POWER QUALITY ANALYZER 3196
Power Measuring Instruments

Investigate All Your Power Quality Problems

- Remote control and data collection via LAN modem
- A full range of clamp sensors
  (Seven models with ratings from 5 to 5000 A AC)
- PQA-HiVIEW PRO 9624-50 software for flexible PC analysis

- 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
**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.

**Fully identify the many phenomena hiding in your power lines**

**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.**

**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.

**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.

**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.

**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.

**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.

**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.

**Instantaneous interruptions**

**Phenomenon:**
An instantaneous or short/long term power supply interruption caused by accidents at the power company (such as interruption of power transmission due to lightning strike) or tripping of breakers due a power supply short.

**Damage:**
Thanks to the increasingly widespread adoption of uninterruptible power supplies, equipment such as computers is increasingly protected against this problem. However, it may still cause other devices to stop operating or reset.

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.
- Neutral line measurement can be used 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), HIОКI 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

- 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).
- Optional printer for easy hard copy output
  - Connect the optional the PRINTER 9670 to the RS-232C terminal for easy hard copy output of screens.
- 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 the GPS Box XD112 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 case and measure while the 3196 is safely stored.

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;Harmonics</th>
<th>ALL DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Memory</td>
<td>Max. 100 (approx. 8MB)</td>
<td>1 s</td>
<td>2h 01 m</td>
<td>8 m</td>
<td>5 m</td>
</tr>
<tr>
<td>Max. 2000 (approx. 16MB)</td>
<td>1 m</td>
<td>5 days 1 hour</td>
<td>8h 29 m</td>
<td>5 h 45 m</td>
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<tr>
<td>Max. 3100 (approx. 24MB)</td>
<td>1 h</td>
<td>31 days</td>
<td>21 days 5 h</td>
<td>14 days 9 h</td>
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<tr>
<td>PC Card (256MB)</td>
<td>Max. 1000 (approx. 8MB)</td>
<td>1 m</td>
<td>31 days</td>
<td>17 days 9 h</td>
<td>11 days 19 h</td>
</tr>
<tr>
<td>Max. 2000 (approx. 16MB)</td>
<td>1 m</td>
<td>31 days</td>
<td>11 days 14 h</td>
<td>7 days 20 h</td>
<td></td>
</tr>
<tr>
<td>Max. 3100 (approx. 24MB)</td>
<td>1 m</td>
<td>2 days 18 h</td>
<td>4 h 38 m</td>
<td>3 h 8 m</td>
<td></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 the GPS Box XD112 to make sure the time recorded for measured events is based on the global standard time.
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!

-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)

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.

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.

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

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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.
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 ∆V10) 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**

Time series fluctuation results are displayed in the TIME PLOT screen
- 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
    - ∆V10 measurement (according to Japanese domestic guidelines)

Continuous data calculation processing of all data without fail!
- 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 ∆V10 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.
- Cursor values (maximum, minimum, and average values for the specified interval) are displayed.
- All RMS measurement items can be selected for display.

**Harmonic fluctuation display**
- You can specify display of up to six harmonic orders.
- Cursor values are displayed for the specified orders.
- Dual screen display is possible for combinations such as voltage and current.

**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.
- 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.

**Flicker display**
- IEC flicker display: Displays the Pst and Plt values as a graph once every ten minutes.
- The Pst and Plt cursor values are displayed.
- 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.

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

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.

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 V pk with durations as low as 0.5 µs are captured without fail.
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.

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.

Transfer Measurement Data to Your PC
Data saved in Binary/Text/BMP formats in the PC Card or internal memory of the 3196 can easily be transferred to your PC using the freeware Down96, supplied with your purchase or downloadable from the HIOKI website.
(Compatible with 3196 version 1.21 or later)

Note: To further analyze binary data, use the optional PQA HiVIEW Pro 9624-50 application software.
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), **∆V10 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

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
</table>

**Screen button**

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.

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

■ **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.
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.

Print function

Print a hard copy of the event list screen, event data screen, ∆V10 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.

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.

Analyze power consumption and demand using acquired data

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.

Quickly print reports and apply data

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

Print example: Event waveform screen printed on A4 paper

ITIC curve display function

General power consumption is displayed.

Cursor measurement

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

Convenient Feature

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

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

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

Print example: Event waveform screen printed on A4 paper
-1. Function specifications

## Data loading functions

**Data that can be loaded**
- Binary data recorded using the 3196
- SET files (Settings data), ITV files (TIME PLOT data), EVT files (event data), TRN files (Transient waveforms), EVENT files (Flicker data (AV10, IEC)), EVENT files (EN50160), EVENT files (EN50160 Event data)

**Maximum data capacity**
- Up to 528 MB

### Data display functions

**SYSTEM display function**
- SYSTEM (settings) content screen
- SYSTEM data display screen

**TIME PLOT display function**
- Display the event data selected in the EVENT list display screen
- Display one of the following screens ((1) to (4))
- Select from the voltage/current waveform, 4-channel voltage waveform, 4-channel current waveform, and voltage/transient overvoltage waveform displays.
- Select from the harmonic RMS value and phase angle displays.

**Number of display screens**
- Up to 4 screens
- A and B cursors (interval calculation function provided)

**Cursor function**
- A and B cursors (interval calculation function provided)

**EVENT list display function**
- EVENT list content display
- Order events occurred in, or order of priority

**Event data display function**
- Display the event data selected in the EVENT list display screen
- Display one of the following screens ((1) to (4))
- Select from the voltage/current waveform, 4-channel voltage waveform, 4-channel current waveform, and voltage/transient overvoltage waveform displays.
- Select from the harmonic RMS value and phase angle displays.

**Positive/ Negative/ Zero phase calculation function**
- Display voltage and current of the positive phase, negative phase, and zero phase (A vector display screen, this is conducted during the 3P4W wiring analysis.)

### Flicker graph display function

**Screen display**
- AV10 Flicker graph or IEC Flicker graph

**Cursor function**
- A and B cursors (interval calculation function provided)

### Integral power consumption calculation function

**Settings**
- Analysis start time/period: Set the year, month, day, hours, minutes, and seconds, /1 to 31 days

**Display method and calculation items**
- Integral power consumption calculation graph, Harmonic and result classification data of the specified analysis period
- Total harmonic current distortion factor
- Total harmonic voltage distortion factor
- RMS current
- Voltage peak
- Current peak
- Effective power
- Apparent power
- Reactive power
- Power factor/Displacement power factor

### Demand calculation function

**Settings**
- Analysis start time/period: Set the year, month, day, hours, minutes, and seconds, /1 to 31 days

**Display method and calculation items**
- Demand graph (for consumption only), Average demand (average demand value for the specified analysis period), Maximum demand (maximum demand value for the specified analysis period), Limit ratio (average demand/maximum demand = 80%)

### ITIC curve display function

**Display function**
- Plot event points on limited value curve (points indicating swell/dip/interruption occurrence period and voltage)

### Percent of nominal voltage

- Maximum swell voltage or residual voltage ratio against official voltage

### Limit curve selection

- Number of upper-limit violations, number of lower-limit violations, and total number of events

### ENS0160 display function

**Screen display**
- Overview/Harmonic/Signaling/Measurement result sorting

## Copy function

**Copy content**
- Saves the various screens in BMP format

## Print function

**Print format**
- Prints screen images, Paper size: A4 and Letter, Print preview: Yes

**CSV format conversion function**
- CSV files (Flicker data (Power, P&Harm, or ALL DATA), combined with two patterns, A VE and ALL (maximum, minimum, and average), of detailed data for each measurement item.

## 3196 Specifications

### -1. Measurement and recording items

<table>
<thead>
<tr>
<th>Recording item</th>
<th>Power</th>
<th>Display</th>
<th>ALL_D</th>
<th>Recording item</th>
<th>Power</th>
<th>Display</th>
<th>ALL_D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transient overvoltage</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Voltage unbalance factor</td>
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<td>Voltage swell</td>
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<td>Current unbalance factor</td>
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<td>Voltage dip</td>
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<td>Total harmonic voltage distortion factor</td>
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<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Current peak</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Total harmonic current distortion factor</td>
<td>☐</td>
<td>☐</td>
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</tr>
<tr>
<td>Effective power</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Total harmonic current distortion factor</td>
<td>☐</td>
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</tr>
<tr>
<td>Apparent power</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Total harmonic voltage distortion factor</td>
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<tr>
<td>Reactive power</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Total harmonic current distortion factor</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>
<td>Flicker (AV10/Pol. Ph.)</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), of detailed data for each measurement item.

### -2. Basic specifications

**Power quality measurement standards conformance**
- IEC61000-4-30:2003, IEEE1159, EN50160:1999

**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**
- Recording item setting patterns (Power, P&Harm, and ALL DATA)
- MAX/MIN/AVE values
- Interval selections
- Event settings
- Event settings
- Maximum number of recording events
- Continuous operating time with battery

**Battery pack**
- Battery pack 9459

**External dimensions**
- Approximately 298W (11.73") x 215H (8.46") x 67D (2.64") mm (not including projections)

**Memory**
- At least 128 MB
-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:
- Voltage: 4 MΩ ±10% (differential input)
- Current: 200 Ω ±10%

Measurement accuracy:
- PLL synchronization: ±0.5% rdg. ±0.2% f.s., ±1 dgt. from the calculation of each measurement value
- Voltage/current: ±0.5% rdg. ±0.2% f.s., ±1 dgt. from the calculation of each measurement value

Measurement range:
- Voltage: 150.00, 300.00, 600.00 Vrms
- Current: 100.00 A, 1.0000 kArms

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

PLL synchronization channel source: Automatically switches to fixed clock during dropouts, so sampling is never interrupted

Voltage measurement range:
- Single-phase 2-wire: 0 to 400 Vrms
- Single-phase 3-wire: 0 to 600 Vrms
- Three-phase 3-wire: 0 to 1000 Vrms
- Three-phase 4-wire: 0 to 1500 Vrms

Sampling frequency:
- For measurements (including DC measurement): 255 points/cycle
- For harmonic and inter-harmonic analysis: 256 points/8 cycles (for 400 Hz)
- For transient overvoltage (impulse): 2048 points/10 cycles (for 50 Hz)
- For harmonic and inter-harmonic analysis: 2048 points/12 cycles (for 60 Hz)
- For inter-harmonic voltage and current: 2048 points/80 cycles (for 400 Hz)
- Voltage at either U1, U2, or U3: ±2 MHz

-4. Measurement specifications

(Range specifications)

RMS voltage
- True RMS: (calculated continuously every 10 or 12 cycles at 50 or 60 Hz respectively)
- Measurement accuracy: ±0.5% rdg. ±0.2% f.s., ±1 dgt. from the calculation of each measurement value

RMS current
- True RMS: (calculated continuously every 10 or 12 cycles at 50 or 60 Hz respectively)
- Measurement accuracy: ±0.5% rdg. ±0.2% f.s., ±1 dgt. from the calculation of each measurement value

Transient overvoltage (impulse)
- Sampling rate: 2 MHz
- Measurement accuracy: ±0.5% rdg. ±0.2% f.s., ±1 dgt. from the calculation of each measurement value

Voltage swell (rise in RMS voltage)
- True RMS: (a single cycle is calculated by overlapping each half cycle)
- Measurement accuracy: ±0.5% rdg. ±0.2% f.s., ±1 dgt. from the calculation of each measurement value

Instantaneous Interruption
- Same as voltage dip

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

Displacement power factor
- Measurement range: ±1.000 (lead) to ±1.000 (lag)
- Measurement accuracy: ±0.5% rdg. ±0.2% f.s., ±1 dgt. from the calculation of each measurement value

Voltage unbalance factor
- Measurement range: ±30° (average over one hour, fourth maximum over one hour, maximum over one hour, overall maximum during the measurement period), ∆U (deviation with respect to nominal voltage)

Harmonic voltage, current, and power
- Measurement accuracy: ±0.5% rdg. or loss of the limit value

(Harmonic contents)

Inter-harmonic voltage and current
- Measurement accuracy: ±0.5% rdg. ±0.2% f.s., ±1 dgt. from the calculation of each measurement value

-6. External interface specifications

I/O bus interface
- Type: EIA RS-232C-compliant (with 9-pin D-sub connector)
- Communications protocol: EIA RS-232C

External event input and output
- Compatible cards: Flash ATA cards up to 528 MB

Display device
- Type: 16" TFT color LCD (640 x 480 dots)

-7. Environment & safety specifications

Operating environment
- Indoors, up to a height of 2000 m (6562.2 ft)

Storage temperature & humidity: -20 to 50°C, 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

Current terminals: 1.7 Vrms AC, 2.4 V peak

Maximum in-phase voltage: 600 Vrms AC (50/60 Hz, voltage input terminals)

Withstand voltage: 5.55 kVrms AC/1 min (50/60 Hz, 1 mA current sensitivity)

Between voltage and clamp input terminals, between the voltage input terminal and 3196 casing, and between voltage input terminals (U1 to U3) and voltage input terminal (U4)

Maximum measurement terminal voltage: 780 Vrms AC, 1103 V peak

Current terminals: 1.7 Vrms AC, 2.4 V peak

Maximum in-phase voltage: 600 Vrms AC (50/60 Hz, voltage input terminals)

Storage temperature & humidity: -20 to 50°C, max. 80% rh (non-condensing)

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**Option Specifications**

### Clamp On Sensors

<table>
<thead>
<tr>
<th>Model</th>
<th>Appearance</th>
<th>Primary current rating</th>
<th>Output voltage</th>
<th>Accuracy</th>
<th>Frequency characteristic</th>
<th>Effect of external magnetic field</th>
<th>Effect of conductor position</th>
<th>Maximum rated voltage to earth</th>
<th>Maximum allowable input area</th>
<th>Measurable conductor diameter</th>
<th>Dimensions and weight</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>9694</td>
<td>CAT III 300V</td>
<td>5 A AC</td>
<td>10 mV/AC</td>
<td>±0.3% rdg.</td>
<td>±1.0% or less for 66 Hz to 5 kHz</td>
<td>Corresponding to 0.1 A or less (with magnetic field of 400 A/m AC)</td>
<td>±0.5% or less</td>
<td>1500 V continuous</td>
<td>2 mm (0.08&quot;) or less</td>
<td>φ15 mm (0.59&quot;) or less</td>
<td>46W (1.81&quot;) x 135H (5.31&quot;)</td>
<td>46W (1.81&quot;) x 135H (5.31&quot;)</td>
</tr>
<tr>
<td>9660</td>
<td>CAT III 300V</td>
<td>100 A AC</td>
<td>1 mV/AC</td>
<td>±0.3% rdg.</td>
<td>±2.0% or less</td>
<td>Corresponding to 5 A, 15 A max. (with magnetic field of 400 A/m AC)</td>
<td>±1.5% or less</td>
<td>1000 V continuous</td>
<td>21D (0.83&quot;) mm, 230 g (8.1 oz.)</td>
<td>φ15 mm (0.59&quot;) or less</td>
<td>46W (1.81&quot;) x 135H (5.31&quot;)</td>
<td>21D (0.83&quot;) mm, 230 g (8.1 oz.)</td>
</tr>
<tr>
<td>9661</td>
<td>CAT III 600V</td>
<td>500 A AC</td>
<td>1 mV/AC</td>
<td>±0.3% rdg.</td>
<td>±2.0% or less</td>
<td>Corresponding to 50 A, 150 A max. (with magnetic field of 400 A/m AC)</td>
<td>±1.5% or less</td>
<td>5000 V continuous</td>
<td>21D (0.83&quot;) mm, 230 g (8.1 oz.)</td>
<td>φ15 mm (0.59&quot;) or less</td>
<td>46W (1.81&quot;) x 135H (5.31&quot;)</td>
<td>21D (0.83&quot;) mm, 230 g (8.1 oz.)</td>
</tr>
<tr>
<td>9669</td>
<td>CAT III 600V</td>
<td>1000 A AC</td>
<td>0.5 mV/AC</td>
<td>±0.3% rdg.</td>
<td>±2.0% or less</td>
<td>Corresponding to 500 A, 1500 A max. (with magnetic field of 400 A/m AC)</td>
<td>±1.5% or less</td>
<td>10000 V continuous</td>
<td>21D (0.83&quot;) mm, 230 g (8.1 oz.)</td>
<td>φ15 mm (0.59&quot;) or less</td>
<td>46W (1.81&quot;) x 135H (5.31&quot;)</td>
<td>21D (0.83&quot;) mm, 230 g (8.1 oz.)</td>
</tr>
</tbody>
</table>

### Accessories

**POWER QUALITY ANALYZER 3196**

VOLTAGE MEASUREMENT CABLE 9438-02 (zone each of red, yellow, blue and gray, plus four black lines, Cord 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 (3P3W3) and three-phase 4-wire measurements

Models 3196 + 9661 (500 A x 3) + 9339 + PC card

**Options**

**CLAMP ON SENSOR (100 A AC) Voltage output type**

**CLAMP ON SENSOR (500 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 (1000 A AC) Voltage output type**

**CLAMP ON SENSOR (3 A AC) Voltage output type**

**CLAMP ON LEAK SENSOR (5A AC with Model 3196) Voltage Output Type**

**CLAMP ON SENSOR (5 A AC) Voltage output type**

**CLAMP ON LEAK SENSOR (5A AC with Model 3196) Voltage Output Type**

**CLAMP ON ADAPTER**

**WIRING ADAPTER (3P3W)**

**WIRING ADAPTER (3P4W)**

**VOLTAGE MEASUREMENT CABLE (standard accessory)**

5438-02

**BATTERY PACK (standard accessory)**

9459

**PRINTING (with one roll recording paper)**

9670

**AC ADAPTER (for the 9670)**

9671

**RECORDING PAPER**

80 mm (3.15") x 25 m (82.03 ft), 4 rolls, for 9670

9237

**RS-232C CABLE**

1.5 m (4.92 ft), for printer connection

9638

**LAN CABLE**

(5m (16.41 ft), with straight and crossover connectors)

9642

**CARRYING CASE (soft)**

9339

**CARRYING CASE (hard)**

9340

**POA-HIVIEW PRO (PC application software)**

9264-00

**PC CARD 256 M**

9727

**PC CARD 512 M**

9728

**Operating Manual**

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