Measure Everything from AC, DC and 3-Phase Power Sources to Standby Power

The optimal power meter lineup for all applications
Advancing the Standard for Power Measurement

The best performing instruments for power measurement on production lines, in laboratories, and in research facilities. Hioi delivers the optimal power testing solutions based on use case conditions, practical application, and accuracy.

Three-phase Power Meter

The PW3337 and PW3336 are suitable for a wide variety of connections, such as measuring three-phase circuits and single-phase 2-wire multiple circuits. There is little internal resistance for the current input, and large currents up to 65 A can be measured with great accuracy.

Single-phase Power Meter

The PW3335 provides highly accurate measurements for everything from standby power to operating power. Compliant with the IEC62301 measurement standard for standby power, it is capable of measuring current as low as 10 μA. Designed for power consumption testing, the 3334 and 3333 are guaranteed for accuracy for up to 3 years.
### Basic Accuracy and Frequency Bands

<table>
<thead>
<tr>
<th>Frequency Band [Hz]</th>
<th>Voltage/Current/Power Basic Accuracy [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 Hz</td>
<td>POWER ANALYZER PW6001: 0.05% (±0.02% rdg. ±0.03% f.s.)</td>
</tr>
<tr>
<td>1 Hz</td>
<td>POWER ANALYZER PW3390: 0.09% (±0.04% rdg. ±0.06% f.s.)</td>
</tr>
<tr>
<td>10 Hz</td>
<td>POWER METER PW3337/PW3336: 0.15% (±0.05% rdg. ±0.05% f.s.)</td>
</tr>
<tr>
<td>100 Hz</td>
<td>POWER METER PW3335: 0.15% (±0.01% rdg. ±0.05% f.s.)</td>
</tr>
<tr>
<td>1 kHz</td>
<td>POWER METER PW3335: 0.15% (±0.01% rdg. ±0.05% f.s.)</td>
</tr>
<tr>
<td>10 kHz</td>
<td>POWER METER PW3335: 0.15% (±0.01% rdg. ±0.05% f.s.)</td>
</tr>
<tr>
<td>100 kHz</td>
<td>POWER METER PW3335: 0.15% (±0.01% rdg. ±0.05% f.s.)</td>
</tr>
<tr>
<td>1 MHz</td>
<td>POWER METER PW3335: 0.15% (±0.01% rdg. ±0.05% f.s.)</td>
</tr>
</tbody>
</table>

* Power analyzer accuracy only.

### Effective Measurement Range

<table>
<thead>
<tr>
<th>Voltage</th>
<th>AC/DC POWER HiTESTER 3334: 0.05% (±0.02% rdg. ±0.03% f.s.)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>POWER METER PW3337/PW3336: 100 mV to 1000 V</td>
</tr>
<tr>
<td>1 V</td>
<td>POWER METER PW3335: 1000 V to 1000 V</td>
</tr>
<tr>
<td>10 V</td>
<td>POWER METER PW3335: 1000 V to 1000 V</td>
</tr>
<tr>
<td>100 V</td>
<td>POWER METER PW3335: 1000 V to 1000 V</td>
</tr>
<tr>
<td>1000 V</td>
<td>POWER METER PW3335: 1000 V to 1000 V</td>
</tr>
</tbody>
</table>

* Power analyzer accuracy only.

### Comparison Chart

<table>
<thead>
<tr>
<th>No. of channels</th>
<th>Supported connections</th>
<th>Effective measurement range, voltage</th>
<th>Effective measurement range, current</th>
<th>Frequency band</th>
<th>Basic accuracy, AC (Voltage, current, power)</th>
<th>Basic accuracy, DC (Voltage, current, power)</th>
<th>Integrated power measurement</th>
<th>Harmonic measurement</th>
<th>Current sensor input</th>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW3337</td>
<td>3</td>
<td>Three-phase, three-phase + single-phase, single-phase x 3, DC x 3</td>
<td>0.15 V to 1000 V</td>
<td>DC, 0.1 Hz to 100 kHz</td>
<td>±0.1% rdg. ±0.05% f.s.</td>
<td>±0.1% rdg. ±0.1% f.s.</td>
<td>Yes</td>
<td>IEC61000-4-7 compliant</td>
<td>Yes</td>
<td>LAN</td>
</tr>
<tr>
<td>PW3336</td>
<td>2</td>
<td>Three-phase, single-phase x 2, DC x 2</td>
<td>0.06 V to 1000 V</td>
<td>DC, 45 Hz to 5 kHz</td>
<td>±0.1% rdg. ±0.1% f.s.</td>
<td>±0.2% f.s.</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>RS-232C</td>
</tr>
<tr>
<td>PW3335</td>
<td>1</td>
<td>Single-phase, DC</td>
<td>0.15 V to 300 V</td>
<td>45 Hz to 5 kHz</td>
<td>±0.1% rdg. ±0.1% f.s.</td>
<td>±0.1% rdg. ±0.2% f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>GP-IB</td>
</tr>
<tr>
<td>3334</td>
<td>1</td>
<td>Single-phase</td>
<td>20 V to 300 V</td>
<td></td>
<td>±0.1% rdg. ±0.1% f.s.</td>
<td>±0.1% rdg. ±0.2% f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>PW3335-02, -03, -04</td>
</tr>
<tr>
<td>3333</td>
<td>1</td>
<td>Single-phase</td>
<td>5 mA to 30 A</td>
<td></td>
<td>±0.1% rdg. ±0.1% f.s.</td>
<td>±0.1% rdg. ±0.2% f.s.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3334-01, 3333-01</td>
</tr>
</tbody>
</table>

When using a current sensor

- POWER METER PW3337/PW3336: 5000 A to 5000 A
- POWER METER PW3335: 30 A to 30 A
- POWER METER PW3333: 30 A to 30 A

- * Power analyzer accuracy only.
Features

POWER METER PW3337/PW3336
Accurate measurement of power for three-phase equipment, through direct input up to 1000 V AC/DC / 65 A.

• Voltage/current/power basic accuracy of ±0.1% *
• Direct input up to 1000 V AC/DC / 65 A
• Harmonic measurement as standard feature, IEC61000-4-7 compliant
• Little instrument loss, even with large currents. DCCT input with an input resistance of 1 mΩ or less.
• Power factor effect of ±0.1% f.s. delivers highly accurate measurements even for no-load testing of transformers with a low power factor
• Measurement of multiple connections in the optimal range for each due to independent ranges for each channel
• Measure up to 5000 A AC with optional current sensor

POWER METER PW3335
Highly accurate AC/DC measurements from standby power to operating power

• Voltage/current/power basic accuracy ±0.1% *
• Highly accurate AC/DC measurements from standby power to operating power
• Accuracy guaranteed throughout a wide range, from 10 μA to 30 A and 60 mV to 1000 V AC/DC
• Harmonic measurement as standard feature, IEC61000-4-7 compliant
• Compliant with the IEC62301 and EN50564 measurement standards for standby power
• Power factor effect of ±0.1% f.s. delivers highly accurate measurements even for no-load testing of transformers with a low power factor
• Accurate measurement of fluctuating electric power thanks to auto range integration with guaranteed accuracy for measurements while range switching
• Measure up to 5000 A AC with optional current sensor (PW3335-03, -04)

* For complete details, please refer to the specifications
AC/DC POWER HiTESTER 3334
Measurement of power consumption and integrated power for battery-operated equipment, home appliances, and office equipment
• Accuracy guaranteed up to 3 years
• Compliant with the SPECpower® server power evaluation test

POWER HiTESTER 3333
Low-price model for measurement of power consumption on production/inspection lines
• Compact model for saving space, even when added to a system
• Accuracy guaranteed up to 3 years

Dimensional Drawings
Applications

Inspection of Electrical Equipment Production Lines

**Key features**

- Best-in-class basic accuracy
- Extensive interfaces
- Long-term accuracy guarantee

**Best-in-class Accuracy ±0.1%**

Our lineup provides reliable accuracy for a variety of measurement scenarios. Accurately measure the power consumption of a variety of household appliances, such as liquid crystal displays, refrigerators, and air conditioners.

**Basic accuracy, AC**

\[ \pm 0.1\% \]

* For complete details, please refer to the specifications

**Extensive Interfaces**

The built-in interfaces are convenient for transferring data to a PC and equipping the unit on automated machines. PC communication software can be downloaded free of charge from the HIoki website. For details about the built-in interfaces, refer to the specifications for each model.

**Accuracy Guaranteed Up to 3 Years (Longest in the Industry)**

The 3333 and 3334 are guaranteed for accuracy for 3 years. Even after 3 years, they maintain an accuracy of ±0.5% rdg. as required for measurements. This 3-year accuracy guarantee, the longest in the industry, helps to save on calibration expenses.

**Replacement for Analog Meters**

These models can be used as replacements for analog voltmeters, ammeters, and watt meters. Up to 4 parameters such as voltage, current, and power can be displayed at the same time, allowing 3 measuring devices to be covered with a single unit. The digital display avoids issues such as parallax due to viewing angle and zero shift of the indicator.
Compliant with IEC62301 and EN50564 Standards

The PW3335 is compliant with measurement standards for standby power, as well as other measurement standards including the ErP Directive and Energy Star. Special parameters required by such standards including THD, CF, and MCR can also be checked with this unit.

Requirements for Measurement Instruments for Standby Power Measurements (excerpt)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>PW3335 Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power resolution of 1 mW or better</td>
<td>Minimum resolution of 0.01 mW (in the 300 V / 1 mA range)</td>
</tr>
<tr>
<td>Crest factor 3 support</td>
<td>Crest factor 6 support</td>
</tr>
<tr>
<td>Harmonic component measurement of up to at least 50th order</td>
<td>Harmonic measurement as standard feature</td>
</tr>
<tr>
<td>Data acquisition via interface</td>
<td>LAN (standard feature), RS-232C, GPIB</td>
</tr>
</tbody>
</table>

THD (Total Harmonic Distortion): Indicates to what extent harmonic components are present in an AC waveform
CF (Crest Factor): Ratio of the peak value to the effective (RMS) value of an AC waveform
MCR (Maximum Current Ratio): Current evaluation index, calculated from the crest factor and power factor

Wide Range of Effective Measurement

The PW3335 has an effective measurement range of 1% to 150%. Due to this wide range of effective measurement, even equipment with large load fluctuations, such as refrigerators, heaters, and pumps, can be measured accurately under all conditions from no-load to full operation.

Create Reports with Free Software

Standby power measurement software can be downloaded free of charge from the HIOKI website. Enter the required information to perform standby power measurements according to standards. Use this software to create reports of measurement results and save test data in CSV format.

Support for CF6 (Crest Factor 6)

When an AC adapter or switching power supply operates with no load, the crest factor of the current waveform increases. The PW3335 can measure waveforms that exceed the range of wattmeters that support crest factor 3.

In addition, although the power factor is low during no-load operation, the PW3335 is affected very little by power factor and can therefore achieve accurate measurements.
Measurement of Fluctuating Loads and Power Supply Control

Auto Range Integration with Guaranteed Accuracy when Switching Ranges

These models automatically jump to the optimal power range according to current consumption when performing integration measurements. When switching ranges, power is integrated using the B range*, and therefore there is no loss of integration data. Achieve seamless power integration with guaranteed accuracy, even with loads that experience frequent and repeated fluctuations. In addition, since power integration can be performed for individual ranges, you can measure integrated power for the various conditions of devices that experience power fluctuations.

<table>
<thead>
<tr>
<th>Power range</th>
<th>Range selection</th>
<th>Standby</th>
<th>Measurement with B range when switching ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0000 kW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5000 kW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150.00 W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75.000 W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75.000 W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.000 W</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Power range Range selection

Time average power = Integration power / Integration time

Time average current = Integration current / Integration time

Intermittent Power Supply

Devices that perform intermittent operation and cycle control repeat a cycle of stopped states and operating states. Therefore, with normal power measurement, it is not possible to determine a value for rated power consumption.

Time average active power (current) is a function that allows the measurement of the time average for power (current) that experiences fluctuations.

AC/DC Measurement

For equipment that uses rectifiers and control devices, it might not be possible to accurately measure voltage or current without an AC/DC power meter.

- Half-wave rectified waveforms used for dryers and fans
- Full-wave rectified waveforms used for AC adapters
- Cycle control waveforms used for voltage and temperature adjustment heaters
- DC waveforms with superimposed ripple components

Example: Current Waveform for Heat Retention Heater

Example: Long-term Power Fluctuation in a Refrigerator

Example: Current Waveform for Heat Retention Heater

Example: Half-wave Rectified Waveform

Example: Full-wave Rectified Waveform

Example: Cycle Control Waveform

Example: DC Waveform with Superimposed Ripple

* Internal range when using range switching
Compliant with IEC61000-4-7 Harmonic Measurement Standards

These models are compliant with the IEC61000-4-7 international standard for harmonic measurements. Conduct harmonic analysis up to the 50th order. The upper limit for harmonic analysis can be set from 2nd to 50th, according to the standard used.

IEC61000-4-7 is an international standard for the measurement of harmonic current and harmonic voltage in power supply systems, and the harmonic current emitted from devices. It specifies the performance of standard measurement instruments. Among the series of standards that include specifications for power measurements, it is used as a reference standard for harmonic measurements.

Support for Various Connections

The PW3337 supports not only 3V3A, but also a variety of three-phase connections such as 3P4W, 3P3W2M, and 3P3W3M.

Accuracy Guaranteed for Currents Up to 65 A

Because DCCT allows a current with an input resistance of 1 mΩ or less, accuracy is guaranteed up to 65 A. No heat is generated even with the input of large currents, so there is no loss of accuracy due to self-heating. Even if the current exceeds 65 A, an optional current sensor allows measurements up to 5000 A.

Inverter Efficiency Measurement

These models cover not only the fundamental frequency bands for inverters, but also carrier frequency bands, in a wide range that includes DC and frequencies from 0.1 Hz to 100 kHz.

24-channel Power Meter with Synchronous Control for up to 8 Units

Connect 8 units for synchronous measurement of up to 24 channels. The calculation and control timing for PW3337, PW3336, and PW3335 units that are set as slaves are synchronized with the master unit. Use this feature to measure the I/O efficiency of power supply devices, compare multiple pieces of equipment, or to perform simultaneous parallel testing of production lines. Use the free PW COMMUNICATOR® software to calculate the efficiency between multiple units and to acquire data simultaneously from multiple units.

* This software can be downloaded from the HIOKI website.
PV Power Conditioner (PCS) Efficiency Measurements

Independent Ranges Per Channel for Highly Accurate Measurements
Independent channels allow the selection of the optimal range for each connection. One example is the simultaneous measurement of the primary side (DC) and secondary side (three-phase) of a PCS using a single unit. Selecting the optimal range for each target to be measured enables highly accurate measurements.

Simultaneous Measurement of Power Data and Harmonics
In addition to standard measurement items such as voltage, current, and power, all items related to harmonics, such as distortion and content percentage, are calculated internally in parallel at the same time. Items such as RMS value, MEAN value, DC components, AC components, and fundamental wave components can all be confirmed simply by switching the display. Even for DC waveforms with superimposed ripple components, the AC/DC components can be measured separately. In addition, when using PC software, more than 180 measurement items can be acquired at the same time.

I/O Efficiency Calculation with a Single Unit
Input and output can be measured independently at the optimal ranges, and the PCS efficiency can be calculated and displayed on a single unit. PCS can be evaluated with a simple system configuration.

1000 V Range for Evaluation of Large Power Conditioners
These models support the measurement of large voltages, which is required in order to measure power conditioners for solar power generation. Measure up to 1000 Vrms and 1500 Vpeak.

Aggregation of Output from DC Current Sensors (Up to 4000 A)
SENSOR UNIT CT9557 is a power supply for highly accurate current sensors that have a waveform output function. In addition to using it as a 4-channel power supply, it is also equipped with a sum feature for aggregating the input waveforms into a single waveform to be output.
The level output (analog output) function delivers measured values that are displayed on the power meter with an analog voltage that is updated every 200 ms. Connect the unit to a data logger to check trends through synchronization with data such as temperature and heat flow.

The waveform output function outputs the voltage/current waveforms captured by a power meter in the form of high-speed analog voltage. Connect to a memory recorder to check behavior when load fluctuates, such as with the inrush current of a motor.

**Key features**

- Level output
- Waveform output
- High-speed level output
- LR8410Link

**Display Trends with a Data Logger**

The level output (analog output) function delivers measured values that are displayed on the power meter with an analog voltage that is updated every 200 ms. Connect the unit to a data logger to check trends through synchronization with data such as temperature and heat flow.

**Observe Waveforms with a Memory Hicorder**

The waveform output function outputs the voltage/current waveforms captured by a power meter in the form of high-speed analog voltage. Connect to a memory recorder to check behavior when load fluctuates, such as with the inrush current of a motor.

**Observe Power for Each Cycle**

The PW3337, PW3336, and PW3335 feature built-in, high-speed active power level output. Level is output for power per cycle. When used in combination with a memory hicorder, fluctuations in power can be observed in real time. This feature is also useful for analyzing equipment that uses power, such as monitoring cutting and grinding tools.

**Log Data Measured by a Power Meter Wirelessly on a Hioki Logger (LR8410 Link)**

Wirelessly transmit measurement parameters from the Power Meter PW3335 (excluding model -01) to a Wireless Logging Station LR8410 via Bluetooth® wireless technology.

- The PW3335-02 and PW3335-04 can transmit 7 D/A output parameters.
- The PW3335, PW3335-03 can transmit 4 parameters: voltage, current, power and power factor.

This allows you to combine the voltage and temperature data from the Logger with the current and power from the Power Meter in real time.

* Heat flow: Parameter for understanding the heat reception and heat dissipation of an object. Can be measured with a heat flow sensor.

* With the PW3335, high-speed level output is also possible for 45 Hz to 66 Hz voltage and current.
No-load Loss Measurements for Transformers

**Power Factor Effect of 0.1% or Less, Even at Low Power Factors**

A no-load loss test is one indicator for evaluating energy conservation for transformers and motors. The PW3337 and PW3336 are affected very little by power factor, at ±0.1% f.s. or less, allowing active power to be measured with a high level of accuracy at low power factors.

**Support for Crest Factor 6**

The crest factor of a current waveform increases during no-load operation. The PW3337, PW3336, and PW3335 support a crest factor 6. Therefore, even if the waveform peak value is large relative to the range, accurate measurements are possible without exceeding the range.

**DC Power Measurement for Batteries and Power Supplies**

**Best-in-class DC Power Accuracy**

These models are best for measuring battery power consumption and output from switching power supplies. Make accurate measurements of DC power, which is an important factor in improving efficiency and saving energy.

**Current and Power Integration Function by Polarity**

For integrated measurements, recharging power and discharging power are integrated by polarity every 200 ms. The amount of power in the positive direction, the amount of power in the negative direction, and the sum of the amounts of power in the positive and negative direction during the integration period are measured. Accurate measurement of recharging power and discharging power is possible even if there is rapid repetition of battery recharging/discharging.

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** PW3330 Series Power Factor Effect (Typical) **

With f.s. input for voltage/current range, and a power factor of 0.

** PW3335 (1000 V/1 mA) range **

** PW3337/PW3336 (1000 V/50 A) range **

** PW3330 Series Power Factor Effect (Typical) **

With f.s. input for voltage/current range, and a power factor of 0.

** Error [% f.s.] **

** Input Frequency [Hz] **

** Current waveform **

** Voltage waveform **

** Example of Transformer Current Waveform during No-load Operation **

---

** PW3330 Series Power Factor Effect (Typical) **

With f.s. input for voltage/current range, and a power factor of 0.

** PW3335 (1000 V/1 mA) range **

** PW3337/PW3336 (1000 V/50 A) range **

** PW3330 Series Power Factor Effect (Typical) **

With f.s. input for voltage/current range, and a power factor of 0.

** Error [% f.s.] **

** Input Frequency [Hz] **

** Current waveform **

** Voltage waveform **

** Example of Transformer Current Waveform during No-load Operation **

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** DC power accuracy **

** ±0.1% **

* For complete details, please refer to the specifications
## TYPE 1 Current Sensor (General Current Measurements)

Connect this unit to the current sensor input terminal (BNC) on the PW3337/PW3336/PW3335. It can be used with a direct connection.

<table>
<thead>
<tr>
<th>Wiring method</th>
<th>External appearance</th>
<th>Product name/model no.</th>
<th>Rated current</th>
<th>Frequency band</th>
<th>Diameter of measurable conductors</th>
<th>Basic accuracy (amplitude)</th>
<th>Basic accuracy (phase)</th>
<th>Cord lengths</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through method</td>
<td></td>
<td>CLAMP ON SENSOR 9660</td>
<td>100 A</td>
<td>40 Hz to 5 kHz</td>
<td>φ 15 mm (0.59 in)</td>
<td>±0.3% rdg. ±0.02% f.s.</td>
<td>Within ±1°</td>
<td>3 m (9.84 ft)</td>
<td>Not used</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CLAMP ON SENSOR 9661</td>
<td>500 A</td>
<td>40 Hz to 5 kHz</td>
<td>φ 46 mm (1.81 in)</td>
<td>±0.3% rdg. ±0.01% f.s.</td>
<td>Within ±0.5°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CLAMP ON SENSOR 9669</td>
<td>1000 A</td>
<td>40 Hz to 5 kHz</td>
<td>φ 55 mm (2.17 in), 80 mm (3.15 in) x 20 mm (0.79 in) BUS BAR</td>
<td>±1.0% rdg. ±0.01% f.s.</td>
<td>Within ±1°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FLEXIBLE CLAMP ON SENSOR 9667-01</td>
<td>500 A/500 A</td>
<td>10 Hz to 20 kHz</td>
<td>φ 100 mm (3.94 in)</td>
<td>±2.0% rdg. ±0.3% f.s.</td>
<td>Within ±1°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>FLEXIBLE CLAMP ON SENSOR 9667-02</td>
<td>10 Hz to 20 kHz</td>
<td></td>
<td>φ 180 mm (7.09 in)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Options for Current Sensor TYPE 2

<table>
<thead>
<tr>
<th>External appearance</th>
<th>Product name/model no.</th>
<th>Max. no. of sensors</th>
<th>Functions</th>
<th>Power supply</th>
<th>Cord lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SENSOR UNIT CT9555</td>
<td>1</td>
<td>For supplying power to the TYPE 2 current sensor</td>
<td>100 V to 240 V AC</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SENSOR UNIT CT9557</td>
<td>4</td>
<td>For connecting CT9555/CT9557 and PW3330 series units</td>
<td>100 V to 240 V AC</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>CONNECTION CORD L9217</td>
<td>-</td>
<td>For connecting CT9555/CT9557 and PW3330 series units</td>
<td>-</td>
<td>1.6 m (0.25 ft)</td>
</tr>
</tbody>
</table>

### Rack Mount Hardware

HIOKI can also manufacture rack mount hardware (EIA, JIS). Please contact your Hioxi distributor or subsidiary for more information.

### Printing with a Printer

Connect the 3333 to PRINTER 9442* to print out values.

**PRINTER 9442**

Thermal serial dot method, 112 mm (4.41 in) paper width

- Power supply: AC ADAPTER 9443-02, or the included nickel hydride batteries
- Dimensions, mass: 160 mm W × 67 mm H × 170 mm D

**CONNECTION CABLE 9444**

- 9-pin - 9-pin, straight, 1.5 m (4.92 ft)
- For printer, 9442, EU type
- 10-roll set

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**Connectors and Cables**

- AC ADAPTER 9443-02
- SENSOR UNIT CT9555 or CT9557
- RECORDING PAPER 1196

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**Options**

**TYPE 2 Current Sensor (Highly Accurate Current Measurements)**

Connect this unit to the current sensor input terminal (BNC) on the PW3337/PW3336/PW3335. SENSOR UNIT CT9555 or CT9557 and CONNECTION CABLE L9217 are required.

<table>
<thead>
<tr>
<th>Wiring method</th>
<th>External appearance</th>
<th>Product name/model no.</th>
<th>Rated current</th>
<th>Frequency band</th>
<th>Diameter of measurable conductors</th>
<th>Basic accuracy (amplitude)</th>
<th>Basic accuracy (phase)</th>
<th>Cord lengths</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through method</td>
<td></td>
<td>CT6862-05</td>
<td>50 A</td>
<td>DC to 1 MHz</td>
<td>φ 24 mm (0.94 in)</td>
<td>±0.05% rdg. ±0.01% f.s.</td>
<td>Within ±0.2°</td>
<td>3 m (9.84 ft)</td>
<td>CT9555 or CT9557</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CT6863-05</td>
<td>200 A</td>
<td>DC to 500 kHz</td>
<td>φ 24 mm (0.94 in)</td>
<td>±0.04% rdg. ±0.008% f.s.</td>
<td>Within ±0.1°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CT6875</td>
<td>500 A</td>
<td>DC to 2 MHz</td>
<td>φ 36 mm (1.42 in)</td>
<td>±0.3% rdg. ±0.01% f.s.</td>
<td>Within ±0.1°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CT6876</td>
<td>1000 A</td>
<td>DC to 1.5 MHz</td>
<td>φ 36 mm (1.42 in)</td>
<td>±0.3% rdg. ±0.01% f.s.</td>
<td>Within ±0.1°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CT6877</td>
<td>2000 A</td>
<td>DC to 1 MHz</td>
<td>φ 80 mm (3.15 in)</td>
<td>±0.3% rdg. ±0.01% f.s.</td>
<td>Within ±0.1°</td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td>CT6841-05</td>
<td>20 A</td>
<td>DC to 200 Hz</td>
<td>φ 20 mm (0.79 in)</td>
<td>±0.3% rdg. ±0.01% f.s.</td>
<td>Within ±0.1°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CT6843-05</td>
<td>500 A</td>
<td>DC to 500 kHz</td>
<td>φ 20 mm (0.79 in)</td>
<td>±0.3% rdg. ±0.01% f.s.</td>
<td>Within ±0.1°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CT6844-05</td>
<td>500 A</td>
<td>DC to 200 kHz</td>
<td>φ 20 mm (0.79 in)</td>
<td>±0.3% rdg. ±0.01% f.s.</td>
<td>Within ±0.1°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CT6845-05</td>
<td>500 A</td>
<td>DC to 100 kHz</td>
<td>φ 50 mm (1.97 in)</td>
<td>±0.3% rdg. ±0.01% f.s.</td>
<td>Within ±0.1°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CT6846-05</td>
<td>1000 A</td>
<td>DC to 20 kHz</td>
<td>φ 50 mm (1.97 in)</td>
<td>±0.3% rdg. ±0.01% f.s.</td>
<td>Within ±0.1°</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9272-05</td>
<td>20 A/200 A</td>
<td>1 Hz to 100 kHz</td>
<td>φ 46 mm (1.81 in)</td>
<td>±0.3% rdg. ±0.01% f.s.</td>
<td>Within ±0.2°</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Options for Current Sensor TYPE 2

<table>
<thead>
<tr>
<th>External appearance</th>
<th>Product name/model no.</th>
<th>Max. no. of sensors</th>
<th>Functions</th>
<th>Power supply</th>
<th>Cord lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SENSOR UNIT CT9555</td>
<td>1</td>
<td>For supplying power to the TYPE 2 current sensor</td>
<td>100 V to 240 V AC</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SENSOR UNIT CT9557</td>
<td>4</td>
<td>For connecting CT9555/CT9557 and PW3330 series units</td>
<td>100 V to 240 V AC</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>CONNECTION CORD L9217</td>
<td>-</td>
<td>For connecting CT9555/CT9557 and PW3330 series units</td>
<td>-</td>
<td>1.6 m (0.25 ft)</td>
</tr>
</tbody>
</table>
Software

PW Communicator

PW Communicator is an application for communicating between a PW3337/PW3336/PW3335 and a PC. This software can be downloaded free of charge from the HIOKI website. Use this software to configure the power meter, acquire interval data with a PC, perform numerical calculations for measurement data, calculate efficiency between multiple units, display 10 or more measurement items, and display waveforms.

- **Numerical value monitoring**: Display the PW3337/PW3336/PW3335 measurement values on the PC screen. You can freely select up to 64 values, such as voltage, current, power, and harmonics.
- **Waveform monitoring**: The voltage, current, and waveforms measured by the unit can be monitored on the PC screen.
- **Meter setting**: The configuration of the connected power meter can be changed on the PC screen.
- **Synchronous measurement**: Efficiency calculations, such as input/output of the power supply conversion device, are possible between multiple power meters. Use a sync cable to connect and synchronize the control of up to 8 units.
- **Save in chronological order**: More than 180 pieces of measured data can be recorded to a file in CSV format at regular time intervals. The minimum time interval for recording is 200 ms.

LabVIEW Driver

Obtain data and configure measurement systems with the LabVIEW driver.

Sample Software

Sample software for loading data (via RS-232C) can be downloaded from the HIOKI website.

- The 3333/3334 front panel is displayed on the PC screen. Operate the power meter or change settings directly on the PC.
- The measured values for the 3333/3334 are displayed in real time on the PC screen. Save data as a CSV file.
"Standby Power Measurement Software" is an application software exclusively designed for the Power Meter PW3335. This software lets you to view PW3335 measurement data and also save them as reports or in CSV format via a LAN, GP-IB, or RS-232C. Measure standby power consumption in accordance with IEC62301. Download the software free of charge from the HIOKI website.

**Workflow for Standby Power Test**

1. **Connect to power meter**
   Configure the settings for communication with a power meter. Connect the PC to a power meter, and enter the settings required for the interface used (LAN/RS-232C/GP-IB).

2. **Configure the test target**
   Enter the information of the device under test. The information to be entered includes manufacturer name, model name, serial number, and operation mode. You can also register an image of the test target.

3. **Configure the test power supply**
   Enter the information of the test power supply. Information to be entered includes rating and frequency. Also, enter the values of uncertainty due to the connection method, wiring, power supply, and temperature.

4. **Configure the test conditions**
   Set the current range, stop conditions, algorithm used to judge stability, cycle time, and upper limit for test time.

5. **Run test**
   The consumed power is measured according to the configured settings.

6. **Create report**
   Create a report of the test results. Output either a PDF report or CSV file.

**Example of report output**

**CSV output example**
Validity: for 15A or less. 

**Input Methods**

Voltage: Isolated input, resistance voltage division method.

Current: Isolated input, DCCT method (isolated input from current sensors).

**Filter**

Power ranges: Depends on the combination of voltage and current ranges.

Sampling frequency: Approx. 700 kHz.

**Measurement Accuracy**

Frequency bands: DC, 0.1 Hz to 100 kHz.

- 50kHz < f ≤ 100kHz: ±0.1%rdg. ±0.2%f.s. ±0.3%rdg. ±0.3%rdg.
- 10kHz < f ≤ 50kHz: ±0.1%rdg. ±0.1%f.s. ±0.2%rdg. ±0.2%rdg.
- 600Hz < f ≤ 500Hz: ±0.1%rdg. ±0.2%f.s. ±0.3%rdg. ±0.3%rdg.
- 500Hz < f ≤ 1kHz: ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s.
- 1kHz < f ≤ 10kHz: ±(0.03+0.07×F)%rdg.
- 0.1Hz ≤ f < 16Hz: ±0.1%rdg. ±0.1%f.s. ±0.2%rdg. ±0.2%rdg.
- 45Hz ≤ f ≤ 66Hz: ±0.1%rdg. ±0.1%f.s. ±0.2%rdg. ±0.2%rdg.

Output values: As per voltage and voltage waveform, peak current and true RMS values for current and voltage waveform peak values for effective measurement ranges.

**Basic Specifications**

- Measurement: simultaneous voltage and current digital sampling, zero-cross simultaneous calculation.
- Sampling frequency: 700 kHz.
- ADC converter: 16-bit resolution.
- Frequency bands: DC, 0.1 Hz to 100 kHz.
- Sampling rate: 20-kHz sampling rate for each input mode.

**Measurement Items**

- Input: Voltage, current, apparent power, active power, apparent power factor, phase angle, frequency, harmonic parameters, total harmonic distortion, voltage waveform peak value, current waveform peak value, voltagecrest factor, current crest factor, time average current, time average active power, voltage ripple factor, current ripple factor, harmonic parameters, harmonic voltage RMS value, harmonic current RMS value, harmonic active power, total harmonic distortion, voltage fundamental waveform, current waveform peak value, apparent power fundamental waveform, reactive power fundamental waveform, power factor fundamental waveform, displacement power factor, voltage current phase difference, fundamental waveform, inter-channel voltage fundamental wave phase difference, inter-channel harmonic fundamental wave phase difference, harmonic voltage current, harmonic current content %, harmonic active power content %.

- The following parameters can be downloaded as data during PC communication but not displayed:
  - Harmonic voltage phase angle
  - Harmonic current phase angle
  - Harmonic voltage current phase difference

**Rectifiers**

- AC/DC, DC/AC measurement types:
  - Total RMS values for both voltage and current.
  - AC/DC Unm: AC/DC measurement types:
    - Display of average rectified values for voltage and true RMS values for current.
  - DC/AC measurement:
    - Display of simple averages for both voltage and current.
  - DC/AC measurement:
    - Display of values calculated by (average DC voltage) × (DC current value) for active power.
  - AC measurement:
    - Display of values calculated by (AC/DC voltage) × (DC value) for active power.

**Power Supplies**

- Power supplies include: 3V3A, 3P3W, 3P3W2M, 3P3W3M, 3P4W.

**Wiring**

- X: 1P2W; Xsum: (X(1) + X(2) + X(3)); Psum: (P(1) + P(2) + P(3)).

**Temperature Characteristics**

- ±0.03% f.s. per °C.

**Display of values calculated by**

- (AC+DC value): (Ac + Dc) value
- for both voltage and current
- AC: AC measurement
- DC: Display of true RMS values for both voltage and current
- Vrms: Measurement of fundamental wave component

**Display of values calculated by**

- (voltage DC value) × (current DC
time-averaged value)
- (voltage and true RMS values for current)
- (voltage waveform peak value) x (current waveform peak value)
- (voltage and true RMS values for current)

**Voltage/Current/Active power Measurement Specifications**

- Types: Rectifiers, AC/DC, DC/AC, AC/DC, AC/AC, AC/DC.

**Voltage/Current/Active power channel and sum value calculation formulas**

- Voltage: V = Vrms × sin(θ), where θ is the phase difference between voltage and current.
- Current: I = I rms × cos(θ), where θ is the phase difference between voltage and current.
- Active power: P = Vrms × I rms × cos(θ), where θ is the phase difference between voltage and current.

**Voltage Waveform Peak Value / Current Waveform Peak Value Measurement Specifications**

- Measurement types: 1P2W, 1P3W, 3P3W, 3P3W2M, 3P4W.
- Measurement accuracy:
  - ±1%: for a range of 0.1 to 100 Hz. (current: f is linearly dependent on frequency)
  - ±0.5%: for a range of 100 Hz to 1 kHz. (current: f is linearly dependent on frequency)
  - ±0.2%: for a range of 1 kHz to 10 kHz. (current: f is linearly dependent on frequency)
  - ±0.1%: for a range of 10 kHz to 100 kHz. (current: f is linearly dependent on frequency)
  - ±0.05%: for a range of 100 kHz to 1 MHz. (current: f is linearly dependent on frequency)

**Voltage/Current Ratio Calibration**

- Zero-crossing: 600 Hz/200 kHz.

**Measurement Accuracy**

- Frequency (f): Input < 50% f.s.
  - 0% to 50%: ±0.1% rdg. ±0.1%f.s. ±0.2%rdg. ±0.3%rdg.
  - 50% to 100%: ±0.1% rdg. ±0.1%f.s. ±0.2%rdg. ±0.3%rdg.
- Frequency (f): Input > 50% f.s.
  - 50% to 100%: ±0.1% rdg. ±0.1%f.s. ±0.2%rdg. ±0.3%rdg.
  - 100%: ±0.1% rdg. ±0.1%f.s. ±0.2%rdg. ±0.3%rdg.
- Frequency (f): Input > 50% f.s.
  - 50% to 100%: ±0.1% rdg. ±0.1%f.s. ±0.2%rdg. ±0.3%rdg.
  - 100%: ±0.1% rdg. ±0.1%f.s. ±0.2%rdg. ±0.3%rdg.
- Frequency (f): Input > 50% f.s.
  - 50% to 100%: ±0.1% rdg. ±0.1%f.s. ±0.2%rdg. ±0.3%rdg.
  - 100%: ±0.1% rdg. ±0.1%f.s. ±0.2%rdg. ±0.3%rdg.
Voltage Ripple Rate / Current Ripple Factor Measurement Specifications

- **Effective measuring range:**
  - As per voltage and voltage waveform peak value or current and current waveform peak value effective measuring range.
- **Display range:**
  - For sine wave input that is at least 20% of the measurement range.
- **Frequency range:**
  - (0 Hz to 100 Hz)
- **Display accuracy:** ±0.05% rdg. ±1 dgt. (0°C to 40°C)

Power channel and sum value calculation formulas

1. **Measurement channel:**
   - S = Apparent power
   - Q = Reactive power

2. **Sum values:**
   - S = \(\frac{\sum_{i=1}^{n} S_i}{n}\)
   - P = \(\frac{\sum_{i=1}^{n} P_i}{n}\)
   - Q = \(\frac{\sum_{i=1}^{n} Q_i}{n}\)
   - Z = \(\frac{\sum_{i=1}^{n} Z_i}{n}\)

3. **Efficiency measurement:**
   - Efficiency range: 0.1 Hz to 100 kHz
   - Efficiency measurement accuracy: ±1% rdg. ±1 dgt. (0°C to 40°C)

Frequency Measurement Specifications

- **Number of measurement channel:** 3 ch
- **Measurement source:** select from (VxCA) or (f xA) by channel
- **Measurement method:** Calculated from input waveform period (reciprocal method)
- **Measurement range:** 0 Hz to 199 kHz (linked to the input filter)
- **Measurement accuracy:** ±1% rdg. ±1 dgt. (0°C to 40°C)
- **Effective range:** 0.1 Hz to 100 kHz
- **Display format:** 0.1000 Hz to 9.9999 Hz; 9.900 Hz to 99.999 Hz; 99.00 Hz to 999.99 Hz
- **Display range:** ±1% rdg. ±1 dgt. (0°C to 40°C)

Efficiency Measurement Specifications

- **Measurement method:**
  - Calculates the efficiency using (1) at 130% of the rated active power for channels and areas.
  - **Wiring mode:**
    - 3P2W
    - 3P3W
    - 3P4W
    - 3P3W2M
    - 3P3W3M

Harmonic Measurement Specifications (built-in function)

- **Measurement method:**
  - Calculates the harmonic content (see separate pages) by channel according to the wiring mode.
  - Uniform thinning between zero-cross events after processing with a digital anti-aliasing filter
  - Interpolation calculations (Lagrange interpolation)
  - When the synchronization frequency falls within the 45 Hz to 66 Hz range:
    - IEC 61000-4-7:2002 compliant
    - Gaps and overlaps are not within the measurement range of 45 Hz to 66 Hz

Functional Specifications

- **Reference (AUTO):**
  - Measured value changes the voltage and current range for each wiring mode according to the panel display.
- **Averaging (AVG):**
  - Averages the voltage, current, apparent active power, apparent reactive power, and active power.
  - The power factor and phase angle are calculated from averaged data.
  - Measured values other than peak values, power factor, phase angle, integrated values, integral values, and harmonics are averaged.
  - **Method:** Simple averaging
  - **Number of averaging iterations:** 1 (OFF) 2 5 10 25 50 100

Scaling (VT, CT)

- **Applies user-defined VT and CT range settings to measured values.
  - VT range settings: OFF (0), 0.1 to 1000 (setting: 0000)
  - CT range settings: OFF to 100: 100 Hz to 200 Hz (0000)

Integration Measurement Specifications

- **Measurement accuracy:** ±100 ppm ±1 dgt. (0°C to 40°C)

Zero Adjustment (ADJ)

- **Disregards the current input unit DC1 and then zeroes out the current input offset.
- **Back-up:** Enables key input in the measurement state, except for the Shift-1 key and KEY LOCK key.

System Reset

- **Initializes the instrument’s settings.** Communications-related settings and 4-20mA-related settings are not initialized.

Harmonic Measurement Specifications (built-in function)

- **Harmonic voltage RMS value**
- **Harmonic voltage phase angle**
- **Harmonic current RMS value**
- **Harmonic current phase angle**
- **Harmonic active power**
- **Harmonic active power content**
- **Harmonic reactive power**
- **Harmonic reactive power content**
- **Total harmonic distortion**
- **Total harmonic disturbance**
- **Total current harmonic distortion**
- **Voltage fundamental waveform**
- **Current fundamental waveform**
- **Active power fundamental waveform**
- **Reactive power fundamental waveform**
- **Power factor fundamental waveform**

The following parameters can be downloaded as data during PC communications, but not displayed.

- **Volts wave phase**
- **Harmonic voltage phase angle**
- **Harmonic voltage current phase difference**
D/A Output Specifications (PW3336-02/-03 and PW3337-02/-03)

### Synchronized Control
- **Output parameters**
  - Voltage, Current, Active power, Reactive power, Phase angle
  - Harmonic voltage, instantaneous current, RMS value level
  - Instantaneous voltage, instantaneous current, RMS value level

### Power factor measurement characteristics
- Power factor accuracy
  - For voltage level: ±0.1% f.s.
  - For current level: ±0.1% f.s.

### Harmonic accuracy measurement
- Frequency: 45 Hz ≤ f ≤ 66 Hz
- Accuracy: ±0.2% f.s.

### Configuration
- Output parameters: U1 to U3 (voltage level) or u1 to u3 (instantaneous voltage waveform) (switchable)

### Terminal configuration
- Number of units for which synchronized control can be performed:
  - 1 master unit and 7 slave units (total 8 units)

### Terminal BNC terminal × 1 (non-isolated)
- Display 7-segment LED
- Functionality: Upper limit setting, Analysis order

### Port Isolation
- 1 cycle
- Maximum: +2 V DC at 200.00 Hz

### General Specifications
- IP : IP54
- Temperature characteristic: ±0.05% f.s./°C or less

### Power supply
- Rated supply voltage: 100 VAC to 240 VAC
- Rated power supply frequency: 50/60 Hz
- Maximum rated power: 40 VA or less

### Accessories
- Instruction manual × 1, Measurement guide × 1, Power cord × 1

### Dimensions
- Approx. 305W(12.01") × 132H(5.20") × 256D(10.08") mm
- Rated supply voltage: 100 VAC to 240 VAC
- Rated power supply frequency: 50/60 Hz
- Maximum rated power: 40 VA or less
- Applicable Standards
  - Safety: EN61010
  - EMC: EN61326 Class A / EN61000-3-2 / EN61000-3-3

### General Specifications (excluding dimensions)
- Rated voltage to earth: 10 to 50°C (14 to 122°F)
- Humidity: 80% RH or less (non-condensing)

### External control
- functions: START/STOP, integration reset and hold via external control
- Communications: Full duplex, 10BASE-T/100BASE-TX (automatic detection)

### RS-232C interface
- Communication Speed: 9600bps/38400bps

### LAN interface
- Communication Speed: 100Mbps/38400bps

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### Display Specifications
- **Display resolution**
  - 320 × 240 pixels

### Display update rate
- 200 ms to 2.5 s (varies with number of averaging iterations setting)

### General Specifications
- **LAN interface (built-in feature)**
  - Connector: RJ-45 connector × 1
  - Transmission: IEEE802.3 compliant
  - Connector: 10BASE-T/100BASE-TX
  - Communication speed: 9600bps/38400bps

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### Electrical Specifications
- **Connector**
  - Interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, DC1
  - Remote control by controller
- **RS-232C interface (built-in feature)**
  - Communication Speed: 10BASE-T/100BASE-TX (automatic detection)
  - Remote control by controller (REMOTE lamp will light up.)
- **GP-IB interface (PW3336-01/03, PW3337-01/03)**
  - Connectors: 10BASE-T/100BASE-TX
  - Functions: HI/LO, START/STOP, STOP, HOLD, HI/LO, START/STOP

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### Remote control by controller
- Remote control by controller
- Remote control by controller (REMOTE lamp will light up.)

---

### Remote control by controller
- Remote control by controller
- Remote control by controller (REMOTE lamp will light up.)

---

### Accessories
- Instruction manual × 1, Measurement guide × 1, Power cord × 1

---

### Decimal dielectric strength
- 2400 Vrms Ac (sensed current: 1 mA)
- Between voltage input terminal and current direct input terminal
- Between voltage input terminals and current direct input terminals
- Between voltage input terminals and current direct input terminals
### Input Specifications

#### Input Module
- **Input terminal**: Online input, resistive voltage divider method
- **Current Input**: 1 mA to 20 mA range
- **Voltage Range**: Depends on the combination of voltage and current ranges:
  - 0.015 Hz to 16 Hz: ±1.5% rdg.
  - 16 Hz to 1 kHz: ±1% rdg.
  - 1 kHz to 66 Hz: ±0.7% rdg.
  - 66 Hz to 500 Hz: ±0.4% rdg.
  - 500 Hz to 1 kHz: ±0.3% rdg.
  - 1 kHz to 66 Hz: ±0.2% rdg.
  - 66 Hz to 500 Hz: ±0.1% rdg.
  - 500 Hz to 1 kHz: ±0.05% rdg.
- **Input resistance**: Voltage input terminal: 2 MΩ; Current input terminal: 100 Ω
- **Voltage Meas. Spec.**: Depends on the combination of voltage and current ranges:
  - From 6000 mV to 200 kV (also applies to VA, var)

#### Basic Measurement Specifications

### Measurement Range
- **Frequency**: Approx. 700 kHz
- **Sampling frequency**: Approx. 700 kHz
- **Power factor**: 100% ±0.1% (0.8–1)
- **Phase angle**: ±1.5° or less (1000 V range, up to 1000 V)

### Frequency Meas. Spec.
- **Input**: Sine wave input, power factor of 1, voltage to earth
- **Measurements**: Simultaneous voltage and current digital sampling, zero-cross calculation

### Rectifiers
- **Input**: AC (AC+DC) measurement
- **Display of true RMS values**: for both voltage and current
- **Display of measured values**: for active power and apparent power
- **Display of calculated values**: for current

### Zero-cros Stabilizer
- **Measurement**: Voltage 1% to 150% of the range (1000 V range, up to 1000 V)
  - ±1% rdg.
  - ±0.1% rdg.
  - ±0.05% rdg.

### Temperature & Humidity
- **Temperature**: 23°C±5°C (73°F±9°F)
- **Humidity**: 80% RH or less

### Repeatability
- **Frequency**: ±0.05% rdg.
- **Current**: ±0.5% rdg.

### Calibration
- **Frequency**: ±0.05% rdg.
- **Current**: ±0.05% rdg.

### Effective Measurement Range
- **Power factor**: Active power 0% to 100% for which 0 < f < 100 kHz
- **Voltage**: ±0.05% rdg.
- **Current**: ±0.1% rdg.

### Effect of Power Factor
- **Current**: ±0.1% rdg. or less (45 to 66 Hz, at power factor = 0)
- **Voltage**: ±0.3% rdg. or less (45 to 66 Hz, at power factor = 0)

### Meaurement Accuracy
- **Power factor**: ±0.05% rdg.
- **Current**: ±0.1% rdg. or less (45 to 66 Hz, at power factor = 0)
- **Voltage**: ±0.3% rdg. or less (45 to 66 Hz, at power factor = 0)

### Active Power
- **Frequency**: ±0.05% rdg.
- **Current**: ±0.05% rdg.
- **Voltage**: ±1% rdg.

### Active Power
- **Frequency**: ±1% rdg.
- **Current**: ±0.1% rdg.
- **Voltage**: ±1% rdg.

### Comparison
- **Mode**: Voltage and current
- **Values for t.s.f. on measurement ranges**: ±1% rdg. or less
- **Current**: ±0.1% rdg.
- **Voltage**: ±1% rdg.
- **Frequency**: ±1% rdg.

### Effect of Harmonics
- **Single Voltage and Current**: Total harmonic distortion, voltage ripple rate, current ripple rate
- **Multiple Voltage and Current**: Total harmonic distortion, voltage ripple rate, current ripple rate

### Effect of Self-heating
- **Current**: ±1% rdg. or less (45 to 66 Hz, at power factor = 0)
- **Voltage**: ±1% rdg. or less (45 to 66 Hz, at power factor = 0)

### Effect of Magnetic Field
- **Effect**: Voltage and current
- **Threshold**: ±1% rdg.

### Effect of Power Source
- **Effect**: Voltage and current
- **Threshold**: ±1% rdg.

### Effect of Power Source
- **Effect**: Voltage and current
- **Threshold**: ±1% rdg.

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- **Effect**: Voltage and current
- **Threshold**: ±1% rdg.

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- **Effect**: Voltage and current
- **Threshold**: ±1% rdg.

### Effect of Power Source
- **Effect**: Voltage and current
- **Threshold**: ±1% rdg.
Voltage/Current/Active Power Measurement Specifications

Effective measuring range:
- Voltage: ±1% to ±150% of the range.
- Power: ±5% to ±100% of the range (no zero-suppression).
- Current: ±5% to ±1% of the range, ±0.5% to ±150% of the range (no zero-suppression).

Display range:
- Voltage: ±0.5% of the range. However, zero-suppression when less than ±0.5%.
- Current: ±1% of the range. However, zero-suppression when less than ±0.5% or ±9 mA.
- Power: ±0.2% to ±31.04% of the range (no zero-suppression).

Measurement configurations:
- Voltage:
  - When using DC rectifier
- Current: Displays consumption (no polarity display)
- Active Power: Positive: Power consumption; Negative: generation or regenerated power

Polarity:
- Voltage: Current = Voltage/Current = Display range
- Active Power: Positive: Power consumption; Negative: generation or regenerated power

Voltage Waveform Peak Value/Current Waveform Peak Value Measurement Specifications

Measurement method:
- Measures the voltage waveform's peak value (for both positive and negative polarity) based on sampled instantaneous voltage values.

Voltage range:
- 300.00 V to 3600.0 V
- 90.00 V to 90.00 V
- 180.00 V to 180.00 V
- 360.00 V to 360.00 V
- 90.00 V to 90.00 V
- 180.00 V to 180.00 V
- 360.00 V to 360.00 V
- 600.00 V to 600.00 V
- 1.0000 V to 1.0000 V

Current range:
- 1.0000 mA to 1.0000 mA
- 10.00 mA to 10.00 mA
- 100.00 mA to 100.00 mA
- 1.0000 A to 1.0000 A
- 10.00 A to 10.00 A
- 100.00 A to 100.00 A
- 1.0000 A to 1.0000 A

Effective measuring range:
- ±0.1% to ±31.04% of the range (no zero-suppression).

Display range:
- ±0.01% of the range, however, up to ±60 A

Voltage Crest Factor/Current Crest Factor Measurement Specifications

Measurement method:
- Calculates the ratio of the voltage waveform peak value to the voltage RMS value.

Effective measuring range:
- As voltage and voltage waveform peak value, or current and current waveform peak value effective measurement ranges.

Display range:
- ±0.9% of ±150% of the range

Voltage Ripple Rate/Current Ripple Rate Measurement Specifications

Measurement method:
- Calculates the AC component (peak to peak [peak width]) as a proportion of the voltage or current DC component.

Effective measuring range:
- As voltage and voltage waveform peak value, or current and current waveform peak value effective measurement ranges.

Display range:
- ±0.0000 to ±100.000
- ±0.0000 to ±100.000

Apparent Power/Reactive Power/Power Factor/Phase Angle Measurement Specifications

Measurement types:
- Reactive:
  - Apparent Power/Reactive Power: Power Factor
  - AC+DC, AC, FND, AC+DC Unm

Effective measuring range:
- All per voltage, current, and active power effective measurement ranges.

Display range:
- Apparent Power/Reactive Power: ±0% to ±1% of the range (no zero-suppression)
- Power Factor: ±0.0000 to ±1.0000
- Phase Angle: ±180.00 to ±180.00

Power Calculation Formulas:
- S : Apparent power
  \[ S = V I \]
- Q : Reactive power
  \[ Q = s \sqrt{I^2 - P^2} \]
- \( \alpha \) : Power factor
  \[ \alpha = s / P \]
- \( \phi \) : Phase angle
  \[ \phi = \arccos \left( \frac{P}{s} \right) \text{ or } \arcsin \left( \frac{Q}{s} \right) \]

Frequency Measurement Specifications

Measurement types:
- Rectifiers: AC+DC, DC, AC, FND, AC+DC Unm

Maximum Current Ratio Measurement Specifications (MCR)

Measurement method:
- Calculates the ratio of the crest factor to the power factor.

Effective measuring range:
- ±1% to 100 kHz

Display range:
- ±0.1% to ±225% of the range (Has polarity)

Time Average Current/Time Average Active Power Measurement Specifications

Measurement method:
- Calculates the average by dividing the current or active power integrated value by the integration time.

Effective measuring range:
- ±0% to ±3745.4% of the range (Has polarity)

Functional Specifications
- Auto-range (AUTO): Automatically changes the voltage and current range according to the input.

Averaging:
- Averages the voltage, current, active power, apparent power, and reactive power. (Other than harmonic measurement parameters.)

Scaling (VT, CT):
- Applies user-defined VT and CT ratio settings to measured values.

Hold:
- Stops display updates for all measured values and fixes the displayed values at that point in time.
- Internal calculations (including integration and integration elapsed time) will continue.
- Analogue output and waveform output are not held.
Integration Measurement Specifications

**Integration operation modes**
Switchable between fixed-range integration and auto-range integration.

**Fixed-range integration**
Integration can be performed for all voltage and current ranges. The voltage and current ranges are fixed once integration starts.

**Auto-range integration**
Integration can be performed for all voltage ranges. The current is set to auto-range operation using ranges from 200 mA to 20 A. The integrated value for each range can be displayed by switching the current range (200 mA to 20 A) while integration is stopped.

**Measurement items and display**
Simultaneous integration of the following 6 parameters:
- Positive current integrated value (Ah+)
- Negative current integrated value (Ah−)
- Sum of current integrated values (Ah±)
- Positive active power integrated value (Wh+)
- Negative active power integrated value (Wh−)
- Sum of active power integrated values (Wh±)

**Measurement types**
- Recorders: AC+DC, AC+DC Lumin
- Current: Displays the result of integrating current RMS value data (display values) once every display update interval as an integrated value.
- Active power: Displays the result of integrating active power values by polarity calculated once every cycle for the selected synchronization source as integrated values.
- Recorder: DC Displays the result of integrating instantaneous data obtained by sampling both current and active power by polarity as integrated values (these values are not integrated values for the DC component when active power contains both DC and AC components).

**Integration time**
1 min. to 10000 hr., selectable in 1 min. blocks

**Integration time accuracy**
±0.01% rdg. ±1 dgt

**Integration measurement accuracy**
For current or active power measurement accuracy: + (±0.01% rdg. ±1 dgt.)

**Effective measuring range**
- L1 PEAK OVER V lamp or PEAK OVER V lamp lights up.

**Display resolution**
- 99999 (6 digits + decimal point)

**Functions**
- Stopping integration based on integration time setting (timer)
- Stopping/startup integration and resetting integrated values based on external control
- Displaying the integration elapsed time (displayed as 1 TME on panel display)
- Additional integration by repeatedly starting/stopping integration
- Backing up integrated values and the integration elapsed time during power outages
- Stopping integration when power returns

Harmonic Measurement Specifications

**Measurement method**
Zero-cross simultaneous calculation method
Uniformly filtering zero-cross events after processing with a digital anti-aliasing filter
Input capacitance: 1 nF
Input bias voltage: 1 V
Input impedance: 1 kΩ
Input offset voltage: ±100 mV
Input offset current: ±10 μA
Input range: ±10 A (CT6862-05, CT6863-05, CT6875, CT6876, CT6877, 9272-05, 9660, 9661, 9669, CT6867-01/-02/-03, etc.)
CT6841-05, CT6843-05, CT6844-05, CT6845-05, CT6846-05, CT6847-05, CT6848-05, CT6849-05, CT6846-05, etc.

**Measurement items**
- Harmonic voltage RMS value
- Harmonic voltage phase angle
- Harmonic current content percentage
- Harmonic active power
- Harmonic active power content percentage
- Harmonic voltage current percentage
- Harmonic current RMS value
- Harmonic current phase angle
- Total harmonic voltage distortion
- Fundamental wave voltage
- Fundamental wave active power
- Fundamental wave reactive power
- Fundamental wave voltage current phase difference
- (The following parameters can be downloaded as data with communications)

**FFT processing**
- FFT processing word length: 32 bits
- Number of FFT points: 4096 points

**Window function**
- Rectangular

**Analysis window width**
- 45 Hz ≤ f ≤ 56 Hz: 178.57 ms to 222.22 ms (10 cycles)
- 56 Hz ≤ f ≤ 66 Hz: 181.82 ms to 214.29 ms (12 cycles)
- Frequencies other than the above: 185.92 ms to 214.08 ms

**Data update rate**
- Depends on window width.

**Maximum analysis order**
- Synchronization frequency (f) range: 10 Hz ≤ f ≤ 56 Hz

**Data analysis order upper limit setting**
- 2nd to 50th

**Display Specifications**
- Number of display parameters: 4 (display area a, b, c, and d)
- Display resolution: Other than integrated values: 99999 count (5 digits)
- Display update rate: 200 ms ±50 ms (approx. 5 updates per sec.) to 20 s (varies with number of averaging iterations setting)

Synchronized control

**Functions**
- The timing of calculations, display updates, data updates, integration start, stop, and reset events, display hold operation, key lock, and zero-adjustment operation for the slave PW3335 series is synchronized with the master PW3336 series. Synchronization with the PW3336 series and PW3337 series is also supported.

**Terminal**
- BNC terminal ±1 (not-isolated)
- 1/0 settings: Off

External Current Sensor Input Specifications (PW3335-03 and PW3335-04)

- Terminal name: BNC terminal (EXT.SYNC)
- I/O settings: Off
- Channel name: General synchronization terminal (EXT.SYNC)
- Number of units for which synchronized control can be performed:
  - Total of 8 units including the PW3336/PW3337 series

**Current measurement range**
- Auto/ 1 A / 2 A / 5 A (range noted on panel)
- 50 Hz to 60 Hz

**Current measurement constraints**
- Can be read directly by manually setting the CT ratio.
- Auto-range integration not supported
D/A Output Specifications (PW3335-02 and PW3335-04)

### Frequency (f) [Hz]

**Input** | DC | 0.1Hz | 1Hz | 16Hz | 45Hz | 1kHz | 3kHz | 5kHz | 10kHz | 50kHz | 100kHz
---|---|---|---|---|---|---|---|---|---|---|---
**Output** | ±0.6%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg

### Current (f) [Hz]

**Input** | DC | 0.1Hz | 1Hz | 16Hz | 45Hz | 1kHz | 3kHz | 5kHz | 10kHz | 50kHz | 100kHz
---|---|---|---|---|---|---|---|---|---|---|---
**Output** | ±0.6%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg

### Frequency (f) [Hz]

**Input** | DC | 0.1Hz | 1Hz | 16Hz | 45Hz | 1kHz | 3kHz | 5kHz | 10kHz | 50kHz | 100kHz
---|---|---|---|---|---|---|---|---|---|---|---
**Output** | ±0.6%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg | ±0.3%rdg

### Harmonic specifications

- Values for f.s. depend on measurement ranges.
- *f*s in the tables refers to the frequency in kHz.
- To obtain the current or active power accuracy, add the current sensor’s accuracy to the above current and active power accuracy figures.
- The effective measurement range and frequency characteristics comply with the current sensor’s specifications.
- The following input is considered reference values:
  - Values for voltage, current, and active power for which 0.1 Hz ≤ f ≤ 10 Hz.
  - Values for voltage and active power in excess of 220 V for which 10 Hz ≤ f < 16 Hz.
  - Values for voltage, current, and active power for which 0.1 Hz ≤ f < 10 Hz.
  - Values for frequency (f) Input < 50%f.s.
  - Frequency (f) Input ≥ 50%f.s.
- Add current sensor phase accuracy to the internal circuit voltage/current phase difference noted above.

### Temperature coefficient

- Current, active power: ±0.068% ±0.5°C or less (instrument temperature coefficient: f.s. ±0.1°C or less).
- Add current sensor temperature coefficient to above.

### Effect of power factor

- Add the current sensor phase accuracy to the internal circuit voltage/current phase difference noted above.

### Current waveform peak value measurement specifications

- ±0.5% at DC or 10 Hz ≤ f ≤ 1 kHz (f.s.: current range)
- Add the current sensor accuracy to the above.

### Harmonic measurement accuracy

- External current sensor input measurement accuracy only
- Frequency (f) Voltage, Current, Active power
- 10 Hz ≤ f ≤ 30 Hz ±0.4%rdg ±0.2%rdg
- 30 Hz ≤ f ≤ 400 Hz ±0.3%rdg ±0.1%rdg
- 400 Hz ≤ f ≤ 1 kHz ±0.4%rdg ±0.2%rdg
- 1 kHz ≤ f ≤ 4 kHz ±1.0%rdg ±0.5%rdg
- 4 kHz ≤ f < 9 kHz ±4.0%rdg ±1.0%rdg

- Values for f.s. depend on measurement ranges.
- To obtain the current or active power accuracy, add the current sensor’s accuracy to the above current and active power accuracy figures.
- When using the CT684x-05 series, add ±2 mV to the CT684x-05 series accuracy after adjustment using the 1 A range noted on the panel.

### Output accuracy

- f.s.: Relative to the output voltage rated value for each output parameter
- Level output
  - Output parameter measurement accuracy ±(±0.2% f.s.)
  - High-speed level output
  - Output parameter measurement accuracy ±(±0.1% f.s.)
- Waveform output
  - Output parameter measurement accuracy ±(±0.1% f.s.)

### Output frequency band

- Waveform output, high-speed level output

### Maximum output voltage

- Approx. ±12 V DC

### Output update rate

- Level output
  - Same as the data update period.
  - High-speed level output
  - AC Updated once every cycle for the input waveform set as the synchronization source. However, voltage and current are only updated once every cycle for input signals from 45 to 66 Hz.
  - Waveform output
  - Approx. 1.43 ms (approx. 700 kHz)

### Response time

- Level output
  - 0.6 sec or less
  - High-speed level output
  - 2 ms or less
  - Waveform output
  - 0.2 ms or less

### Temperature coefficient

- ±0.05% ±0.5°C or less

### Output resistance

- Approx. 100 Ω

### External control

- Functions
  - Integration start/stop, integration reset and hold via external control

### GP-IB interface (PW3335-01 and PW3335-04)

- Method
  - Compliant with IEEE488.1 1987, in reference to IEEE488.2 1987
- Connector
  - D-sub 9-pin connector × 1
- Communication method
  - Full duplex, Start-stop synchronization
  - Stop bits: 1 (fixed)
  - Data length: 8 (fixed)
  - Parity: None
- Communication speed
  - 9600 bps/ 38400 bps

### LAN interface

- Connector
  - RJ-45 connector × 1
- Electrical specifications
  - Compliant with IEEE802.3
- Transmission method
  - 10Base-T/ 100Base-TX (automatic detection)
- Protocol
  - TCP/IP
- Functions
  - HTTP server (remote operation, firmware updates)
  - Dedicated ports (command control, data transfer)

### General Specifications

- Product warranty period
  - 3 year
- Operating environment
  - Indoors, altitude up to 2000 m (6562 ft.), pollution degree 2
- Operating temperature and humidity
  - 0°C to 40°C (32°F to 104°F), 80% RH or less (no condensation)
  - Storage temperature and humidity
  - -10°C to 50°C (14°F to 122°F), 80% RH or less (no condensation)
- Dielectric strength
  - 4200 V rms AC (current sensitivity: 1 mA)
  - Between the voltage input terminals and a connection consisting of chassis, interfaces, and output terminals
  - Between the current input terminals and a connection consisting of chassis, interfaces, and output terminals
  - Between the voltage input terminals and the current input terminals
  - Measurement category III 600 V (anticipated transient overvoltage: 6000 V)
  - Measurement category II 1000 V (anticipated transient overvoltage: 6000 V)
- Maximum rated voltage to earth
  - Voltage input terminal
  - Measurement category III 600 V (anticipated transient overvoltage: 6000 V)
  - Measurement category II 1000 V (anticipated transient overvoltage: 6000 V)
- Maximum input voltage
  - Between the voltage input terminals U and ±U
  - 1000 V ±1500 V peak
- Maximum input current
  - Between the current input terminals I and ±I
  - 200 mA to 20 A range 30 A, ±100 A peak
  - 1 mA to 100 mA range 20 A, ±30 A peak
- Applicable Standards
  - Safety: EN61010
  - EMC: EN61326
  - EN61000-3-3
  - EN61010
- Rated supply voltage
  - 100 V AC to 240 V AC
  - 50 Hz/60 Hz
- Maximum rated power
  - 30 VA or less
- Dimensions
  - Approx. 210W × 104H × 245D mm (8.27×W × 3.94×H × 9.65 D)
  - (excluding protrusions)
- Mass
  - Approx. 2.8 kg (10.5 lb.)

### Accessories

- Instruction manual x1
- Power cord x1
- Voltage and current terminal safety cover x2
### 3334 Specifications

#### Basic specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Color</td>
<td>3-color LED</td>
</tr>
<tr>
<td>Display Size</td>
<td>128 x 64 pixels</td>
</tr>
<tr>
<td>Digital Input</td>
<td>8 digital inputs</td>
</tr>
<tr>
<td>Digital Output</td>
<td>4 digital outputs</td>
</tr>
<tr>
<td>Analog Input</td>
<td>2 analog inputs</td>
</tr>
<tr>
<td>Sampling Time</td>
<td>1 second</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.1% ±1% Rdg. ±2% F.S. ±0.5% Rdg. ±1% F.S.</td>
</tr>
<tr>
<td>Frequency Bandwidth</td>
<td>50 Hz to 1 kHz</td>
</tr>
<tr>
<td>Waveform Outputs</td>
<td>±2 VDC F.S. for each range</td>
</tr>
<tr>
<td>Waveform Integration</td>
<td>±20% of F.S.</td>
</tr>
<tr>
<td>Power Factor</td>
<td>0.65 F.S.</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>0.5 W</td>
</tr>
<tr>
<td>Power Supply</td>
<td>100 V to 240 V, 50/60 Hz</td>
</tr>
<tr>
<td>Environmental Conditions</td>
<td>0 to 40°C, 80% RH or less, non-condensing</td>
</tr>
<tr>
<td>Operating Environment</td>
<td>100 to 2000 V, 50/60 Hz</td>
</tr>
<tr>
<td>Storage Environment</td>
<td>-10 to 80°C, 80% RH or less, non-condensing</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>±0.02% Rdg. ±0.02% F.S. ±0.02% Rdg. ±0.02% F.S.</td>
</tr>
</tbody>
</table>

#### Display specifications

- **Input specifications**
  - 24 V for voltage, 10 mA for current
  - 24 V for voltage, 10 mA for current
- **Output specifications**
  - 24 V for voltage, 10 mA for current
  - 24 V for voltage, 10 mA for current
- **Temperature Coefficient**
  - ±0.02% Rdg. ±0.02% F.S. ±0.02% Rdg. ±0.02% F.S.
- **Frequency Bandwidth**
  - 50 Hz to 1 kHz
- **Waveform Outputs**
  - ±2 VDC F.S. for each range
- **Waveform Integration**
  - ±20% of F.S.
- **Power Factor**
  - 0.65 F.S.
- **Power Consumption**
  - 0.5 W
- **Power Supply**
  - 100 V to 240 V, 50/60 Hz
- **Environmental Conditions**
  - 0 to 40°C, 80% RH or less, non-condensing
- **Operating Environment**
  - 100 to 2000 V, 50/60 Hz
- **Storage Environment**
  - -10 to 80°C, 80% RH or less, non-condensing
- **Temperature Coefficient**
  - ±0.02% Rdg. ±0.02% F.S. ±0.02% Rdg. ±0.02% F.S.
### 3-phase Power Meter

<table>
<thead>
<tr>
<th>Model &amp; Appearance</th>
<th>Model No. (Order Code)</th>
<th>Number of Channels</th>
<th>AC/DC</th>
<th>Harmonic Measurement</th>
<th>LAN</th>
<th>RS-232C</th>
<th>GP-IB</th>
<th>D/A output</th>
<th>Current Sensor Input</th>
<th>Synchronized Control</th>
</tr>
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<tbody>
<tr>
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**Accessories:** Instruction manual x1, Measurement guide x1, Power cord x1

### Single-phase Power Meter

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<th>Model No. (Order Code)</th>
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<th>Harmonic Measurement</th>
<th>LAN</th>
<th>RS-232C</th>
<th>GP-IB</th>
<th>D/A output</th>
<th>Current Sensor Input</th>
<th>Synchronized Control</th>
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**Accessories:** Instruction manual x1, Power cord x1

### Communications and control options

- **RS-232C CABLE**
  9637  
  Cable length: 1.8 m (5.91 ft)
  9pin to 9pin
- **GP-IB CONNECTOR CABLE**
  9151-02  
  Cable length: 2 m (6.56 ft)
- **LAN CABLE**
  9642  
  Cable length: 5 m (16.41 ft)
  supplied withstraight to cross conversion cable
- **CONNECTION CORD**
  9165  
  For synchronized control
  Cable length: 1.5 m (4.92 ft),
  metal BNC to metal BNC

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