Single-Phase AC/DC Power Meter

High-accuracy measurement of standby to operating power

- Wide measurable range
- Basic accuracy for voltage, current and power
- Frequency bandwidth
- High-accuracy measurement even for equipment with low power factors
- Standby power consumption
- Measure up to 5000A AC

: 10 μA to 30 A, 60 mV to 1000 V
: ±0.1%*
: DC, 0.1Hz to 100kHz
: ±0.1% f.s. power factor effect
: Built-in harmonic measurement; IEC62301-compliant
: Built-in external sensor input terminals (PW3335-03, -04)

* For complete details, please refer to the specifications.
Single-Phase Power Meter with All-Round Capability

High accuracy of ±0.1%*1 and guaranteed accuracy range from 1 to 150% f.s.

DC, 0.1Hz to 100kHz frequency bandwidth
With built-in harmonic measurement for detailed analysis

Voltage range: 6.0000 V to 1.0000 kV
Current range: 1.0000 mA to 20.000 A (30 A maximum)

With an expanded guaranteed accuracy range, the power meter minimizes range switchings even under power fluctuations.

*1 : For complete details, please refer to the specifications.

Power Meter PW3335: Single-phase AC/DC power meter with built-in harmonic measurement

Voltage range: 6.0000 V to 1.0000 kV
Current range: 1.0000 mA to 20.000 A (30 A maximum)

Use in the development and production of solar panels and AC adapters, secondary-side DC equipment and inverters, and power converters such as thyristors. Equipped with multiple functions for computing a wide variety of items, the PW3335 Power Meter can also be used alone for detailed analysis.
**PW3335**

from AC/DC Standby to Operating Power

**Highest basic accuracy and DC accuracy of any instrument in its class**

±0.1%

Thanks to Hioki’s accumulated technology and track record, the PW3336/PW3337 delivers the highest basic accuracy and DC accuracy of any instrument in its class. Reliable measurement accuracy ensures robust performance in customers’ measurement applications.

* For complete details, please refer to the specifications.

**Peak value of up to 600% of the range, supporting crest factor of 6**

Current waveforms in the switching power supply or at the primary-side of inverters become steep and often exceed the fundamental range, preventing them from being accurately measured. The PW3335 resolves these issues by offering a crest factor of 6, allowing it to measure accurately even when the waveform peaks are high relative to its range.

**Greater accuracy for standby power**

The PW3335 Power Meter delivers a range configuration that lets you measure extremely low power levels with a margin to spare. Accuracy can be set from 10 μA and up for current, and 0 W and up for effective power. Perfect for measurements according to IEC62301 and other standards.

**Power data and harmonic data — all measured simultaneously**

All measurement data are internally processed in parallel simultaneously. Even when waveforms have mixed AC/DC components – half-wave rectification waveforms for example – the individual components can be measured simultaneously. The PC communication application further enables 180 or more measurement parameters to be acquired simultaneously.

**Built-in harmonic measurement**

The PW3335 measures harmonics up to the 50th order. Use it for evaluation and development of power sources for home appliances and other electrical equipment. Simultaneously display the effective voltage and total harmonic distortion (THD) on the screen. For THD computation, any maximum harmonic order can be specified.

**Power factor effects of no more than ±0.1% f.s.**

The effective power value may be affected in situations with low power factors, such as measurement of standby power or unloaded operation of transformers and motors. The PW3335 reduces the power factor effect to less than a half of that available in legacy models.

**Power consumption and regeneration (recharging) power integrated separately**

Use for evaluating the input and output of secondary batteries in EVs, etc., and for measuring the sold power of solar panels. Power consumption and regeneration (recharging) power can each be measured separately.

**Max/Min hold function for spotting current peaks at a glance**

Capture maximum and minimum values such as inrush current waveform peak values and maximum consumed power.

Example of half-wave rectification waveform

Example of distorted waveform containing harmonic component

Example of power fluctuation

Power consumption Wh(+)

Regeneration power Wh(−)
Diverse and Powerful Functionality

Measure power in accordance with international standards

The PW3335 is engineered to comply with important international standards, including IEC62301 for electrical power consumption in standby mode and the ErP Directive or Energy Star standard. It can also be used to find the special parameters required by the standards – such as THD, CF, and MCR.

**THD (total harmonic distortion)**
Indicates the total harmonic components in an AC waveform.

**CF (crest factor)**
Also known as the peak-to-rms ratio, the ratio of the waveform’s peak value to its effective value.

**MCR (maximum current ratio)**
Evaluation index of the current, calculated from the crest factor and the power factor.

Measure integral power of equipment that operates intermittently or has a large power variation

**Time-averaged effective integral power**
Use this feature to measure the power of equipment that operates intermittently or is under cycle control. Average power is calculated from the integral value of the fluctuating power.

**Auto-range integration**
A function whereby the device jumps automatically to the optimal current range for the consumed current as it measures and integrates the values. Power integration can be carried out on separate ranges, enabling measurements for individual modes in equipment that has fluctuations in power levels.

Download free software for creating IEC62301-compliant reports from the Hioki website.
Rich interfaces and extensibility

3 D/A output types
(PW3335-02, PW3335-04)

The PW3335 can output measurement values to a data logger, Hioki Memory HiCorder or similar, via voltage signals. The power meter is also built in with functions for outputting the high-speed level of each successive fundamental wave cycle*, in addition to instantaneous waveform output and level output, and provides in-depth analysis of power-consuming equipment such as cutting/grinding tool monitoring equipment.

* For voltage and current, cycle-by-cycle updating is possible only with an input of 45 to 66 Hz.

PC communication software

By using the bundled PC application, you can control the power meter from a PC without needing to code your own communication program. The software enables you to save data to the PC, display waveforms, and perform efficiency calculations*, etc. Compatible with LAN, RS-232C, GP-IB

Pair with current sensors delivering a maximum accuracy of ±0.26% to measure 30 A and up
(PW3335-03, PW3335-04)

You can input up to 5000A AC with the use of an optional current sensor. Using Hioki AC/DC high-accuracy pull-through sensors will enable precise measurement with maximum accuracy of ±0.26%.

Up to 8 units of simultaneous control

Use the simultaneous control feature for measuring input/output efficiency of the power source equipment, for making comparisons between multiple equipment, or for simultaneous parallel testing of production lines and achieve measurement with guaranteed synchronization. Efficiency computation is also possible in conjunction with PC software. Synchronization with both the Hioki PW3336 and PW3337 Power Meters is also supported.
PC Communication Software – PW Communicator

PW Communicator is an application software for communicating between a PW3335 series power meter and a PC. Free download is available from the Hioki website. The application contains convenient functions for setting the PW3335, monitoring the measurement values, acquiring data via communication, computing efficiency, and many more.

- **Value monitoring**
The Value monitoring function displays the PW3335’s measurement values on the PC screen. You can freely select up to 64 values, such as voltage, current, power, and harmonics.

- **Waveform monitoring**
This function enables you to monitor the voltage, current, and waveforms measured by the meter right on the PC screen.

- **Meter setting**
The application also enables you to configure the connected PW3335 from the PC screen.

- **Synchronous measurement**
When using multiple PW3335s, computation of the input/output efficiency of a power converter and similar operations are supported. This feature can be used to synchronously control up to 8 meters – including Hioki PW3336 and PW3337 series units – connected together with synchronous control cables.

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**IEC62301-compliant reporting software**

Download free software for creating IEC62301-compliant reports from the Hioki website.

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**LabVIEW Driver**

A LabVIEW driver compatible with the PW3335 will enable you to acquire data and build measurement systems.

( LabVIEW is a registered trademark of National Instruments Corporation.)

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**Comparison with Hioki legacy Model 3332**

<table>
<thead>
<tr>
<th></th>
<th>PW3335 series</th>
<th>3332</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency bandwidth</strong></td>
<td>DC, 0.1 Hz to 100 kHz</td>
<td>1 Hz to 100 kHz</td>
</tr>
<tr>
<td><strong>Sampling</strong></td>
<td>700 kHz digital sampling</td>
<td>Analog computation</td>
</tr>
<tr>
<td><strong>Voltage measurement range</strong></td>
<td>6 V to 1000 V</td>
<td>15 V to 600 V</td>
</tr>
<tr>
<td><strong>Current measurement range</strong></td>
<td>1 mA to 20 A</td>
<td>1 mA to 50 A</td>
</tr>
<tr>
<td><strong>Power measurement range</strong></td>
<td>Determined by combination of voltage and current ranges. 6.0000 mW and up</td>
<td>Determined by combination of voltage and current ranges. 15.000 mW and up</td>
</tr>
<tr>
<td><strong>Basic accuracy (DC)</strong></td>
<td>Voltage/current/power: ±0.1% rdg, ±0.1% f.s.</td>
<td>-</td>
</tr>
<tr>
<td><strong>Basic accuracy (45 Hz to 66 Hz)</strong></td>
<td>Voltage/current/power: ±0.1% rdg, ±0.05% f.s.</td>
<td>Voltage/current/power: ±0.1% rdg, ±0.1% f.s.</td>
</tr>
<tr>
<td><strong>Effect of power factor</strong></td>
<td>±0.1% f.s. with 45 Hz to 66 Hz, PF = 0</td>
<td>±0.23% f.s. with 45 Hz to 66 Hz, PF = 0</td>
</tr>
<tr>
<td><strong>Communication interface</strong></td>
<td>LAN</td>
<td>RS-232C</td>
</tr>
<tr>
<td><strong>Synchronous control</strong></td>
<td>Up to 8 meters</td>
<td>-</td>
</tr>
<tr>
<td><strong>Harmonics measurement</strong></td>
<td>Available on all models Compliant with IEC61000-4-7:2002</td>
<td>-</td>
</tr>
<tr>
<td><strong>Current sensor support</strong></td>
<td>PW3335-03, PW3335-04</td>
<td>-</td>
</tr>
<tr>
<td><strong>Auto-range integration function</strong></td>
<td>Available</td>
<td>-</td>
</tr>
<tr>
<td><strong>D/A output</strong></td>
<td>7 channels (level output, high-speed level output and waveform output selectable)</td>
<td>Level output (fixed voltage, current and effective power)</td>
</tr>
<tr>
<td><strong>Time-averaged effective integral power</strong></td>
<td>Computable</td>
<td>Waveform output (fixed voltage and current)</td>
</tr>
<tr>
<td><strong>Maximum current ratio (MCR)</strong></td>
<td>Computable</td>
<td>1-channel D/A level output</td>
</tr>
</tbody>
</table>
### Basic Measurement Specifications

#### Measurement items

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
<th>Active power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harmonic voltage RMS value</td>
<td>Harmonic current RMS value</td>
<td>Harmonic active power Total harmonic voltage distortion</td>
</tr>
<tr>
<td>Harmonic active power Total harmonic voltage distortion</td>
<td>Harmonic wave current</td>
<td>Harmonic wave active power</td>
</tr>
<tr>
<td>Harmonic wave current</td>
<td>Harmonic wave apparent power</td>
<td>Harmonic wave reactive power</td>
</tr>
<tr>
<td>Harmonic wave apparent power</td>
<td>Harmonic wave power factor (Displacement power factor)</td>
<td>Harmonic wave current phase difference</td>
</tr>
<tr>
<td>Harmonic wave power factor (Displacement power factor)</td>
<td>Harmonic voltage content percentage</td>
<td>Harmonic current content percentage</td>
</tr>
<tr>
<td>Harmonic current content percentage</td>
<td>(The following parameters can be downloaded as data via PC communication)</td>
<td>Harmonic voltage phase angle</td>
</tr>
<tr>
<td>Harmonic voltage phase angle</td>
<td>Harmonic voltage current phase difference</td>
<td>Harmonic voltage current phase difference</td>
</tr>
</tbody>
</table>

#### Rectifiers

- **AC/DC**: AC/DC measurement
- **AC/DC Umn**: AC/DC measurement
- **DC**: DC measurement

- **AC/DC measurement**: Display of true RMS values for both voltage and current
- **AC/DC Umn**: AC/DC measurement
- **DC**: DC measurement

- **Display of values calculated by (voltage DC value) × (current DC value)** for current and active power
- **Display of average value rectified RMS converted values for AC+DC Umn**: AC+DC measurement

#### Zero-cross Filter

- **100 Hz: 0.1 Hz to 100 Hz**
- **500 Hz: 0.1 Hz to 500 Hz**
- **1 kHz: 0.1 Hz to 1 kHz**
- **5 kHz: 0.1 Hz to 5 kHz**
- **9 kHz: 0.1 Hz to 9 kHz**

#### Rectifiers

- **Effective measuring range**: ±600% of each voltage range.
- **For the sake of 300 V, 600 V, and 1000 V ranges, ±1500 V peak**
- **Maximum effective peak voltage**: ±600% of each current range.
- **However, for 20 A range, ±60 A peak.**
- **Guaranteed accuracy period**: 1 year
- **Post-adjustment accuracy guaranteed**: 6 months

#### Conditions of guaranteed accuracy

- **Temperature coefficient**: ±0.03%/°C or less.
- **However, for 1 mA range, ±0.06%/°C per °C or less.**
Effect of power factor
\[ \pm 0.1\% \text{ds. or less (45 to 66 Hz, at power factor } = 0) \]

Internal circuitry voltage/current phase difference: \( \pm 0.0573\% \)

Effect of common mode voltage
\[ \pm 0.01\% \text{ds. or less (600 V, 50/60 Hz, applied between input terminals and enclosure)} \]

Effect of magnetic field
400 A/m, DC and 50 Hz/60 Hz magnetic field

Voltage
\[ \leq 1.5\% \text{ds. or less} \]

Current
\[ \leq 1.5\% \text{ds. or less than or equal to the following value, whichever is greater} \]

0.2 mA/ 1 mA/ 2 mA/ 5 mA/ 10 mA/ 20 mA/ 50 mA/ 100 mA range: \( \leq 200 \mu A \)

Active power
\[ \leq 3.0\% \text{ds. or less than or equal to the following value, whichever is greater}. \]

200 mA/ 500 mA/ 1 A/ 2 A/ 5 A/ 10 A/ 20 A range: \( \leq 20 \mu A \)

Voltage influence quantity: \( \pm (20 \mu A) \)

Effect of self-heating
With input of at least 15 A to current input terminals

AC input signal
\[ \leq 0.025+0.005\times(|I-15|) \text{rdg. or less} \]

DC input signal
\[ \leq 0.025+0.005\times(|I-15|) \text{rdg. or less} \]

Effective measuring range
As per voltage, current, and active power effective measurement ranges

Display range
Normalized to ±225% of the range (no zero-suppression)

Voltage Effective measuring range
Voltage peak range
\[ \text{Voltage range: } 6.0000 \text{ V} - 36.0000 \text{ V} \]

Current Effective measuring range
Current peak range
\[ \text{Current range: } 1.0000 \text{ A} - 6.0000 \text{ A} \]

Effective Power
Applied as reference value when 0.1 Hz ≤ f < 10 Hz and when 1 kHz < f.

Effective measuring range
Provided as reference value when 0.1 Hz ≤ f < 10 Hz and when 1 kHz < f.

Display range
Up to ±152% of the range. However, up to ±1500 V peak value and 1000 V RMS value

Effective Power
\[ \leq 1\% \text{ to } \pm 150\% \text{ of the range } \]

Voltage
\[ \leq 1\% \text{ to } \pm 150\% \text{ of the range } \]

Current
\[ \leq 1\% \text{ to } \pm 150\% \text{ of the range } \]

Power factor
\[ \leq 1\% \text{ to } \pm 150\% \text{ of the range } \]

Voltage/Current/Active Power Measurement Specifications

Voltage/Current/Active Power Measurement Specifications

Measurement types
Rectifiers: AC+DC, DC, AC, FND, AC+DC Umn

Effective measuring range
Voltage
Up to ±150% of the range.

Current
Up to ±150% of the range.

Display range
Voltage
Up to ±152% of the range. However, zero-suppression when less than ±0.5%.

Current
Up to ±152% of the range. However, zero-suppression when less than ±0.5% or less than ±9 μA.

Polarity
Voltage: Current
Positive: Power consumption (no polarity display)

Negative: generation or regenerated power

Frequency Measurement Specifications

Number of measurement channels
2 (Voltage, current)

Measurement method
Calculated from input waveform period (reciprocal method)

Measurement ranges
100 Hz/ 500 Hz/ 5 kHz/ 100 kHz (linked to zero-cross filter)

Measurement accuracy
\[ \pm 1.1\% \text{ rdg. } \pm 1 \text{ dgt.} \]

Effective measuring range
0.1 Hz to 100 kHz

For sine wave input that is at least 20% of the measurement source’s measurement range

Display format
0.1000 Hz to 6.0000 kHz

0.1000 Hz to 6.0000 kHz

0.1000 Hz to 6.0000 kHz

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

Measurement types
Rectifiers
Apparent Power/ Reactive Power/ Power Factor
Phase Angle
AC+DC, AC, FND, AC+DC Umn

Effective measuring range
As per voltage, current, and active power effective measurement ranges

Power Calculation Formulas

\[ Q = \text{si} \times S - P \]

\[ \text{Power Factor} = \frac{Q}{P} \]

\[ \phi = \text{phase angle} \]

\[ \alpha = \text{Power factor} \]

\[ \beta = \text{Phase angle} \]

\[ \gamma = \text{Polarity symbol} \]

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 Waveform Peak Value/Current Waveform Peak Value Measurement Specifications

Voltage
Voltage range
Voltage peak range
6.0000 V
36.0000 V
15.000 V
90.0000 V
20.000 V
120.000 V
60.000 V
360.00 V
150.00 V
900.00 V
300.00 V
1.8000 kV
600.00 V
3.6000 kV
1.0000 kV
6.0000 kV

Current
Current range
Current peak range
1.0000 mA
6.0000 mA
2.0000 mA
12.0000 mA
5.0000 mA
30.0000 mA
10.000 mA
60.0000 mA
20.000 mA
120.0000 mA
50.000 mA
300.0000 mA
100.00 mA
600.0000 mA
200.000 mA
1.2000 A
500.000 mA
3.0000 A
1.000 A
6.0000 A
2.000 A
12.000 A
5.000 A
30.000 A
10.00 A
60.000 A
20.00 A
120.000 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 Crest Factor
As per voltage and waveform peak value, or current and current waveform peak value effective measurement ranges.

Display range
Up to ±102% of current peak range, however, the value 0 will be displayed if the current RMS value triggers the instrument's zero suppression function.

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 Ripple Rate
As per voltage and waveform peak value, or current and current waveform peak value effective measurement ranges.

Display range
0.00 to 500.00 (No polarity)
**Maximum Current Ratio Measurement Specifications (MCR)**

**Measurement method**
Calculates the ratio of the current crest factor to the power factor. 

(MCR) = (Current Crest Factor) / (Power Factor)

**Effective measuring range**
As per power factor (voltage, current, active power) and current crest factor (current, current waveform peak value) effective measurement ranges.

**Display range**
1.0000 to 6.1200 M (no polarity)

**Synchronized control**

**Functions**
The timing of calculations, display updates, data updates, integration, start, stop, and reset events; display hold operation; key lock operation; 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 (non-isolated)

**Terminal name**
External synchronization terminal (EXT.SYNC)

**I/O settings**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Synchronized control function off (signals input to the external synchronization terminal (EXT.SYNC) are ignored)</td>
</tr>
<tr>
<td>In</td>
<td>The external synchronization terminal (EXT.SYNC) is set to input, and a dedicated synchronization signal can be input (slave).</td>
</tr>
<tr>
<td>Out</td>
<td>The external synchronization terminal (EXT.SYNC) is set to output, and a dedicated synchronization signal can be output (master).</td>
</tr>
</tbody>
</table>

**Number of units for which synchronized control can be performed**
Up to 7 slaves per master (total of 8 units including the PW3336/PW3337 series)

**Synchronized control**

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

- **Range up**: The range is increased when input exceeds 150% of the range or when the peak is exceeded.
- **Range down**: The range is decreased when input falls below 15% of the range. However, the range is not increased when the peak is exceeded at the lower range. The input level is monitored, and the range is switched over multiple ranges. Range select can be used to disable ranges so that they are not selected.

**Range select**
Selects whether to enable (turn on) or disable (turn off) individual voltage and current ranges.

- **Enabled (use)**: Ranges can be selected with the range keys.
- **Disabled (do not use)**: Ranges cannot be selected with the range keys.

**Zero-cross filter’s threshold level**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>The zero-cross filter’s threshold level for voltage and current ranges. Set from 1% to 15% (in 1% intervals). Synchronization occurs when the percentage level set for each measurement range is exceeded.</td>
</tr>
</tbody>
</table>

**Averaging**
Averages the voltage, current, active power, apparent power, and reactive power. (Other than harmonic measurement parameters.) The power factor and phase angle are calculated from averaged data. Averaging is not performed for parameters other than those listed above. Method: Simple averaging

<table>
<thead>
<tr>
<th>Number of averaging iterations</th>
<th>Display update interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (OFF)</td>
<td>200 ms</td>
</tr>
<tr>
<td>2</td>
<td>400 ms</td>
</tr>
<tr>
<td>5</td>
<td>5 s</td>
</tr>
<tr>
<td>10</td>
<td>1 s</td>
</tr>
<tr>
<td>25</td>
<td>5 s</td>
</tr>
<tr>
<td>50</td>
<td>10 s</td>
</tr>
<tr>
<td>100</td>
<td>20 s</td>
</tr>
</tbody>
</table>

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

- **VT ratio setting range**: OFF (1.0), 0.001 to 1000
- **CT ratio setting range**: OFF (1.0), 0.001 to 1000

**Hold**

- **Stop**
  - Stops display updates for all measured values and fixes the display values at that point in time. 
  - Measurement data acquired by communications is also fixed at that point in time. 
  - Internal calculations (including integration and integration elapsed time) will continue. 
  - Analog 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**
Rectifiers: AC+DC, AC+DC Unn

- **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.
- **Rectifier**: DC

**Measurement time**
1 min. to 10000 hr., settable in 1 min. blocks

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

**Integration measurement accuracy**
(0.001) + (±0.01% rdg. ±1 dgt.)

**Effective measuring range**
Until PEAK OVER U lamp or PEAK OVER I lamp lights up.

**Display resolution** 999999 (6 digits + decimal point)

**Functions**

- **Stopping integration based on integration time setting (timer)**
- **Stopping/start integration and resetting integrated values based on external control**
- **Displaying the integration elapsed time (displayed as TIME 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**

**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.

**Measurement accuracy**
(Current or active power measurement accuracy) + (±0.01% rdg. ±1 dgt.)

**Effective measuring range**
As per the current or active power integration effective measurement range.

**Display range**
Time Average Current
±0% to ±3745.4% of the range (Has polarity)

Time Average Active Power
±0% to ±3745.4% of the range (Has polarity)
Harmonic Measurement Specifications

**Measurement Method**
- Zero-cross simultaneous calculation method
- Uniform thinning between zero-cross events after processing with a digital antialiasing 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 may occur if the measurement frequency is not 50 Hz or 60 Hz.
- When the synchronization frequency falls outside the 45 Hz to 66 Hz range: No gaps or overlap will occur.

**Display Resolution**
- Other than integrated values: 99,999 count (5 digits)
- Integrated values: 99,9999 count (6 digits), 50 Hz or 60 Hz.

**FFT Processing**
- FFT processing word length: 32 bits
- Measurement order
  - Frequencies other than the above: 185.92 ms to 214.08 ms (12 cycles)
  - 56 Hz ≤ f < 66 Hz: 181.82 ms to 214.29 ms (12 cycles)
  - 45 Hz ≤ f < 56 Hz: 178.57 ms to 222.22 ms (10 cycles)

**Window Function**
- Rectangular

**Maximum Analysis Width**
- Number of FFT points: 4096 points
- Measurement items
  - Harmonic voltage RMS value
  - Harmonic voltage phase angle
  - Harmonic current reference value
  - Harmonic current phase angle
  - Harmonic active power
  - Harmonic active power content percentage
  - Harmonic voltage current phase difference
  - Total harmonic voltage distortion
  - Fundamental wave voltage
  - Fundamental wave current
  - Fundamental wave reactive power
  - Fundamental wave voltage phase difference
  - Interpolation calculations (Lagrange interpolation)
  - Digital antialiasing filter

**Input Current Ranges**
- 45 Hz ≤ f ≤ 56 Hz: ±0.1% rdg. ±0.2% f.s. ±0.3% rdg.
- 50 Hz ≤ f ≤ 66 Hz: ±0.1% rdg. ±0.1% f.s. ±0.2% rdg.
- 1 kHz ≤ f ≤ 10 kHz: ±(0.03+0.07×F)% rdg.
- 10 kHz ≤ f ≤ 50 kHz: ±0.4% rdg. ±0.2%f.s.
- 50 kHz ≤ f ≤ 100 kHz: ±4.0% rdg. ±0.1% f.s.
- 100 kHz ≤ f ≤ 200 kHz: ±0.1% rdg. ±0.2%f.s.

**Current Sensor Specifications**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Isolated BNC terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current sensor type switching</td>
<td>Off: TYPE1 / TYPE2</td>
</tr>
<tr>
<td>When set to off, input from the external current sensor input terminal is ignored.</td>
<td>Supported current sensors</td>
</tr>
</tbody>
</table>

**Current Sensor Options**

**Current Measurement Range**
- Auto: 1 A / 2 A / 5 A (range noted on panel)
- Can be read directly by manually setting the CT ratio.

**Power Range Configuration**
- Depends on the combination of voltage and current ranges; from 24,000 W to 5,000 MW (also applies to VA, var)

**Current Measurement Accuracy**
- 61000-4-7:2002 compliant
- Conforms to synchronization source (SYNC) for the basic measurement specifications.

**Display Specifications**
- 7-segment LED
- Number of display parameters: 4 (display area a, b, c, and d)
- Display resolution: Other than integrated values: 99,999 count (5 digits)
- Integrated values: 99,9999 count (6 digits)
- Display update rate: 200 μs ±50 μs (approx. 5 updates per sec.) to 20 s (varies with number of averaging iterations setting)

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**Harmonic Measurement Specifications**

- Measurement upper limit setting: 2nd to 50th
- Depend on window width.

**Data Update Rate**
- Depends on window width.

**Display**
- 7-segment LED

**Number of Display Parameters**
- 4 (display area a, b, c, and d)

**Display Resolution**
- Other than integrated values: 99,999 count (5 digits)
- Integrated values: 99,9999 count (6 digits)

**Display Update Rate**
- 200 μs ±50 μs (approx. 5 updates per sec.) to 20 s (varies with number of averaging iterations setting)
D/A Output Specifications
(PW3335-02 and PW3335-04)

<table>
<thead>
<tr>
<th>Configuration</th>
<th>7 channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage</td>
<td>The output level, output speed, and waveform output can be selected. Level output 2 VFs or 5 VFs, linked to display updates. High-speed level output 2 VFs or 3 VFs, linked to synchronization interval. Waveform output 1 VFs, linked to sampling.</td>
</tr>
<tr>
<td>Output parameters</td>
<td>Output parameters for all channels. Available selections vary with the output parameter. Level output: High-speed level output/ Waveform output Voltage, current, active power Only Level output Apparent power, reactive power, power factor, phase angle, total harmonic voltage distortion, total harmonic current distortion, voltage ripple rate, current ripple rate, voltage crest factor, current crest factor, time average current, time average active power, maximum current ratio Only Level output 5 VFs. Frequency, current integration, active power integration. The rectifier can be selected. Harmonic-order output is not supported.</td>
</tr>
<tr>
<td>Output accuracy</td>
<td>1.0% for Current, 0.2% for Voltage (f.s.: full scale).</td>
</tr>
<tr>
<td>Maximum output voltage</td>
<td>Approx. ±12 V DC</td>
</tr>
<tr>
<td>Output update rate</td>
<td>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)</td>
</tr>
<tr>
<td>Response time</td>
<td>Level output 0.6 sec. or less. High-speed level output 2 ms or less. Waveform output 0.2 ms or less.</td>
</tr>
<tr>
<td>Temperature coefficient</td>
<td>±0.05%/°C or less</td>
</tr>
<tr>
<td>Output resistance</td>
<td>Approx. 100 Ω</td>
</tr>
</tbody>
</table>

General Specifications

- **Product warranty period**: 1 year
- **Operating environment**: Indoors, altitude up to 2000 m (6562 ft.), pollution degree 2
- **Operating temperature and humidity**: -10°C to 50°C (14°F to 122°F), 80% RH or less (no condensation)
- **Storage temperature and humidity**: -20°C to 60°C (33°F to 140°F), 80% RH or less (no condensation)
- **Dielectric strength**: 4290 V rms AC (current sensitivity: 1 mA)
- **Maximum rated voltage to earth**: Voltage input terminal, Current input terminal Measurement category III 600 V (anticipated transient overvoltage: 6000 V) Measurement category II 100 V (anticipated transient overvoltage: 6000 V)
- **Maximum input current**: Between the voltage input terminals U and ±200 mA, ±100 A peak 1 mA to 100 mA range 20 A, ±30 A peak
- **Applicable Standards**: Safety EN61010 EMC EN61326 Class A EN61000-3-2 EN61000-3-3
- **Rated supply voltage**: 200 V AC to 240 V AC 50 Hz/60 Hz
- **Maximum rated power**: 30 VA or less
- **Dimensions**: Approx. 210W × 100H × 245D mm (8.27"W × 3.94"H × 9.65"D)
- **Mass**: Approx. 3 kg (105.8 oz.)
- **Accessories**: Instruction manual +1 Power cord +1 Voltage and current input terminal safety cover +2
Model : POWER METER PW3335

<table>
<thead>
<tr>
<th>Model</th>
<th>(Order Code)</th>
<th>Harmonics measurement</th>
<th>Synchronous control</th>
<th>LAN</th>
<th>RS-232C</th>
<th>GP-IB</th>
<th>D/A output</th>
<th>Current sensor input</th>
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<tbody>
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</tbody>
</table>

Accessories : Instruction manual ×1, Power cord ×1, Voltage and current input terminal safety cover ×2

**Options**

**Current measurement options [Type 1]**

- **CLAMP ON SENSOR 9060**
  - 100 A AC, ±50 mm(0.59"), 40 Hz to 5 kHz
  - ±0.3%rdg.±0.02%f.s. (Amplitude accuracy 45 Hz to 66 Hz)
  - ±1° or less (Phase accuracy 45 Hz to 66 Hz)

- **CLAMP ON SENSOR 9060**
  - 50 A AC, ±50 mm(0.59"), 40 Hz to 5 kHz
  - ±0.3%rdg.±0.05%f.s. (Amplitude accuracy 45 Hz to 66 Hz)
  - ±0.5° or less (Phase accuracy 45 Hz to 66 Hz)

- **CLAMP ON SENSOR 9069**
  - 1800 A AC, ±55 mm(0.22"), 80 to 20 mm (3.15" to 0.79") busbar, 48 Hz to 5 kHz
  - ±0.4%rdg.±0.01%f.s. (Amplitude accuracy 45 Hz to 66 Hz)
  - ±1° or less (Phase accuracy 45 Hz to 66 Hz)

- **CLAMP ON SENSOR CT9667-01, CT9667-02, CT9667-03**
  - 500 A AC/DC, Switchable, ±100 mm to ±254 mm (3.94" to 10")
  - 10 Hz to 20 kHz
  - ±2.0%rdg.±0.3%f.s. (Amplitude accuracy 45 Hz to 66 Hz)
  - ±1° or less (Phase accuracy 45 Hz to 66 Hz)
  - Power supply : LR6 alkaline battery ×2, or AC Adapter (option)

**Current measurement options [Type 2]**

- **Requires Sensor Unit CT9555 and Connection Cable L9217**

**Communications and control options**

- **RS-232C CABLE 9637**
  - Cable length: 1.8 m (5.91 ft)
  - 9pin to 9pin

- **RS-232C CABLE 9638**
  - Cable length: 1.8 m (5.91 ft)
  - 9pin to 25pin

- **GP-IB CONNECTOR CABLE 9151-02**
  - Cable length: 2 m (6.56 ft)

- **LAN CABLE 9642**
  - Cable length: 5 m (16.41 ft)
  - Supplied with straight to cross conversion cable

- **CONNECTION CORD 9165**
  - For synchronized control
  - Cable length: 1.5 m (4.92 ft)
  - Metal BNC to metal BNC