CLAMP ON POWER HiTESTER
3169-20, 3169-21
Power Measuring Instruments

- Measure up to two 3-phase, 3-wire systems (displays voltage and current for three lines)
- Measure up to four single-phase, 2-wire systems
- 0.5 A to 5000 A range

- Compact and lightweight
- PC card data storage
- Power recording for individual waveforms
- Simultaneous recording of demand values and harmonics
- POWER MEASUREMENT SUPPORT SOFTWARE 9625

Offering a new approach to energy-related measurement such as energy conservation, ISO14001 testing, equipment diagnosis, and harmonics measurement.

FLEXIBLE CLAMP ON SENSOR CT9667

CLAMP ON POWER HiTESTERS are 3169-20 and 3169-21 that allow measurement of single-phase to three-phase 4-wire circuits with a single unit. In addition to measuring standard parameters such as voltage, current, power, power factor, and integrated values, these clamp-on power meters can simultaneously perform demand measurements required for carrying out power management and energy-saving measures, as well as harmonic measurements. The two new power meters also feature PC card data storage, and come equipped with an RS-232C interface for PC communications. Further, with greater data processing speeds, it is possible to measure the power of just a few cycles, enabling more detailed and effective energy-saving measures for equipment. The 3169-20 and 3169-21 are ideal for users who want to achieve close control over energy-saving management activities and measures.

The photo shows the 3169-21 combined with CLAMP ON SENSORS 9661 and 9669 (optional) for measuring 2 systems.

The 3169-20/21 can also be used in conjunction with CLAMP ON SENSORS (optional) rated up to 5000 A.
Offering a new measurement method for energy saving activities
All in a compact A5-size unit

Features

■ Measure power lines of up to four systems (with a common voltage)

One single unit can measure four circuits (single-phase 2-wire), two circuits (3-phase, 3-wire), or one circuit (3-phase, 4-wire) system.

■ A wide range of measurement functions

The 3169-20/21 can simultaneously measure voltage, current, power (active, reactive, and apparent), integrated power, power factor, and frequency. Further, when using 3-phase, 3-wire (3P3W2M) mode, you can display the voltage and current for all three lines by measuring just two of them. When using the 3-phase, 4-wire (3P4W4I) mode, neutral line current can be displayed using 4 current measurement.

■ Equipped with ranges from 0.5 A to 5000 A

The power meters support seven types of clamp-on current sensors to enable measurement for a variety of items, from CT terminals to large current and thick power lines.

■ Supports high-speed data storage from individual waveforms

When using the standard mode to perform integrated power measurement, you can store data in intervals starting from one second, and when simultaneously measuring integration and harmonics, in intervals starting from one minute. When in the fast mode, you can store RMS data for individual waveforms.

■ PC Card compatible plus internal hard drive for extra memory

Store valuable measurement data in convenient PC cards. The internal memory (1 MB) supports measurement over extended periods and detailed measurement parameters.

■ Housed in a compact A5 body size

The 3169-20 and 3169-21 feature a compact design that makes them portable and easy to use in tight spaces, and are approximately 30% more compact than the CLAMP ON POWER HITESTER 3166.

■ Multi-language Compatibility

Select from nine languages, including Japanese and English.

■ Detect incorrect connection using vector diagrams

Use the vector display on the connection confirmation screen to check the phases, whether a connection is loose, or whether the clamp-on sensor connection has been reversed during VT/CT terminal measurement.

■ Polarity display and measurement using the reactive power measurement method

The units come equipped with a polarity display for checking LAG/LEAD when measuring power factor or reactive power. Further, you can select the reactive power measurement method, or display the phase factors for RMS values and power comparison.

■ High-speed D/A output

The 3169-21 comes equipped with a 4-channel high-speed D/A output to enable analog output of RMS values for individual waveforms.

■ Ideal for power and harmonics management

The power meters come equipped with a harmonics measurement function that supports measurement of 3-phase power lines. They can also perform simultaneous measurement of harmonics and demand values, enabling both power and harmonics management.
The ultimate in clamp-on power meters!

Sleek Design and Engineering
The photo shows the 3169-21 with D/A output.

Range Configuration Table

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
<th>Connection</th>
<th>CLAMP ON SENSOR 9695-02 (CAT II 300V)</th>
<th>CLAMP ON SENSOR 9661 (5A, 10A, 50A, 100A, 500A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150.00V</td>
<td>500.00mA</td>
<td>1.000mA</td>
<td>1.000mA</td>
<td>1.000mA</td>
</tr>
<tr>
<td></td>
<td>2.000mA</td>
<td>1.000mA</td>
<td>2.000mA</td>
<td>2.000mA</td>
</tr>
<tr>
<td></td>
<td>3.000mA</td>
<td>1.000mA</td>
<td>3.000mA</td>
<td>3.000mA</td>
</tr>
<tr>
<td></td>
<td>4.000mA</td>
<td>1.000mA</td>
<td>4.000mA</td>
<td>4.000mA</td>
</tr>
<tr>
<td></td>
<td>5.000mA</td>
<td>1.000mA</td>
<td>5.000mA</td>
<td>5.000mA</td>
</tr>
<tr>
<td>300.00V</td>
<td>100.00mA</td>
<td>1.000mA</td>
<td>1.000mA</td>
<td>1.000mA</td>
</tr>
<tr>
<td></td>
<td>200.00mA</td>
<td>1.000mA</td>
<td>2.000mA</td>
<td>2.000mA</td>
</tr>
<tr>
<td></td>
<td>300.00mA</td>
<td>1.000mA</td>
<td>3.000mA</td>
<td>3.000mA</td>
</tr>
<tr>
<td></td>
<td>400.00mA</td>
<td>1.000mA</td>
<td>4.000mA</td>
<td>4.000mA</td>
</tr>
<tr>
<td></td>
<td>500.00mA</td>
<td>1.000mA</td>
<td>5.000mA</td>
<td>5.000mA</td>
</tr>
</tbody>
</table>

Voltage Configuration Table

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
<th>FLEXIBLE CLAMP ON SENSOR CT9667</th>
</tr>
</thead>
<tbody>
<tr>
<td>150.00V</td>
<td>500.00A</td>
<td>5.000kVA</td>
</tr>
<tr>
<td></td>
<td>1.000kA</td>
<td>1.000kA</td>
</tr>
<tr>
<td>300.00V</td>
<td>150.00kW</td>
<td>1.500kW</td>
</tr>
<tr>
<td></td>
<td>225.00kW</td>
<td>2.250kW</td>
</tr>
<tr>
<td></td>
<td>300.00kW</td>
<td>3.000kW</td>
</tr>
<tr>
<td></td>
<td>450.00kW</td>
<td>4.500kW</td>
</tr>
<tr>
<td></td>
<td>600.00kW</td>
<td>6.000kW</td>
</tr>
<tr>
<td>600.00V</td>
<td>75.00kW</td>
<td>0.750kW</td>
</tr>
<tr>
<td></td>
<td>150.00kW</td>
<td>1.500kW</td>
</tr>
<tr>
<td></td>
<td>225.00kW</td>
<td>2.250kW</td>
</tr>
<tr>
<td></td>
<td>300.00kW</td>
<td>3.000kW</td>
</tr>
<tr>
<td></td>
<td>450.00kW</td>
<td>4.500kW</td>
</tr>
<tr>
<td></td>
<td>600.00kW</td>
<td>6.000kW</td>
</tr>
</tbody>
</table>

D/A output terminal pin placement
Use the CONNECTION CABLE 9441 to connect to external devices. (Output resistance: 100Ω)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal name</th>
<th>Pin</th>
<th>Signal name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D/A output 1</td>
<td>4</td>
<td>D/A output 4</td>
</tr>
<tr>
<td>2</td>
<td>D/A output 2</td>
<td>5</td>
<td>Power input</td>
</tr>
<tr>
<td>3</td>
<td>Power input</td>
<td>6</td>
<td>GND</td>
</tr>
</tbody>
</table>
Measure hidden power waste through secure connections, simple measurement methods, and detailed data capture.

Promises reliable measurement for power demand requirements!

- Select from a variety of data, including detailed and harmonics data for multiple circuits

**To measure multiple systems simultaneously**

A single unit can measure two three-phase, 3-wire systems. Further, you can make individual clamp-on sensor and current range settings for each system.

Also, in addition to performing simultaneous measurement for up to four systems (single-phase, 3-wire) with a common voltage, you can set the current range individually for each system. Setting the most suitable current range for both large and small loads allows you to acquire more accurate measurements.

**When measurement accuracy is crucial**

The addition of a vector display for viewing the connection status completes the preparation required for measurement.

Have you ever experienced incorrect measurement results? The most common cause of measurement errors is a faulty connection. With the 3160 series you can use the vector display to check the phase, whether a connection is loose, or whether the clamp-on sensor connection has been reversed.

Also, you are assured of proper connection when using the VT/PT/CT terminals even if you cannot see the line you are measuring.

**Magnetic voltage adapters for hard-to-clip terminals**

New magnetic voltage adapters compatible with the Voltage Cords L4436-53 let you accurately detect voltage when the circuit terminals are too shallow for alligator clips to latch on.

**Simultaneous power and harmonics management**

Use a single unit to simultaneously measure data for power and harmonics.

All acquired data can be saved onto a PC card.

Power data (including demand data) and harmonics data can be simultaneously saved onto a PC card or in the unit's internal memory. Further, data for all of the systems being measured can be saved when measuring multiple circuits. Each of these two new units offers a management system for power and harmonic quality.

**Capture facility data quickly**

By using continuous processing to measure individual waveforms, you can accurately measure data in a relatively short amount of time.

Use the desired measurement method to continuously measure the voltage, current, and power for individual waveforms, enabling you to obtain accurate data in one second or less. Further, you can record the maximum, minimum, and average values.

**Measure another device simultaneously**

Using the external I/O function, you can obtain even more detailed measurements for energy conservation.

In addition to measuring startup control through external input, you can use this function to display measurement startup signals for the 3160-40W. Simultaneous recording of a variety of signals is also possible for equipment when using multiple devices to perform startup control and multi-channel recording.
Large storage capacity to accommodate power and harmonics data for individual waveforms. Supports energy saving measures that can be carried out from your PC.

Greater flexibility for energy saving measures through detailed measurement!

- Reduce energy consumption by "1%"? Why not try analyzing your energy saving measures?

- Unbalanced loads are an enemy to energy saving activities. Solve your problems with careful management of power lines.

- Harmonics cause wasted power.

- Improve energy-saving operations and create an energy-efficient facility.

- Identify even small amounts of power waste using individual waveform measurements.

- Accurate recording of harmonics in operation.

- Simultaneous recording of power waveform and harmonics.
POWER MEASUREMENT SUPPORT SOFTWARE 9625

Graphically process measurement data from Model 3169-20/21 easily on a PC!

The POWER MEASUREMENT SUPPORT SOFTWARE 9625 application provides easy graphical processing on a computer of measurement data saved on CLAMP ON POWER HITESTERS 3169-20/21 and 3166.

3169-20/21

![Diagram showing data flow between devices and a computer]

The 9625 handles both power and harmonic measurement data simultaneously.

Features

- **Time Series Graph Display Function**
  Measurement data can be displayed as a time series graph. Demand data measured in different series can be overlaid on the display.

- **Summary Display Function**
  Measurement data can be displayed directly in table form.

- **Daily, Weekly and Monthly Report Display Function**
  Daily, weekly and monthly reports of demand data can be displayed.

- **Harmonic Analysis Function**
  Display harmonic measurement data as a graph, list or waveform. (Also compatible with the harmonic measurement data captured by Model 3166.)

- **Print Function**
  Each screen can be printed.

Easily display and print various screens such as graphs and spreadsheet tables

**Step 1. Load measurement data**
Load up to 16 data sets from the 3169-20/21 or 3166 at once. Measured numerical values and waveform data are recognized and displayed automatically.
1. Loading and deleting data, and changing data names, can be done easily.
2. Multiple sets of measurement data can be loaded and managed in a single file.

**Step 2. Select the display (screen) type**
Select from time series graph, summary, daily, weekly or monthly report, harmonic list, harmonic graph, harmonic waveform or settings.

**Step 3. Select display items (two-axis display is possible)**
1. Select the data items (up to 16) to display. For graph displays, the type of graph (line, bar, etc.) can be selected.
2. Enter details for data display, (data item names, levels, etc.)

**Step 4. Set the start/stop times and data interval to be displayed**
1. Set the data period to display, (start/stop time and data interval)
   - The displayed period can be easily changed by scrolling.
**Time Series Graph Display Function**  
Two axes display possible.

- The displayed graph can be set to suit particular start/stop times and data intervals. Harmonic time series graphs can be displayed.

**Convenient Functions**

1. The horizontal (time) axis can be easily scrolled to show the desired range.
2. Upper and lower limits (measurement values) of the vertical axis can be easily set and changed.
   - Graph type (line, bar or stacked bar), line type (such as solid or dashed), color and details of upper and lower numerical values can be set.
3. Any desired numerical data value on a graph can be confirmed and displayed by cursor movement.
4. The display can be switched between 2D and 3D graphs.

**Summary Display Function**

**Summary**

- Displays a summary of the data values between specified start/stop times, at the specified data interval.

**Convenient Functions**

1. In addition to measurement values within the period being displayed, the summary shows period, maximum, minimum and average values.
2. Measurement data names and measurement units can be edited in the summary.

**Daily, Weekly or Monthly Report Display**

- Displays a summary covering the total values in daily, weekly or monthly reports.

**Convenient Functions**

1. The time axis for each total scrolls to easily change the totalized period.
2. The total time range of measurement data can be totalized in up to four sections per time period.

**Harmonic Display Function**  
Harmonic data measured by the 3169 i/o and 3168 can be displayed in various ways.

**Harmonic Time Series Display**

- While displaying a time series graph, select the harmonic item for the vertical axis to display a time series graph of harmonics.

**Convenient Functions**

1. Up to 32 graphs can be displayed simultaneously using 2-axes display.
   - For one circuit measurement, up to 32 orders can be graphed. Using multiple instruments, time series of harmonics can be easily compared.
2. Any desired chronological detail can be easily confirmed using the cursors on the graph.

**Harmonic List Display**

- Displays harmonic data for the selected display item as a list.

**Harmonic Graph Display**

- Displays harmonic data for the selected display item as a bar graph.

**Harmonic Waveform Display**

- Displays the voltage and current waveforms upon which harmonic data is based.
Settings Display Function

When you select a data name to be loaded, the measuring instrument model and setting conditions at measurement time are displayed. Measurement data and measurement conditions can be managed at the same time.

Print Function

Reports and screen copies of the displayed screen can be easily printed.

Convenient Functions

1. Printing results can be confirmed by print preview.
2. When creating a report, screen data can be copied and pasted into a commercial word processor program.

9625 Specifications

General Specifications

Supported instrument models: 3169-20, 3169-22 and 3166 (CLAMP ON POWER HITESTER 4)

Operating environment:
- Computer: PC-AT compatible (DOS/V machine)
- CPU: Pentium 200 MHz or higher
- Memory: 128 MB or more (32 KB or more needed)
- Hard disk: 128 MB or more, free space
- Display: XGA (1024x768) or higher
- Disk drive: CD-ROM drive (for installation)
- Operating system: Windows 2000, XP, 7 (English edition)

Functional Specifications

<table>
<thead>
<tr>
<th>Data/Setting Load/Save Functions</th>
<th>File extension</th>
<th>Data format</th>
<th>Data contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading data/Setting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3169-20/22 Data file</td>
<td>CSV</td>
<td>CSV</td>
<td>Instantaneous value, average value, maximum value, minimum value, integrated value, demand value, harmonic</td>
</tr>
<tr>
<td>Waveform data file</td>
<td>WUI</td>
<td>Binary</td>
<td>Instantaneous waveform</td>
</tr>
<tr>
<td>Short-interval data file</td>
<td>BIN</td>
<td>Binary</td>
<td>Instantaneous values</td>
</tr>
<tr>
<td>Integrated measurement data file</td>
<td>ITG</td>
<td>CSV</td>
<td>Instantaneous value, integrated value</td>
</tr>
<tr>
<td>Demand measurement data file</td>
<td>DEM</td>
<td>CSV</td>
<td>Instantaneous value, maximum value, minimum value, demand value</td>
</tr>
<tr>
<td>Harmonic measurement data file</td>
<td>HRM</td>
<td>CSV</td>
<td>Instantaneous value, average value, maximum value</td>
</tr>
<tr>
<td>Waveform data file</td>
<td>WUI</td>
<td>Binary</td>
<td>Instantaneous waveform</td>
</tr>
<tr>
<td>Setting file</td>
<td>SET</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>9625 Combined file</td>
<td>DAT</td>
<td>Binary</td>
<td></td>
</tr>
</tbody>
</table>

Saved data/Setting

<table>
<thead>
<tr>
<th>File extension</th>
<th>Data format</th>
</tr>
</thead>
<tbody>
<tr>
<td>9625 Combined file</td>
<td>DAT</td>
</tr>
</tbody>
</table>

9625 Maximum data capacity: Up to 528 MB per data set (total composite data up to 1.5 GB)

Time Series Graph Display Function

- Voltage, current, active power, reactive power, apparent power, power factor, frequency, integrated reactive power, active power, demand, harmonic, total, content ratio, phase angle, total value, THD
- Display position (upper and lower display limits of the vertical (Y) axis can be set by相爱 bar or by specifying values)
- Select each cycle, or 0.1, 0.2, 0.5, 1, 2, 5, 10, 15, 30 sec., 1, 2, 5, 10, 15 or 30 min., or 1, 2, 3, 4, 6, 8 or 12 h., or 1 day
- An optional analysis period can be specified from the overall measurement data period
- (1) Analysis start date and time (YMD, HMS) is specified numerically
- (2) Analysis stop date and time (YMD, HMS) is specified numerically
- Display of measurement data period (measurement start and stop date and time)

Reference values setting

Graph type selection

Graph line type & color setting

Display graph display

Cursor measurement

Data display units setting

Display set standard value

Line, bar, 2-axis and 3-dimensional

Line type and display color can be set for each data set, and marker display is possible

Up to 16 types of data series (time and value, demand quantity) can be displayed in an overlay graph

Measurement values can be displayed by the cursor

Engineering units (m, k, M, G, etc.) can be selected
**3169-20/21 Specifications**

### Basic Specifications

- **Measurement line type**: Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire, and three-phase 4-wire systems (50/60 Hz)
- **Number of systems that can be measured**: For systems that share the same voltage
- **Measurement range**: For the voltage, current, and active power range, see the range verification table on page 2.
- **Input methods**: Simultaneous digital sampling of voltage and current, PLL synchronization or a fixed clock (50/60 Hz)
- **Input methods**: Isolated input
- **Display area**: 5.7-inch LCD (320 x 240 dots), with backlight
- **Display update rate**: Almost the same range can be set for each system
- **Maximum input**: Voltage: 780 Vrms, AC, peak value: 1100 V
- **Size of the input terminal**: 1.7 Vrms, AC, peak value: 2.4 V
- **Maximum input**: Voltage input terminal: 500 Vrms AC (50/60 Hz)
- **Input terminal**: Less than 2 V (50 Ohm input)
- **Internal memory capacity**: 12 MB

### Measurement Specifications

- **Measurement method**: Time GSM method
- **Measurement method**: Measurement of three voltage lines and 3 or 4 current lines is possible when using three-phase 3-wire and three-phase 4-wire systems
- **Measurement method**: For three-phase 3-wire (the SPWM setting), refer to the display for phase power values
- **Measurement method**: For consumption: no symbol, for regeneration: "−"
- **Measurement method**: ON: Measures the reactive power directly using the reactive power measurement method
- **Measurement method**: OFF: Calculates the reactive power from the measurement values for voltage, current, and active power
- **Measurement method**: For lag phase (LAC: current is slower than voltage): no symbol
- **Measurement method**: For lead phase (LED: current is faster than voltage): "−"
- **Measurement method**: Reactive power measurement method: "ON"
- **Measurement method**: No polarity
- **Measurement range**: -1.0000 to 0.0000 to +1.0000 (lag)
- **Measurement range**: For lag phase (LAC: current is slower than voltage) no symbol
- **Measurement range**: For lead phase (LED: current is faster than voltage): "−"
- **Measurement range**: Within 10 to 100% of the range (for sine wave input)
- **Frequency measurement**: 40.000 to 70.000 Hz
- **Frequency measurement**: Within 10 to 100% of the range (for sine wave input)

### Display Specifications

- **Instantaneous value display**: Voltage, current, active power, reactive power, apparent power, power factor, frequency, average voltage, average current, average power factor
- **Average value display**: Voltage, current, active power, reactive power, apparent power, power factor, frequency, average voltage, average current
- **Integrate display**: Voltage, current, active power, reactive power, apparent power, power factor, frequency
- **Demand value display**: Voltage, current, active power, reactive power, apparent power, power factor, frequency
- **Demand value display**: Average voltage, average current
- **Demand value display**: The maximum demand value once the beginning of time series measurement and the time and date it occurred
- **Harmonics list**: List of the items measured for the specified harmonic (numerical value)
- **Harmonics graph**: Bar graph or vector diagram of the items measured for the specified harmonic (numerical value, magnification factor, with a line and an electric factor)
- **Waveform display**: Voltage and current waveforms (with a magnification update function)
### Setting Specifications

- **Measurement line setting:** 1P, 2P, 3P, 4P
- **Input CT setting:** 5A or 10A (Can be set for each system)
- **Input CT setting:** 0.05 to 2000 (A different CT ratio can be set for each system)
- **Measurement method:** Time, set time, or time (1 seconds to 8760 hours)
- **Setting range:** Standard or Custom (Settings are set using the CT980, 990, 950-01, and 950-02)
- **Output interval:** Standard interval: 1, 2, 5, 10, 15, or 30 seconds, or 1, 2, 5, 10, 15, 35, or 60 minutes
- **Data output destination:** PC card, internal memory, or printer
- **File name:** Automatically generated, or set to the desired name
- **External settings:** PC card, internal memory, or printer
- **Language settings:** Japanese, English, German, French, Italian, Chinese (Simple), Thai, Turkish, Korean
- **Other settings:** Reactive power measurement method selection, harmonic distortion detection, output display selection, backlight settings, ID settings, clock settings, etc.

### External Interface Specifications

- **Card output (G104-α only):** 4 channels for measurement values
- **Number of output channels:** 4 channels for measurement values
- **Output method:** For measurement values, voltage, current, average voltage, average current, active power, apparent power, active power factor, frequency
- **Input level:** 50, 240, 960, 1920, 3840 bps
- **Resolution:** ±0.001%
- **Output accuracy:** ±0.002%
- **Temperature characteristic:** ±0.005% /°C
- **Output resistance:** 100 ohms
- **Output load rating:** 100 ohms

### General Specifications

- **Operating environment:** Indoor, up to 2000m (7874 ft) A SL
- **Storage temperature and humidity:** 0 to 40°C, 90% RH or less (non-condensing)
- **Storage temperature and humidity:** -10 to 50°C, 80% RH or less (non-condensing)
- **Waterproof rating:** 50/60 Hz for 15 sec.
- **Waterproof rating:** 50/60 Hz for 15 sec.
- **Power supply voltage:** 100 to 240 V AC, 50/60 Hz
- **Maximum rated power:** 20 VA
- **Dimensions and weight:** 310 × 200 × 60 mm (L × W × H) (excluding protrusions), 8 kg (17.6 lbs)

### Data output item

- **Instantaneous values:** Voltage, current, active power, reactive power, apparent power, power factor, frequency, RMS voltage, average voltage, average current, (average values are for each system)
- **Average values:** Voltage, current, active power, reactive power, apparent power, power factor, frequency, average voltage, average current, (average values are for each system)
- **Minimum/maximum values:** Voltage, current, active power, reactive power, apparent power, power factor, frequency
- **Derived values:** Average value for each interval (For details, see table)

### Formulae

#### [For single-phase 2-wire system]

- **Voltage:** \( U = \sqrt{\frac{1}{M} \sum \left( I_s \right) \left( I_i \right)} \)
- **Current:** \( I = \sqrt{\frac{1}{M} \sum \left( I_s \right) \left( I_i \right)} \)
- **M:** Number of samples
- **s:** Sample count
- **Active Power:** \( P = \frac{1}{M} \sum \left( I_s \right) \left( I_i \right) \)

#### Measurement is also possible using the reactive power measurement method

In addition to conventional calculation methods that search for reactive power using voltage, current, and active power, you can select the reactive power measurement method, which derives reactive power directly from voltage and current values, just as with the reactive power volume measurement method used in large-volume power consumers.

#### When using the reactive power measurement method:

- **Reactive power:** \( Q = \frac{1}{M} \sum \left( I_s \right) \left( I_i \right) \)
- **Power factor:** \( PF = \frac{P}{\sqrt{P^2 + Q^2}} \)

#### When not using the reactive power measurement method:

- **Reactive power:** \( Q = \frac{1}{M} \sum \left( I_s \right) \left( I_i \right) \)
- **Power factor:** \( PF = \frac{P}{\sqrt{P^2 + Q^2}} \)

### Conforming standards

- **Japan:** EN61010
- **IEC:** IEC 60950-3-2, EN61010-3-2
- **Accessories:** voltage, current, and phase (1 channel each of black, red, yellow, and blue), voltage condenser (1), input condenser label (1), operating manuals (1), accessories (1), interface operating manuals and software, control cable (external use only)
### Measurement accuracy (Guaranteed accuracy period : 1 year)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current/active power</th>
</tr>
</thead>
<tbody>
<tr>
<td>±0.2%rdg±0.1%f.s.</td>
<td>±0.2%rdg±0.1%f.s. + clamp-on sensor accuracy</td>
</tr>
</tbody>
</table>

**Conditions of guaranteed accuracy:** After 30 minutes of warm-up, input 5V, PF=1

**Temperature and humidity:**
- 23°C ± 2°C
- Less than 80% relative humidity

**Frequency characteristic:**
- Fundamental waveforms up to 50th order ± 0.2% rdg ± 0.1% f.s. ± measurement accuracy of ±5-65 Hz fundamental waveform

**Effect of input voltage:**
- ±0.2% rdg ± 0.1% f.s.

**Electrical noise:**
- Within ±0.5% f.s.

**Power factor influence:**
- ≤ ±0.5% f.s.

**Effect of reactive factor:**
- ≤ ±0.5% f.s.

**Practical use accuracy:**
- ±0.1 ppm ± 1 second (23°C) ± 1.9 (95% of day 23°C)

---

### Table of current and active power accuracy with clamp-on sensor combinations

<table>
<thead>
<tr>
<th>Current range</th>
<th>9604</th>
<th>9605-02</th>
<th>9660, 9605-03</th>
<th>9661</th>
<th>9660</th>
<th>CT0667</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5A</td>
<td>±0.5%rdg±0.005f.s.</td>
<td>±0.5%rdg±0.005f.s.</td>
<td>±0.5%rdg±0.005f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1A</td>
<td>±0.5%rdg±0.005f.s.</td>
<td>±0.5%rdg±0.005f.s.</td>
<td>±0.5%rdg±0.005f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5A</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10A</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>50A</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>100A</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>200A</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>500A</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1000A</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5000A</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>±0.5%rdg±0.012f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* f.s. is the sensor's rated maximum current value.

---

### Option Specifications

#### CLAMP ON SENSOR

<table>
<thead>
<tr>
<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 input (50 to 60 Hz)</th>
<th>Measuring conductor diameter</th>
<th>Dimensions and weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>9604</td>
<td>AC 5A</td>
<td>AC 10mA</td>
<td>±0.3%rdg±0.002f.s.</td>
<td>Within ±2°</td>
<td>Equivalent to 0.1 A or less (within ±0.02% f.s.)</td>
<td>Within ±0.5%</td>
<td>300 V rms</td>
<td>10000 A continuous</td>
<td>Less than φ 15 mm(0.59&quot;)</td>
<td>49.1W x 133.8 x 210 (3.9 x 5.2 x 8.3&quot;&quot;)</td>
</tr>
<tr>
<td>9605-02</td>
<td>AC 100 A</td>
<td>AC 1mA</td>
<td>±0.3%rdg±0.002f.s.</td>
<td>Within ±2°</td>
<td>Equivalent to 0.1 A or less (within ±0.02% f.s.)</td>
<td>Within ±0.5%</td>
<td>600 V rms</td>
<td>10000 A continuous</td>
<td>Less than φ 15 mm(0.59&quot;)</td>
<td>77W x 151 x 34 (3.0 x 5.9 x 1.3&quot;&quot;)</td>
</tr>
<tr>
<td>9660, 9605-03</td>
<td>AC 50A</td>
<td>AC 1mA</td>
<td>±0.3%rdg±0.002f.s.</td>
<td>Within ±2°</td>
<td>Equivalent to 0.1 A or less (within ±0.02% f.s.)</td>
<td>Within ±0.5%</td>
<td>500 V rms</td>
<td>10000 A continuous</td>
<td>Less than φ 15 mm(0.59&quot;)</td>
<td>99.5W x 185 x 42 (3.9 x 7.2 x 1.6&quot;&quot;)</td>
</tr>
<tr>
<td>9661</td>
<td>AC 100 A</td>
<td>AC 1mA</td>
<td>±0.3%rdg±0.002f.s.</td>
<td>Within ±2°</td>
<td>Equivalent to 0.1 A or less (within ±0.02% f.s.)</td>
<td>Within ±0.5%</td>
<td>600 V rms</td>
<td>10000 A continuous</td>
<td>Less than φ 15 mm(0.59&quot;)</td>
<td>590g x 20.6 (20.6&quot;&quot;)</td>
</tr>
</tbody>
</table>

#### CLAMP ON SENSOR

<table>
<thead>
<tr>
<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 input (50 to 60 Hz)</th>
<th>Measuring conductor diameter</th>
<th>Dimensions and weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT0667</td>
<td>AC 30mA, 50mA</td>
<td>AC 300 mA</td>
<td>±0.5%rdg±0.002f.s.</td>
<td>Within ±1°</td>
<td>Equivalent to 0.1 A or less (within ±0.02% f.s.)</td>
<td>Within ±0.5%</td>
<td>1000 V rms</td>
<td>10000 A continuous</td>
<td>Less than φ 15 mm(0.59&quot;)</td>
<td>50.5W x 58 x 170 (2 x 2.2 x 6.7&quot;&quot;)</td>
</tr>
<tr>
<td>9605-03</td>
<td>AC 30A</td>
<td>AC 10mA</td>
<td>±0.5%rdg±0.002f.s.</td>
<td>Within ±1°</td>
<td>Equivalent to 0.1 A or less (within ±0.02% f.s.)</td>
<td>Within ±0.5%</td>
<td>300 V rms</td>
<td>130 A continuous</td>
<td>Less than φ 15 mm(0.59&quot;)</td>
<td>50.5W x 58 x 170 (2 x 2.2 x 6.7&quot;&quot;)</td>
</tr>
</tbody>
</table>
**Option Specifications**

**PRINTER 9442**
- **Print method**: Thermal thermal dot printing
- **Print width**: 112 mm (4.44")
- **Number of characters and lines**: 32, 80
- **AC adapter**: 9443-00
- **Dimensions and weight**: 20.5 x 172 x 83 mm, approx. 560 g (20.5 oz.)

When purchasing the printer 9442, make sure you also purchase the RS-232C cable 9721 and AC adapter 9443-02 so that you can connect it to the 9169-01.

**PC CARD 9727, 9728**
- **Use only PC Cards**: 9727, 9728
- **MAGNETIC ADAPTER 9804-01, 02**

- **Red and black adapters sold separately.**
- **Purchasing the quantity and color appropriate for your application**

**CLAMP ON ADAPTER 9290-10**
- **For connection to the 9006-c, 9006-10**
- **CABLE 9219**
- **Max. 1500 A AC current (9000 A) Measurable conductor diameter**: 6.0 mm (0.236")
- **CT ratio**: 10:1
- **Dimensions and weight**: 17.5 x 19.3 x 14.3 mm, approx. 212 g (7.46 oz.)

**CARRYING CASE 9720-01**
- **A softtype case for storing the 9169-001-21 and its accessories, such as the clamp-on sensors.**

**CLAMP ON POWER HiTESTER 3169-20**
- **Supplied with the voltage cord L0438-03 (1) and power cord (1)**

**CLAMP ON POWER HiTESTER 3169-21**
- **Supplied with the voltage cord L0438-03 (1), connection cable 9441 (1) and power cord (1)**

**Accessory Specifications**
- **VOLTAGE CORD L0438-03 (1 cord each of black, red, yellow, and blue, cord length: 3 m (9.84ft))**
- **CONNECTION CABLE 9441 (1 D/A output cable, supplied with the 3169-21)**

**Options**
- **CLAMP ON SENSOR 9660 (AC 100A)**
- **CLAMP ON SENSOR 9661 (AC 500A)**
- **FLEXIBLE CLAMP ON SENSOR CT9667 (AC 3000A)**
- **CLAMP ON SENSOR 9668 (AC 1000A)**
- **CLAMP ON SENSOR 9669 (AC 500A)**
- **CLAMP ON SENSOR 9669 (AC 1000A)**
- **CONNECTION CABLE 9210 (for connection to the 9695-05, 9695-06)**
- **CONNECTION CABLE 9290-10 (AC 1500A)**
- **CONNECTION CABLE 9440 (for external I/O)**
- **RS-232C CABLE 9612 (for connection to a PC)**
- **PRINTERS 9442**
- **AC ADAPTER 9443-02 (for the 9442, for Europe)**
- **RS-232C CABLE 9721 (for connection to the 9442)**
- **RECORDING PAPER 1196 (25.3 m/820 ft x 10 rolls, for the 9442)**
- **CARRYING CASE 9720**
- **POWER MEASUREMENT SUPPORT SOFTWARE 9625**
- **PC CARD 256M 9727**
- **PC CARD 512M 9728**
- **MAGNETIC ADAPTER (1 red adapter) 9804-01**
- **MAGNETIC ADAPTER (1 black adapter) 9804-02**

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