series measurement to monitor power lines

Simultaneous time series monitoring for RMS fluctuations, voltage fluctuations, harmonics fluctuations, and flickering

RMS fluctuation, voltage fluctuation, harmonic fluctuation, and flicker (IEC and ΔV10) time series data is displayed on the TIME PLOT screen. In addition to cursor measurement, you can enlarge events that occur in the voltage fluctuation event screen if a voltage dip, swell, or instantaneous interruption event occurs during the measurement period.

Simply set the interval and start time series measurement to display events in the fluctuation graph

All measurement results are automatically recorded

-1. RMS fluctuation (dual screen display selection)
-2. Voltage fluctuation (interval and event displays)
-3. Harmonic fluctuation (harmonics and inter-harmonics displays)
-4. Flicker (graph and list displays)
  • Pst and Plt measurement conditions according to IEC standards
  • ΔV10 measurement (according to Japanese domestic guidelines)

Calculation method for measured data

-1. RMS fluctuations/Harmonic fluctuations: Values are calculated continuously every 200 ms. The maximum, minimum, and average values are those applicable within the specified interval.
-2. Voltage fluctuations: Values are calculated for a single waveform shifted by a half wave. The maximum and minimum values are those applicable within the specified interval. Detailed measurement of voltage fluctuations is possible because values are calculated every half wave.
-3. Flicker: Values are calculated in accordance using calculation methods defined in the IEC and ΔV10 standards.

In addition to displaying the various measurements in fluctuation graphs, the 3196 also displays the maximum, minimum, and average values for each specified interval.

Further, when the 3196 captures a power anomaly, an event marker appears in the upper part of the graph.

RMS fluctuation display

When a power anomaly occurs during measurement, the event is indicated using the ▼ marker.

Voltage fluctuation display

Cursor values (maximum and minimum values for the specified interval) are displayed.

Even when a long interval is set, momentary voltage fluctuations are accurately captured.

Harmonic fluctuation display

You can specify display of up to six harmonic orders.

Cursor values are displayed for the specified orders.

IEC flicker display

Displays the Pst and Plt values as a graph once every ten minutes.

Cursor markers are displayed in blue. (▼ marker)

Event display

When an event such as a dip, swell, or instantaneous interruption occurs, the time axis is enlarged on the event screen.

Displays a list of detailed data for Pst and Plt values once every ten minutes.
Use event data to analyze the cause of power anomalies!

Display the details for power anomalies captured using event triggers

You can capture a variety of power anomalies by setting the individual trigger levels on the event setting screen. Captured data is displayed in the event list. This enables you to quickly confirm detailed data for phenomena (such as date/time, waveforms, RMS values, and harmonics), that are the source of problems, and effectively assess the cause of the problem.

Set event triggers, start measurement → Capture power anomalies → Search list → Display details

Make event trigger settings and start measurement!

1. Select a trigger threshold value that is suitable for the parameter being measured.
   Set thresholds along with other settings. You can make threshold settings while monitoring the actual input level, input waveform, and harmonics graph.

   ![Threshold setting screen](image)

   All trigger settings can be made at once, enabling accurate capture of complex power anomalies.
   When using the unit’s internal memory to save events, up to 100 events are automatically saved, or up to 1000 events when using a PC card.

Once measurement is finished, search the event list to confirm detailed data for events—even during measurement

2. Confirm the details for events in the list screen.
   The capture date and event category are displayed.

   ![Event list screen](image)

   Waveform display range:
   14 waveforms at 50 Hz
   16 waveforms at 60 Hz

   Simultaneously display voltage and current waveforms for instantaneous interruptions.

   Select an event with the cursor and press the ENTER key

3. Confirm the number of captured events in the monitor screen.
   The number of times each event occurred is visible at a glance. You can also check the events while they are being measured.

   Shows detailed data for the event that you selected with the cursor. (Date of occurrence, event type, level, continuous measurement period)

   Transient overvoltages up to 2000 Vpk with durations as low as 0.5 µs are captured without fail.

   For transient capture

   Transient display range within 4 ms

   Enlarge the transient waveform display.

   Confirm values using the cursor.

   Cursor value

   Detailed transient values
Remote measurement is simplified using the HTTP server function

Real-time measurement/control and download measurement data over the Worldwide Web

- The HTTP server function as a standard feature makes remote measurement even more convenient
  You can perform remote observation and control using an ordinary Web browser, such as Internet Explorer, without the need for special software. Further, you can download measurement data that has been saved onto a PC card.

Using the 3196 and your PC, you can observe power anomalies at remote locations and analyze measurement data

- Choose from a variety of network measurement plans
  By connecting a PC to the 3196, you can set up various types of network measurement systems through a LAN or RS-232C interface.

Ex. 1. Direct connection with a LAN cable

Ex. 2. Remote connection with a LAN through a hub

Ex. 3. Remote RS-232C connection through a modem

Ex. 4. Remote RS-232C connection through a modem

View the 3196 screen on your PC as soon as you open the remote application from your Web browser!

1. Enter the IP address for the 3196 on the browser to display the main screen.
2. A display screen and operation keys identical to those for the 3196 appear, allowing full control of remote operation. Because the various key operations are identical to those for the 3196, the keys are easy to use.
3. Confirm the events that occurred in the list.
4. Confirm detailed data for events, such as waveforms.
5. You can also convert waveform data into text. Click the waveform data. Microsoft Excel starts, and you can save the text data for the waveforms.
6. Using the report creation function, you can paste the event screen displayed into Microsoft Word*. 

* When Microsoft Word is selected as the Internet Explorer HTML editor; Compatible with Microsoft Word 97 or later.
Easy-to-Use Application Software Package for Further Data Analysis

PQA-HiVIEW PRO 9624-50

Features

■ Viewer function
Use this function to display screens similar to those used for the 3196.
Select from the TIME PLOT screen (voltage fluctuation, RMS fluctuation, harmonic fluctuation, inter-harmonic fluctuation), event list screen, event data screen (waveforms, vectors, DMM, harmonics, event details), \( \Delta V_{10} \) screen (Japanese standard), or settings screen. In the TIME PLOT screen, and use the two cursors (A and B) to calculate waveforms within a specified interval.

■ Demand/integral power consumption function
Calculate demand and integral power consumption from TIME PLOT data for effective power.

■ Binary CSV format conversion function
Convert binary data into CSV format for event waveforms within the specified range in the TIME PLOT screen or event waveforms selected in the event waveform screen. Files saved in CSV format can be used with spreadsheet software on your PC.

■ Print function
Use this function in each screen to output reports to a printer connected to your PC.

1. Load measurement data and then select the desired display from the toolbar

1. After loading the data, the possible displays are shown on the toolbar

2. Display multiple 3196 screens simultaneously on your PC, and make calculations and analyses using cursors

■ TIME PLOT screen
This screen enables you to select four different types of data, including RMS fluctuation, voltage fluctuation, harmonic fluctuation, and inter-harmonic fluctuation data, and display the data in graphs corresponding to the TIME PLOT screen of the 3196.

■ Event list screen
This screen displays an event list corresponding to the event list on the 3196.

■ Event data screen
1. Displays detailed data for the event that you selected in the event list.
2. Displays nine different screens that correspond to the VIEW screen on the 3196, such as the waveform, vector, harmonics, and DMM screens.

■ Spot analysis using the cursor
Conduct spot analysis of time series data using the A and B cursors.

Data processing is quick and easy using the PQA-HiVIEW software 9624-50
- Use it to create reports
- Use data converted to CSV format

Data stored on a PC card can be transferred using remote operations via a LAN or modem
- LAN
- Modem

Measurement data is saved in binary format
- Use data converted to CSV format

PC card
- View power, voltage, and current data at a single glance in the DMM screen!
**ITIC curve display function**

Make ITIC (CBEMA) curve analyses (limit curve) based on the power quality control standards of the U.S.A.

**EN50160 display functions**

(applicable standard is EN50160:1999)

Effectively evaluate and analyze the quality of power according to EU standards.

**Downloading from LAN**

Data (BINARY/TEXT/BMP) recorded on a PC card or the internal memory of the 3196 can be downloaded via LAN to a personal computer. (*This can be done without use of the freeware Down96. Measurement on the 3196 must be halted during download.)

**Report generation function**

Choose from 3 types of report generation settings to take care of all the troublesome reporting operations, and either send the data to a printer or save as a Rich Text file. (Automatic: Output basic items. Individual setting: Select any item for output. Detailed setting: Specify a time-series graph in details for output.)

**Positive phase, negative phase, and zero phase function**

Recalculate event data captured by 3P4W circuits, and display each component of the voltage/current of the positive phase, negative phase, and zero phase.

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**Analyze power consumption and demand using acquired data**

**Integral power consumption analysis and demand analysis screens**

These screens allow you to calculate measurement data and display it in the integral power consumption graph or demand graph. (Use them to display the maximum demand, average demand, and load ratio values.) Further, you can confirm the power data for a specific interval using the cursor function.

**CSV format conversion function**

Convert data displayed in the TIME PLOT or event waveform screen into CSV format. Converted data can be used with spreadsheet software on your PC.

**Print function**

Print a hard copy of the event list screen, event data screen, ΔV10 screen, integral power consumption screen, or demand screen, one at a time. In the TIME PLOT screen, you can collect all of the screens that are currently open and print them on a single sheet.

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**Quickly print reports and apply data**

Specify a range using the A and B cursors, and convert the data within that range into CSV format.

The interval between the A and B cursors is displayed in red.

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**ITIC curve display function**

Change the upper or lower limit of the curve as desired.

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**Downloading from LAN**

Print example: TIME PLOT screen (U-THD RMS fluctuation) printed on A4 paper

**Print function**

Print example: Event waveform screen printed on A4 paper
### 3196 Specifications

#### 1. Measurement and recording items

<table>
<thead>
<tr>
<th>Recording item</th>
<th>Power</th>
<th>mA/MV</th>
<th>ALL_D</th>
<th>Recording item</th>
<th>Power</th>
<th>mA/MV</th>
<th>ALL_D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transient overvoltage</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Voltage unbalance factor</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Voltage swell</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Current unbalance factor</td>
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<td>☐</td>
<td>☐</td>
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<tr>
<td>Voltage dip</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Harmonic voltage</td>
<td>×</td>
<td>☐</td>
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<tr>
<td>Instantaneous interruption</td>
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<td>☐</td>
<td>Harmonic current</td>
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<tr>
<td>Frequency</td>
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<td>☐</td>
<td>Harmonic power</td>
<td>×</td>
<td>☐</td>
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</tr>
<tr>
<td>RMS voltage</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Harmonic voltage (envelope)</td>
<td>×</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>RMS current</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Inter-harmonic voltage</td>
<td>×</td>
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<tr>
<td>Voltage peak</td>
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<td>☐</td>
<td>☐</td>
<td>Inter-harmonic current</td>
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<tr>
<td>Current peak</td>
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<td>☐</td>
<td>Total harmonic voltage</td>
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<tr>
<td>Effective power</td>
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<td>☐</td>
<td>Total harmonic current</td>
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</tr>
<tr>
<td>Apparent power</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Total harmonic current (envelope)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Reactive power</td>
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<td>☐</td>
<td>☐</td>
<td>Total harmonic current (envelope)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Power factor/Displacement power factor</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>K factor</td>
<td>☐</td>
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</tr>
<tr>
<td>Flicker (AV10/Pat, Ph)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td></td>
<td>☐</td>
<td>☐</td>
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</tr>
</tbody>
</table>

* Select from a total of six different patterns when recording data. These consist of three available data patterns (Power, P&Harm, or ALL Data), combined with two patterns, AVE and ALL (maximum, minimum, and average), or detailed data for each measurement item.

### 2. Basic specifications

#### Power quality measurement standards

#### Clock functions
- Auto calendar, auto leap year, 24-hour clock

#### Real-time clock accuracy
- Within ±0.3 s/day (when the 3196 is turned on)

#### Internal memory capacity for data
- 13 MB (time series and event data)

#### Maximum recording interval
- 1 month (internal memory)

#### Measurement time control
- Manual/Specified time

#### Time series data settings
- Data item settings
  - Recording item settings: Power, P&Harm, and ALL DATA
  - MAX/MIN/AVE values: AVE values, ALL values (maximum, minimum, and average values)
  - Interval selections: 1, 3, 15, or 30 seconds, 1, 5, 10, 15, or 30 minutes, 1 or 2 hours

#### Event settings
- Event settings: All measurement settings except flicker and inter-harmonics

#### Event threshold value setting
- Threshold settings: OFF or desired numerical value

#### Maximum number of recording events
- 100 (internal memory)

#### Power supply
- 12 V DC from the AC ADAPTER 9458 or BATTERY PACK 9459

#### Maximum rated power
- 40 VA

#### Continuous operating time with battery
- Approximately 30 minutes (9459 battery pack)

#### External dimensions
- Approximately 295W (11.73") x 215H (8.46") x 67D (2.64") mm (not including projections)

#### Mass
- Approximately 2.25 kg (79.4 oz) (including 9459 battery pack)
### 3. Input specifications

**Measurement line types**: Single-phase 2-wire, Single-phase 3-wire, Three-phase 3-wire (3P3W2M, 3P3W3M) or Three-phase 4-wire, plus one extra input channel.

**Input channels**:
- Voltage: 4 channels (U1 to U4) (channel U4 can be switched between AC and DC)
- Current: 4 channels (I1 to I4).

**Input methods**:
- Voltage between U1, U2, and U3 without inter-channel isolation.
- Voltage between U1 to U3 and U4 with inter-channel isolation.

**Input resistance**:
- Current input by clamp-on sensor
- Voltage: 4 MΩ ±10% (difference input)
- Current: 200 kΩ ±10%

**Measurement method**:
- Simultaneous digital sampling of voltage and current (PLL synchronization automatically switches to fixed clock during drops, so sampling is never interrupted).
- PLL synchronization channel source: Voltage at either U1, U2, or U3.

**PLL synchronization frequency range**: 4.2 to 69 Hz.

**Sampling frequency**:
- For calculations (including DC measurement): 256 points/cycle
- 256 points/8 cycles (for 400 Hz)
- 2048 points/10 cycles (for 50 Hz)
- 2048 points/12 cycles (for 60 Hz)
- 2048 points/80 cycles (for 400 Hz)
- 2 MHz

**Current measurement range**:
- ±3.

**Voltage measurement range**:
- ±60,000, 60,000 V pk (DC measurement)
- ±150,000, 300,000, 600,000 Vrms
- ±2 MHz

**A/D converter resolution**:
- ±0.2% rdg. ±0.1% f.s. + clamp-on sensor accuracy

**Power factor**:
- Measurement range: ±1.000 (lead) to 0.000 to ±1.100 (lag)
- Measurement accuracy: ±1 dgt. from the calculation of each measurement value (±3 dgt. for the sum)

**Displacement power factor**:
- Measurement range: ±1.000 (lead) to 0.000 to ±1.100 (lag)
- Measurement accuracy: ±0.5% rdg. ±0.2% f.s. ±1 dgt. (±3 dgt. for the sum)

**Voltage unbalance factor**:
- Measurement range: ±0.5% rdg. ±0.2% f.s. ±1 dgt. (±3 dgt. for the sum)

**Current unbalance factor**:
- Measurement range: ±0.5% rdg. ±0.2% f.s. ±1 dgt. (±3 dgt. for the sum)

**Harmonic voltage, current, and power** (including fundamental waveform components)

- **Inter-harmonic voltage and current**
  - Measurement range: ±5% rdg. or less of the limit value

**Harmonic voltage/current phase difference** (including fundamental waveform content)
- Measurement range: ±0.5% rdg. ±0.2% f.s. ±1 dgt.

**Period**:
- 4 ms waveform
- 4 ms before and after center peak
- Calculated from the phase difference between the fundamental waveforms of voltage and current.

**Frequency**:
- Measurement range: ±10 mHz (10 to 100% range, with sine wave)
- ±10 Hz (10 to 100% range, with sine wave)

**Display items**:
- Voltage/current: 1st to 20th orders: ±0.5% rdg. ±0.2% f.s.
- 21st to 50th orders: ±1.0% rdg. ±0.3% f.s.
- Power: 1st to 20th orders: ±0.5% rdg. ±0.2% f.s.
- 21st to 30th orders: ±1.0% rdg. ±0.3% f.s.
- 31st to 40th orders: ±2.0% rdg. ±0.3% f.s.
- 41st to 50th orders: ±3.0% rdg. ±0.3% f.s.

**Inter-harmonic voltage and current**
- Measurement range: ±1 dgt. from the calculation of each measurement value

**Display specifications**
- Display device: 6.4” TFT color LCD (640 x 480 dots)
- Text display: English, German, French, Italian, Spanish, Chinese or Japanese

**External interface specifications**
- (1) External control terminals: External event input and output
- (2) PC card interface Slot: Compliant with PCMCIA/EIDE PC Card Standard
- (3) RS-232C interface: Printers or modems or PGS
- (4) LAN interface: Ethernet and TCP/IP (with HIBASE-TRJ-45 connector)

**Environment & safety specifications**
- Operating environment: Indoors, up to a height of 2000 m (6562.2 ft)
- Storage temperature & humidity: -20 to 50°C, max. 80% rh (non-condensing)
- Operating temperature and humidity: 0 to 40°C, max. 80% rh (non-condensing)
- Maximum measurement terminal voltage: Voltage terminals: 780 Vrms AC, 1103 V peak
- Maximum in-phase voltage: 600 Vrms AC (50/60 Hz, voltage input terminals)
- Withstand voltage: 5.55 kVrms AC/15 sec

**Enclosure protection**
- Standards conformance: IP30 (per EN60529)

**Anticipated transient overvoltage**: 6000 V
**Option Specifications**

### Clamp On Sensors

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>CAT III 300V</th>
<th>CAT III 600V</th>
</tr>
</thead>
<tbody>
<tr>
<td>9664</td>
<td>Appearance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary current rating</td>
<td>5 AC</td>
<td>100 AC</td>
</tr>
<tr>
<td></td>
<td>Output voltage</td>
<td>10 mV/AC</td>
<td>1 mV/AC</td>
</tr>
<tr>
<td></td>
<td>Accuracy</td>
<td>±0.5% rdg. ±0.02% f.s.</td>
<td>±0.3% rdg. ±0.02% f.s.</td>
</tr>
<tr>
<td></td>
<td>Frequency characteristic</td>
<td>±1.0˚ or less</td>
<td>±1˚ or less</td>
</tr>
<tr>
<td></td>
<td>Effect of conductor position</td>
<td>±0.5% or less</td>
<td>±0.5˚ or less</td>
</tr>
</tbody>
</table>

### Accessories

**POWER QUALITY ANALYZER 3196**

(VOLTAGE MEASUREMENT CABLE 9438-02 (one each of red, yellow, blue and gray, plus four black lines, CAT III: length: 3 m (9.84 ft), BATTERY PACK 9459, AC ADAPTER 9458, Strap, LAN connector cover, Input Cord Label, Operating Manual (CD-R), Quick Start Manual)

By itself, the 3196 is only capable of voltage measurement. Purchase the optional CLAMP-ON SENSOR 9660 or 9661 for current and power measurement.

**Standard combination example**

For three-phase 3-wire (3P3W) and three-phase 4-wire measurements

Models 3196 + 9661 (500 A) + 9339 + PC card (128 MB)

**Options**

- **CLAMP ON SENSOR** (100 A AC) Voltage output type
- **FLEXIBLE CLAMP ON SENSOR** (5000 A AC) Voltage output type
- **AC ADAPTER** (for the 9667, for America, Japan)
- **AC ADAPTER** (for the 9667, for Europe)
- **CLAMP ON SENSOR** (100 A AC) Voltage output type
- **CLAMP ON LEAK SENSOR** (5 A AC) Voltage output type
- **CLAMP ON LEAK SENSOR** (5 A AC with Model 3196) Voltage Output Type
- **CLAMP ON ADAPTER**
- **WIRING ADAPTER (3P3W)**
- **WIRING ADAPTER (3P4W)**
- **VOLTAGE MEASUREMENT CABLE (standard accessory)**
- **BATTERY PACK** (standard accessory)
- **PRINTER** (with one roll recording paper)
- **AC ADAPTER** (for 9670)
- **RECORDING PAPER** (80 mm (3.15") x 25 m (82.03 ft), 4 rolls, for 9670)
- **RS-232C CABLE** (1.5 m (4.92 ft), for printer connection)
- **LAN CABLE** (5m (16.41 ft), with straight and crossover connection)
- **CARRYING CASE** (soft)
- **CARRYING CASE** (hard)
- **POA-HIVIEW PRO** (PC application software)
- **PC CARD 128 M**
- **PC CARD 256 M**
- **PC CARD 512 M**

**All specifications are subject to change without notice.**

3196USA/EU-81M-02P Printed in Japan