HIOKI

POWER METER Series

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

The optimal power meter lineup for all applications

POWER METER PW3337/PW3336

POWER METER PW3335

AC/DC POWER HiTESTER 3334

POWER HiTESTER 3333

CE

3 year Warranty

Advancing the Standard for Power Measurement

The best performing instruments for power measurement
on production lines, in laboratories, and in research facilities.
Hioki 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.

PW3337 (3ch)

PW3336 (2ch)

Single-phase Power Meter

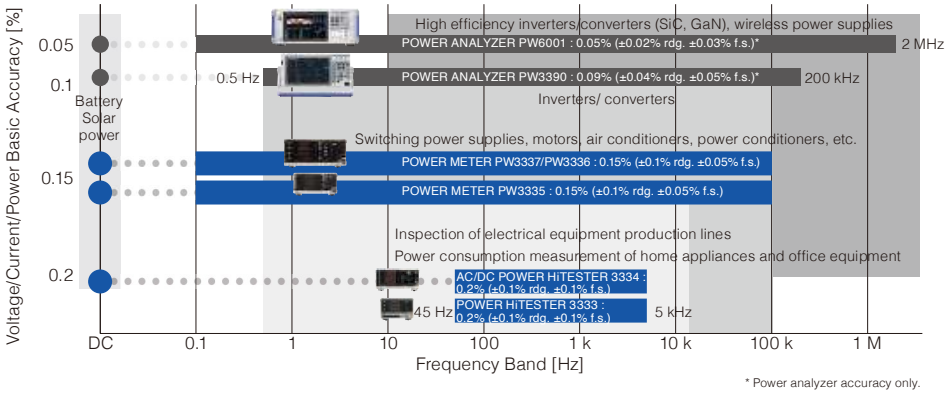
The PW3335 provides highly accurate measurements for
everything from standby power to operating power.
Compliant with the IEC62301 measurement standard for standby power,
it is capable of measuring current as low as 10 μA.
Designed for power consumption testing,
the 3334 and 3333 are guaranteed for accuracy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

PW3335 (1ch)

3334 (1ch)

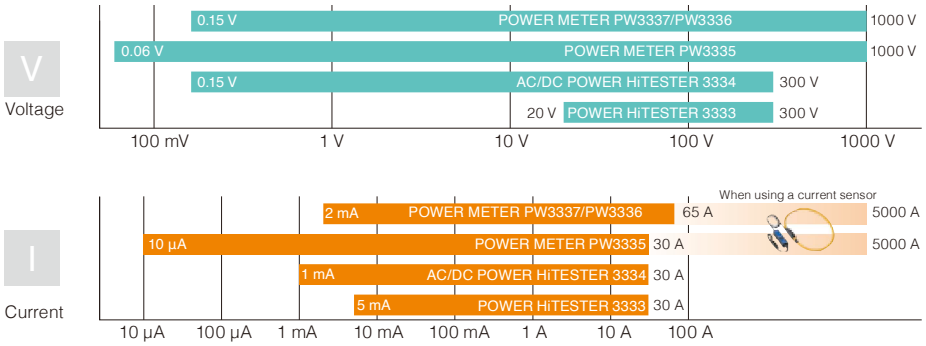
3333 (1ch)

Basic Accuracy and Frequency Bands



* Power analyzer accuracy only.

Effective Measurement Range



Comparison Chart

		PW3337	PW3336	PW3335	3334	3333
No. of channels		3	2	1	1	1
Supported connections		Three-phase, three-phase + single-phase, single-phase x 3, DC x 3	Three-phase, single-phase x 2, DC x 2	Single-phase, DC	Single-phase, DC	Single-phase
Effective measurement range, voltage		0.15 V to 1000 V		0.06 V to 1000 V	0.15 V to 300 V	20 V to 300 V
Effective measurement range, current		2 mA to 65 A		10 µA to 30 A	1 mA to 30 A	5 mA to 30 A
Frequency band		DC, 0.1 Hz to 100 kHz			DC, 45 Hz to 5 kHz	45 Hz to 5 kHz
Basic accuracy, AC (Voltage, current, power)		±0.1% rdg. ±0.05% f.s.			±0.1% rdg. ±0.1% f.s.	±0.1% rdg. ±0.2% f.s.
Basic accuracy, DC (Voltage, current, power)		±0.1% rdg. ±0.1% f.s.			±0.1% rdg. ±0.2% f.s.	-
Integrated power measurement		Yes			Yes	-
Harmonic measurement		IEC61000-4-7 compliant			-	
Current sensor input		Yes		PW3335-03, -04	-	
Interface	LAN	Yes			-	
	RS-232C	Yes		PW3335, -02, -03, -04	Yes	
	GP-IB	PW3337-01, -03	PW3336-01, -03	PW3335-01, -04	3334-01	3333-01
	D/A output	PW3337-02, -03	PW3336-02, -03	PW3335-02, -04	Yes	

Features

POWER METER PW3337/PW3336

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

PW3337-03 Front Panel

PW3337-03 Rear Panel

Maximum 65 A input.
Cable terminals are fixed securely
with large screws on the terminal block.

- 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

PW3336-03
Rear Panel

POWER METER PW3335

Highly accurate AC/DC measurements from standby power to operating power

PW3335-04 Front Panel

PW3335-04 Rear Panel

Half-rack Size to Save Space

For development/production lines for
electrical equipment

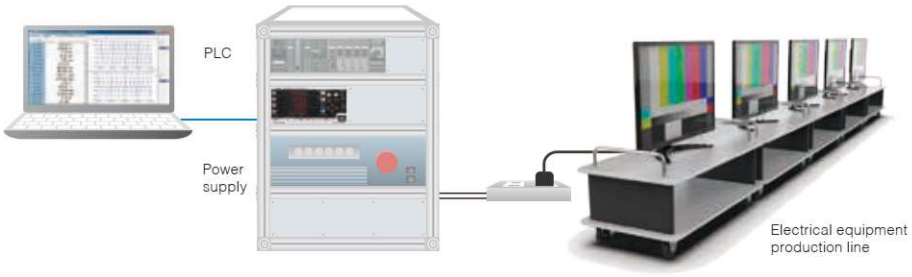
- Voltage/current/power basic accuracy ±0.1% *
- Highly accurate AC/DC measurements from standby power to operating power
- Accuracy guaranteed throughout a wide range, from 10 µA to 30 A and 60 mV to 1000 V AC/DC
- Harmonic measurement as standard feature, IEC61000-4-7 compliant
- Compliant with the 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)

V Voltage input terminal	I Current input terminal	L LAN connector	R RS-232C connector	G GP-IB connector
D D/A output terminal	C Current sensor input terminal	S Synchronous control terminal	E External control terminal	

* For complete details, please refer to the specifications

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% * PW3337 PW3336 PW3335

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

±0.1% *

* For complete details, please refer to the specifications

Accuracy Guaranteed Up to 3 Years (Longest in the Industry) 3334 3333

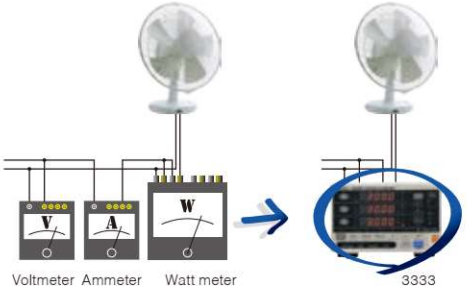
The 3333 and 3334 are guaranteed for accuracy for 3 years. Even after 3 years, they maintain an accuracy of ±0.5% rdg. as required for measurements. This 3-year accuracy guarantee, the longest in the industry, helps to save on calibration expenses.

Extensive Interfaces PW3337 PW3336 PW3335 3334 3333

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.

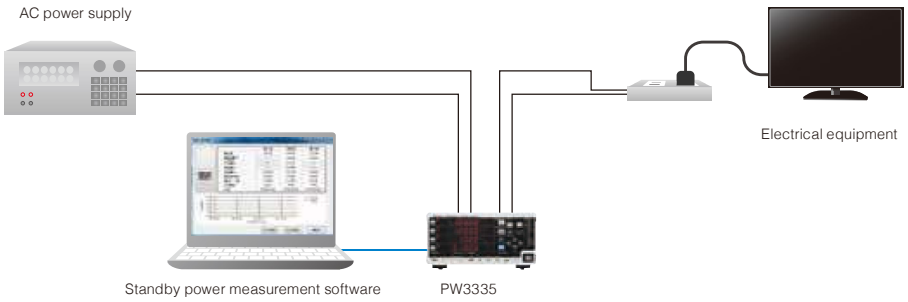
Replacement for Analog Meters PW3337 PW3336 PW3335 3334 3333

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.



Standby Power Measurement

PW3335



Key features

- Compliant with standby power standards
- Wide dynamic range
- Standby power measurement software

AC adapter standby power measurement, for primary AC and secondary DC

Compliant with IEC62301 and EN50564 Standards

The PW3335 is compliant with measurement standards for standby power, as welll 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.

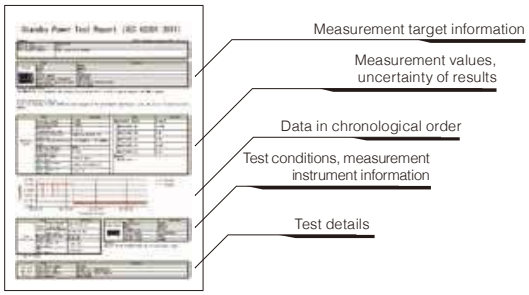
Requirements for Measurement Instruments for Standby Power Measurements (excerpt)

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

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

Create Reports with Free Software

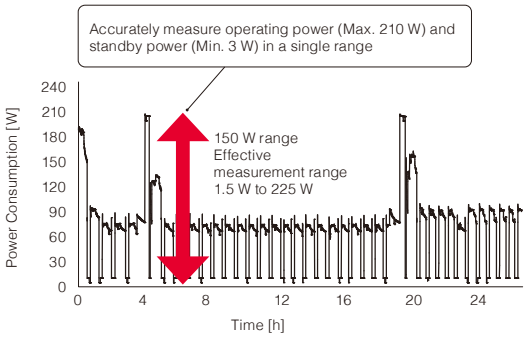
Standby power measurement software can be downloaded free of charge from the HIOKI website. Enter the required information to perform standby power measurements according to standards. Use this software to create reports of measurement results and save test data in CSV format.



Example of Report Output

Wide Range of Effective Measurement

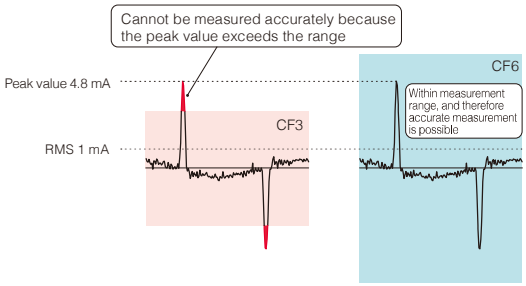
The PW3335 has an effective measurement range of 1% to 150%. Due to this wide range of effective measurement, even equipment with large load fluctuations, such as refrigerators, heaters, and pumps, can be measured accurately under all conditions from no-load to full operation.



Long-term Measurement of Refrigerator Power

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 watt meters 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.

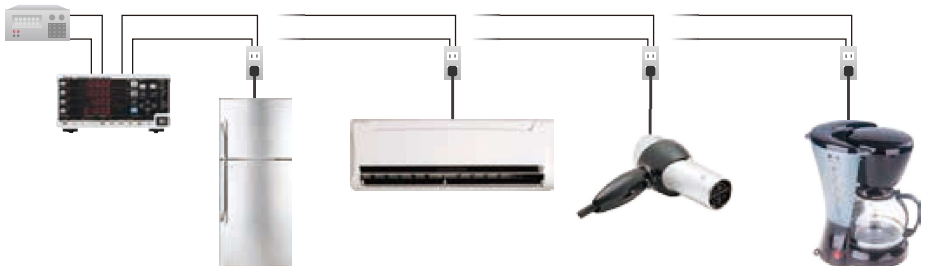


Example of Standby Current Waveform (CF = Peak Value, RMS = 4.8)

Measurement of Fluctuating Loads and Power Supply Control

Key features

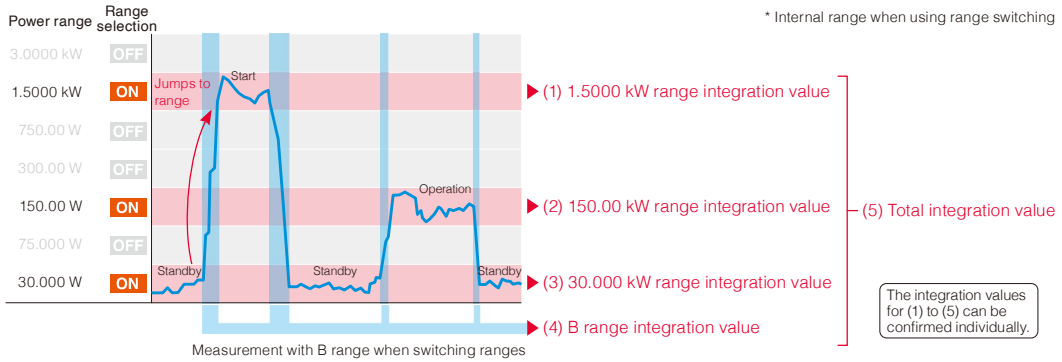
- Auto range integration
- Time average active power
- AC/DC power measurement



Auto Range Integration with Guaranteed Accuracy when Switching Ranges

PW3335

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.

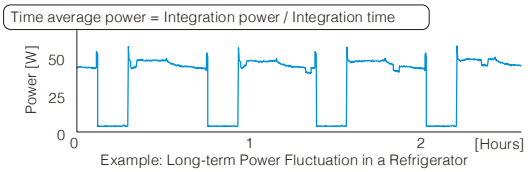


Measurement with B range when switching ranges

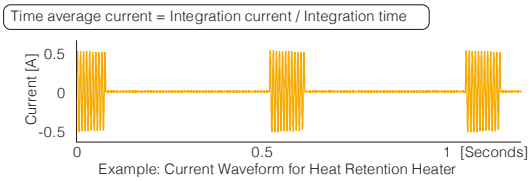
Intermittent Power Supply

PW3337 PW3336 PW3335

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.



Example: Long-term Power Fluctuation in a Refrigerator



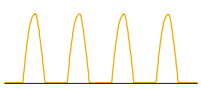
Example: Current Waveform for Heat Retention Heater

AC/DC Measurement

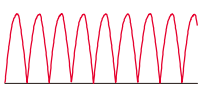
PW3337 PW3336 PW3335 3334

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.

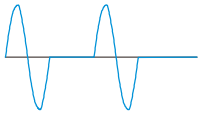
- Half-wave rectified waveforms used for dryers and fans
- Full-wave rectified waveforms used for AC adapters
- Cycle control waveforms used for voltage and temperature adjustment heaters
- DC waveforms with superimposed ripple components



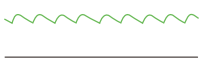
Half-wave Rectified Waveform



Full-wave Rectified Waveform



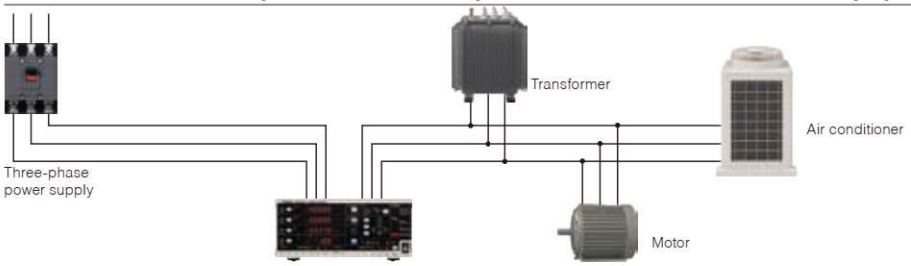
Cycle Control Waveform



DC Waveform with Superimposed Ripple

Research, Development, and Inspection of Three-Phase Equipment

PW3337 7 PW3336 6



Key features

- Extensive connection settings
- Max. 65 A direct input
- Harmonic measurement function
- Current sensor input

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.

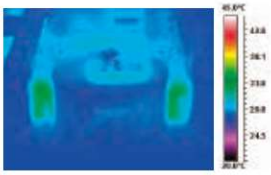
Support for Various Connections

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.

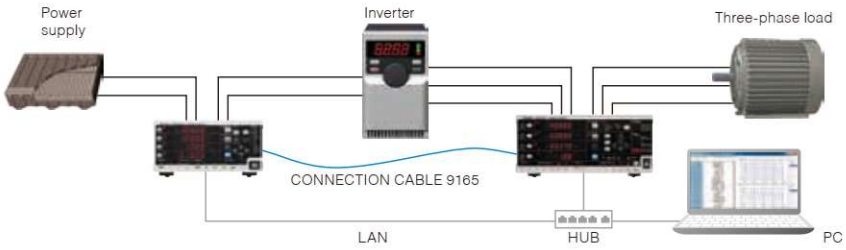
DCCT current sensor
(in the PW3337)



Temperature distribution image at
30 A DC/10-minute input

Inverter Efficiency Measurement

PW3337 7 PW3336 6 PW3335 5

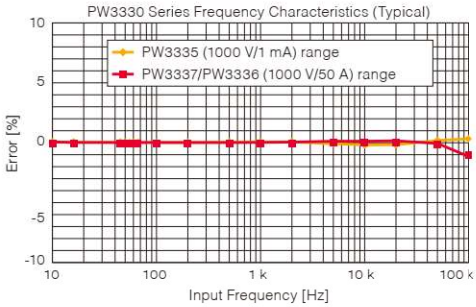


Key features

- Max. 24-channel power meter
- Wideband
DC, 0.1 Hz to 100 kHz
- PW Communicator

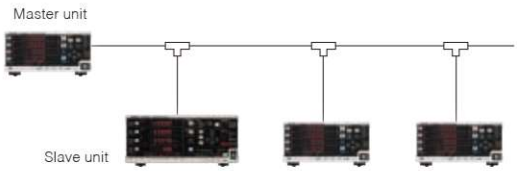
Wide Frequency Band (DC, 0.1 Hz to 100 kHz)

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.

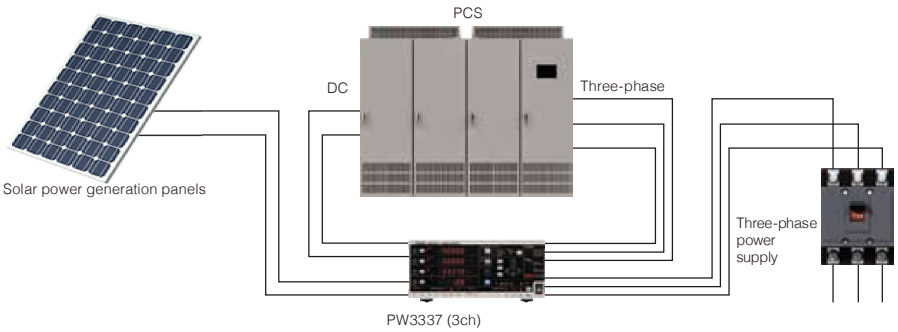


* This software can be downloaded from the HIOKI website.

PV Power Conditioner (PCS) Efficiency Measurements

DC - 3-phase/ 3-wire PW3337 7

DC 1-phase/ 2-wire PW3336 6

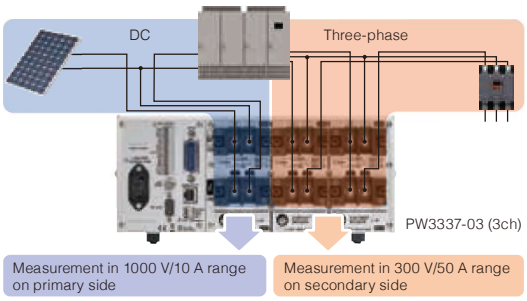


Key features

- Independent range per channel
- Extensive calculation functions
- Harmonic measurement function

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.

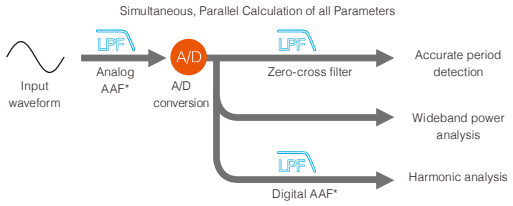


Setting Optimal Range According to Target to be Measured

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.



* AAF (Anti-aliasing filter):
Filter that prevents aliasing errors during sampling

I/O Efficiency Calculation with a Single Unit

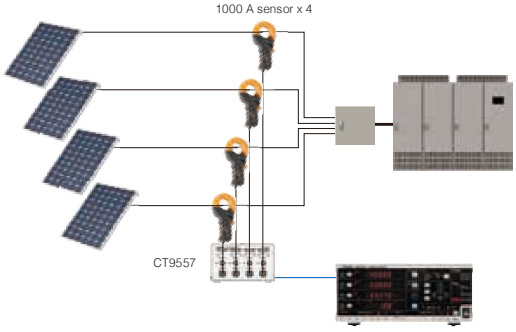
Input and output can be measured independently at the optimal ranges, and the PCS efficiency can be calculated and displayed on a single unit. PCS can be evaluated with a simple system configuration.

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.

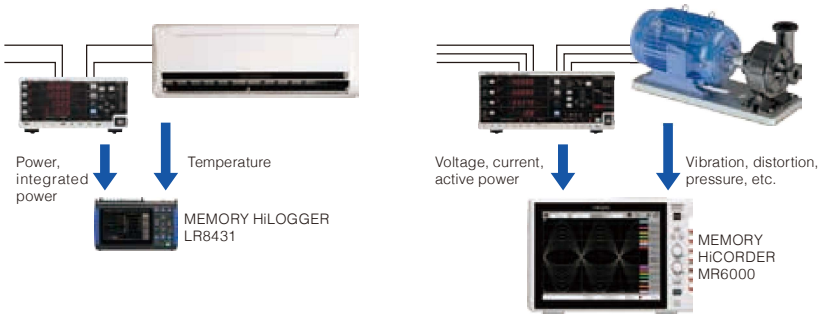
Aggregation of Output from DC Current Sensors (Up to 4000 A)

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.



Aggregating the Output from 4 Sensors into One Unit

Output Function Linked with Recorder



Key features

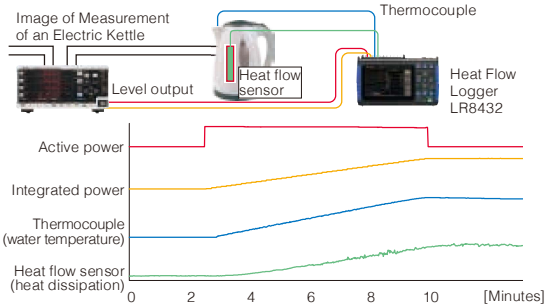
- Level output
- Waveform output
- High-speed level output
- LR8410Link

	PW3337-02 PW3337-03	PW3336-02 PW3336-03	PW3335-02 PW3335-04	3334 3334-01	3333 3333-01
Level output (Analog output)	Yes		Yes	Yes	Yes
Waveform output	Yes		Yes	Yes	-
High-speed level output	Active power only		Voltage, current, active power	-	-

Display Trends with a Data Logger

PW3337 PW3336 PW3335 3334 3333

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*.

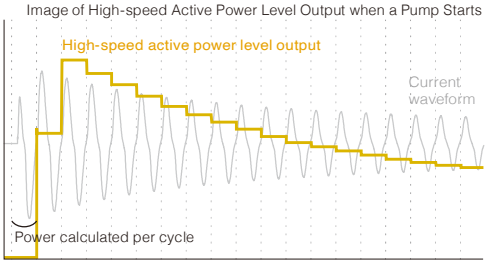


* Heat flow: Parameter for understanding the heat reception and heat dissipation of an object. Can be measured with a heat flow sensor.

Observe Power for Each Cycle

PW3337 PW3336 PW3335

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.

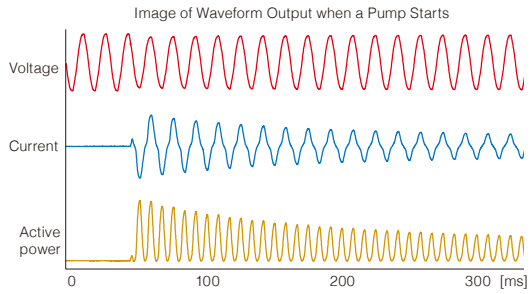


* With the PW3335, high-speed level output is also possible for 45 Hz to 66 Hz voltage and current.

Observe Waveforms with a Memory Hicorder

PW3337 PW3336 PW3335 3334

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.



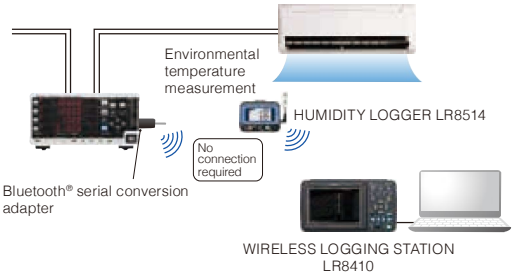
Log Data Measured by a Power Meter Wirelessly on a Hioki Logger(LR8410 Link)

PW3335

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.

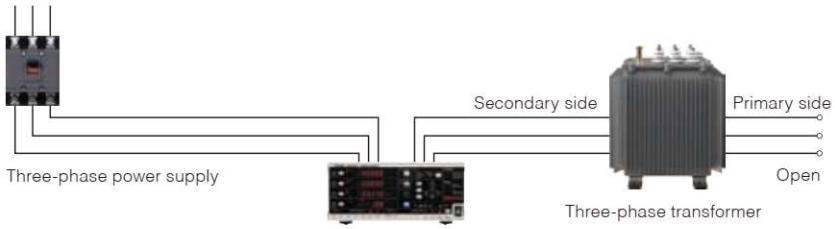


* Connection requires the serial - Bluetooth® wireless technology conversion adapter recommended by Hioki. Please inquire with your Hioki distributor.

No-load Loss Measurements for Transformers

Single-phase only

PW3337 PW3336 PW3335

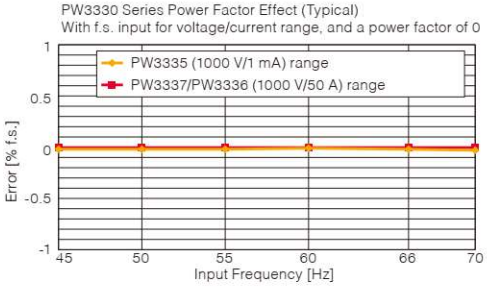


Key features

- Power factor effect ±0.1% f.s. or less
- Crest factor 6

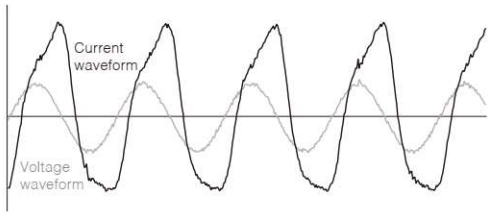
Power Factor Effect of 0.1% or Less, Even at Low Power Factors

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.



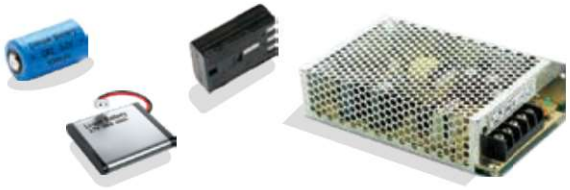
Support for Crest Factor 6

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.



Example of Transformer Current Waveform during No-load Operation

DC Power Measurement for Batteries and Power Supplies



Key features

- DC power accuracy ±0.2% rdg.
- Power integration function by polarity

Best-in-class DC Power Accuracy

PW3337 PW3336 PW3335

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.

PW3337/PW3336

PW3335

DC power accuracy

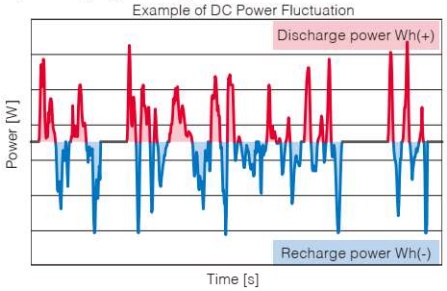
±0.1%*

* For complete details, please refer to the specifications

Current and Power Integration Function by Polarity

PW3337 PW3336 PW3335 PW3334

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.



Options

TYPE 1 Current Sensor (General Current Measurements)

PW3337 PW3336 PW3335

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

Wiring method	External appearance	Product name/ model no.	Rated current	Frequency band	Diameter of measurable conductors	Basic accuracy (amplitude) Basic accuracy (phase)	Cord lengths	Power supply
Clamp method		CLAMP ON SENSOR 9660	100 A	40 Hz to 5 kHz	ϕ 15 mm (0.59 in)	±0.3% rdg. ±0.02% f.s. Within ±1°	3 m (9.84 ft)	Not used
		CLAMP ON SENSOR 9661	500 A	40 Hz to 5 kHz	ϕ 46 mm (1.81 in)	±0.3% rdg. ±0.01% f.s. Within ±0.5°		
		CLAMP ON SENSOR 9669	1000 A	40 Hz to 5 kHz	ϕ 55 mm (2.17 in), 80 mm (3.15 in) × 20 mm (0.79 in) BUS BAR	±1.0% rdg. ±0.01% f.s. Within ±1°		
		FLEXIBLE CLAMP ON SENSOR CT9667-01	500 A/ 5000 A	10 Hz to 20 kHz	ϕ 100 mm (3.94 in)	±2.0% rdg. ±0.3% f.s. Within ±1°		AA (LR6) Alkaline Batteries x 2 (approx. 7 days) or AC ADAPTER 9445-02 (optional)
		FLEXIBLE CLAMP ON SENSOR CT9667-02			ϕ 180 mm (7.09 in)			
		FLEXIBLE CLAMP ON SENSOR CT9667-03			ϕ 254 mm (10.00 in)			

Options for CT9667-01/-02/-03

External appearance	Product name/ model no.	Functions	Power supply
	AC ADAPTER 9445-02	For supplying power to CT9667-01/-02/-03	100 to 240 V AC

TYPE 2 Current Sensor (Highly Accurate Current Measurements)

PW3337 PW3336 PW3335

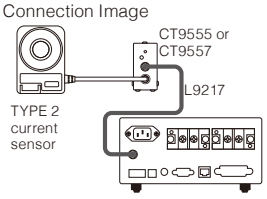
Connect this unit to the current sensor input terminal (BNC) on the PW3337/PW3336/PW3335.
SENSOR UNIT CT9555 or CT9557 and CONNECTION CABLE L9217 are required.

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

Options for Current Sensor TYPE 2

External appearance	Product name/ model no.	Max. no. of sensors	Functions	Power supply	Cord lengths
	SENSOR UNIT CT9555	1	For supplying power to the TYPE 2 current sensor	100 V to 240 V AC	-
	SENSOR UNIT CT9557	4	For supplying power to the TYPE 2 current sensor With addition output function	100 V to 240 V AC	-
	CONNECTION CORD L9217	-	For connecting CT9555/CT9557 and PW3330 series units	-	1.6 m (5.25 ft)

Connection Image



Rack Mount Hardware

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

Printing with a Printer

3333

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

Printing example

```
STATUS,000000.U,+0200.0E+0,1,+014.82E+0,
P,+02.727E+3,S,+02.964E+3,PF,+00.920E+0
```

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 (6.30 in W × 2.64 in H × 6.69 in D), 580 g (20.5 oz)

CONNECTION CABLE 9444
9-pin - 9-pin, straight, 1.5 m (4.92 ft)

AC ADAPTER 9443-02
For printer, 9442, EU type

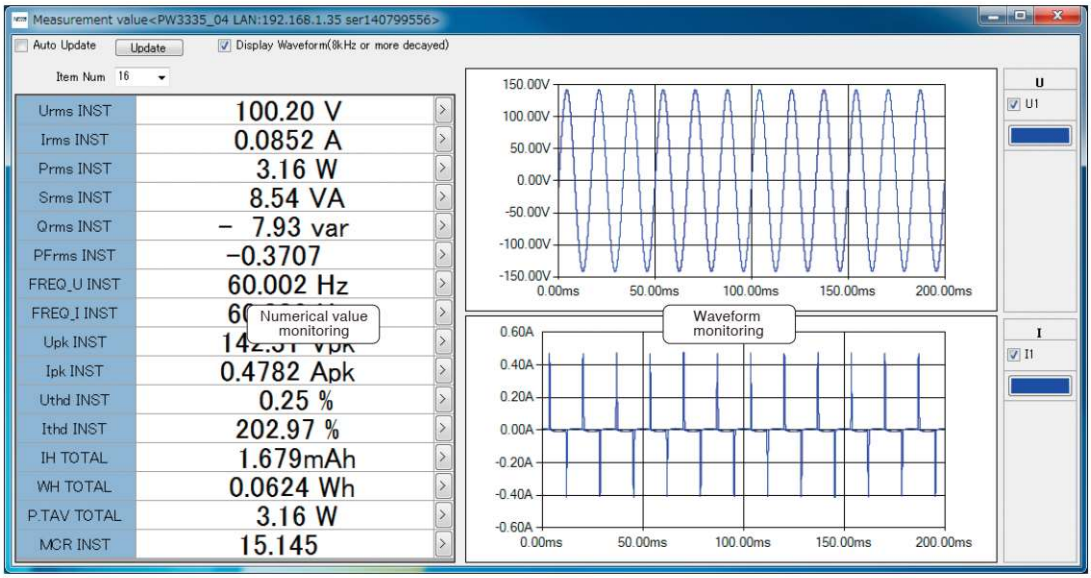
RECORDING PAPER 1196
112 mm (4.41 in) × 25 m (82.03 ft), 10-roll set

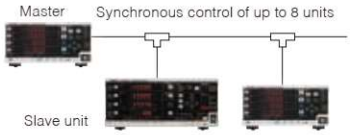
Software

PW Communicator

PW3337 7 PW3336 6 PW3335 5

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

PW3337 7 PW3336 6 PW3335 5

Obtain data and configure measurement systems with the LabVIEW driver.
(LabVIEW is a registered trademark of NATIONAL INSTRUMENTS.)

Sample Software

3334 4 3333 3

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

PW3335

"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.

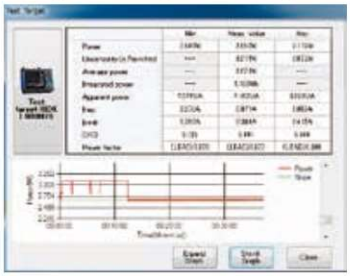
Workflow for Standby Power Test

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

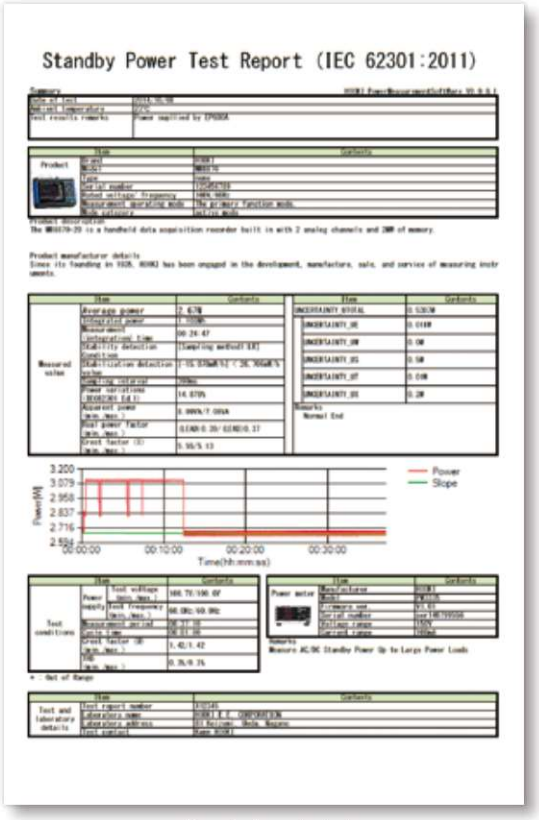
Set the current range, stop conditions, algorithm used to judge stability, cycle time, and upper limit for test time.

5. Run test

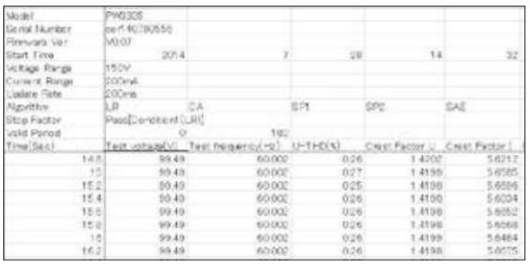
The consumed power is measured according to the configured settings.

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

PW3337 and PW3336 Specifications

Input Specifications

Measurement line type

PW3336 series
Single-phase 2-wire (1P2W), Single-phase 3-wire (1P3W), Three-phase 3-wire (3P3W, 3P3W2M)

Wiring	CH1	CH2
1P2W×2	1P2W	1P2W
1P3W	1P3W	
3P3W	3P3W	
3P3W2M	3P3W2M	

PW3337 series
Single-phase 2-wire (1P2W), Single-phase 3-wire (1P3W), Three-phase 3-wire (3P3W, 3P3W2M, 3V3A, 3P3W3M), Three-phase 4-wire (3P4W)

Wiring	CH1	CH2	CH3
1P2W×3	1P2W	1P2W	1P2W
1P3W&1P2W	1P3W		1P2W
3P3W&1P2W	3P3W		1P2W
3P3W2M	3P3W2M		
3V3A	3V3A		
3P3W3M	3P3W3M		
3P4W	3P4W		

Input methods	Voltage Isolated input, resistance voltage division method Current Isolated input, DCCT method Isolated input from current sensors
Voltage measurement ranges	AUTO/ 15.000 V/ 30.000 V/ 60.000 V/ 150.00 V/ 300.00 V/ 600.00 V/ 1000.0 V (set for each wiring mode)
Current measurement ranges	AUTO/ 200.00 mA/ 500.00 mA/ 1.0000 A/ 2.0000 A/ 5.0000 A/ 10.000 A/ 20.000 A/ 50.000 A (set for each wiring mode) For more information about external current sensor input, see the external current sensor input specifications
Power ranges	Depends on the combination of voltage and current ranges; PW3336: from 3.0000W to 100.00kW (also applies to VA, var) PW3337: from 3.0000W to 150.00kW (also applies to VA, var)
Input resistance (50/60 Hz)	Voltage input terminal : 2 MΩ Current direct input terminal : 1 mΩ or less

Basic Measurement Specifications

Measurement method	Simultaneous voltage and current digital sampling, zero-cross simultaneous calculation
Sampling frequency	Approx. 700 kHz
A/D converter	16-bit resolution
Frequency bands	DC, 0.1 Hz to 100 kHz
Synchronization sources	U1, U2, U3, I1, I2, I3, DC (fixed at 200 ms) Can be set separately for each wiring mode.
Measurement items	· Voltage · Current · Active power · Apparent power · Reactive power · Power factor · Phase angle · Frequency · Efficiency · Current integration · Active power integration · Integrated time · Voltage waveform peak value · Current waveform peak value · Voltage crest 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 voltage distortion · Total harmonic current distortion · Voltage fundamental waveform · Current fundamental waveform · Active power fundamental waveform · Apparent power fundamental waveform · Reactive power fundamental waveform · Power factor fundamental waveform (displacement power factor) · Voltage current phase difference fundamental waveform · Interchannel voltage fundamental wave phase difference · Interchannel current fundamental wave phase difference · Harmonic voltage content % · 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: AC+DC measurement Display of true RMS values for both voltage and current AC+DC Umn: AC+DC measurement Display of average value rectified RMS converted values for voltage and true RMS values for current DC: DC measurement Display of simple averages for both voltage and current Display of values calculated by (voltage DC value)× (current DC value) for active power AC: AC measurement Display of values calculated by for both voltage and current Display of values calculated by $\sqrt{(\text{AC+DC value})^2 - (\text{DC value})^2}$ for active power FND Extraction and display of the fundamental wave component from harmonic measurement
Zero-Crossing Filter	500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Hz, 200 kHz: 0.1 Hz to 200 kHz

Measurement accuracy

Voltage

Frequency (f)	Input < 50% f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. ≤ Input
DC	±0.1%rdg. ±0.1%f.s.	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.
0.1Hz ≤ f < 16Hz	±0.1%rdg. ±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
16Hz ≤ f < 45Hz	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.	±0.2%rdg.
45Hz ≤ f ≤ 66Hz	±0.1%rdg. ±0.05%f.s.	±0.15%rdg.	±0.15%rdg.
66Hz < f ≤ 500Hz	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.	±0.2%rdg.
500Hz < f ≤ 10kHz	±0.1%rdg. ±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
10kHz < f ≤ 50kHz	±0.5%rdg. ±0.3%f.s.	±0.8%rdg.	±0.8%rdg.
50kHz < f ≤ 100kHz	±2.1%rdg. ±0.3%f.s.	±2.4%rdg.	±2.4%rdg.

Current (direct input)

Frequency (f)	Input < 50% f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. ≤ Input
DC	±0.1%rdg. ±0.1%f.s.	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.
0.1Hz ≤ f < 16Hz	±0.1%rdg. ±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
16Hz ≤ f < 45Hz	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.	±0.2%rdg.
45Hz ≤ f ≤ 66Hz	±0.1%rdg. ±0.05%f.s.	±0.15%rdg.	±0.15%rdg.
66Hz < f ≤ 500Hz	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.	±0.2%rdg.
500Hz < f ≤ 1kHz	±0.1%rdg. ±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
1kHz < f ≤ 10kHz	±(0.03+0.07×F)%rdg. ±0.2%f.s.	±(0.23+0.07×F)%rdg.	±(0.23+0.07×F)%rdg.
10kHz < f ≤ 100kHz	±(0.3+0.04×F)%rdg. ±0.3%f.s.	±(0.6+0.04×F)%rdg.	±(0.6+0.04×F)%rdg.

Active power

Frequency (f)	Input < 50% f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. ≤ Input
DC	±0.1%rdg. ±0.1%f.s.	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.
0.1Hz ≤ f < 16Hz	±0.1%rdg. ±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
16Hz ≤ f < 45Hz	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.	±0.2%rdg.
45Hz ≤ f ≤ 66Hz	±0.1%rdg. ±0.05%f.s.	±0.15%rdg.	±0.15%rdg.
66Hz < f ≤ 500Hz	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.	±0.2%rdg.
500Hz < f ≤ 1kHz	±0.1%rdg. ±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
1kHz < f ≤ 10kHz	±(0.03+0.07×F)%rdg. ±0.2%f.s.	±(0.23+0.07×F)%rdg.	±(0.23+0.07×F)%rdg.
10kHz < f ≤ 50kHz	±(0.07×F)%rdg. ±0.3%f.s.	±(0.3+0.07×F)%rdg.	±(0.3+0.07×F)%rdg.
50kHz < f ≤ 100kHz	±(0.6+0.07×F)%rdg. ±0.3%f.s.	±(0.9+0.07×F)%rdg.	±(0.9+0.07×F)%rdg.

- Values for f.s. depend on measurement ranges.
- "F" in the tables refers to the frequency in kHz.
- Add ±1mA to DC measurement accuracy for current.
- Add (±1mA) × (voltage read value) to DC measurement accuracy for active power.
- When using the 200mA or 500mA range, add ±0.1% rdg. to current and active power for which 1kHz < f ≤ 10kHz.
- Values for voltage, current, and active power for which 0.1Hz ≤ f < 10Hz are for reference only.
- Values for voltage, current, and active power in excess of 220V or 20A for which 10Hz ≤ f < 16Hz are for reference only.
- Values for current and active power in excess of 20A for which 500Hz < f ≤ 50kHz are for reference only.
- Values for current and active power in excess of 15A for which 50kHz < f ≤ 100kHz are for reference only.
- Values for voltage and active power in excess of 750V for which 30kHz < f ≤ 100kHz are for reference only.

Guaranteed accuracy period	1 year
Post-adjustment accuracy guaranteed	6 months
Maximum effective peak voltage	±600% of each voltage range However, for 300 V, 600 V, and 1000 V ranges, ±1500 Vpeak
Maximum effective peak current	±600% of each current range However, for 20 A range and 50 A range, ±100 Apeak
Conditions of guaranteed accuracy	Temperature and humidity: 23°C ±5°C, 80% RH or less Warm-up time: 30 minutes Input: Sine wave input, power factor of 1, terminal-to-ground voltage of 0V, after zero adjustment; within range in which the fundamental wave satisfies synchronization source conditions
Temperature characteristic	±0.03% f.s. per °C or less
Power factor effects	±0.1% f.s. or less (45 to 66 Hz, at power factor = 0) Internal circuitry voltage/current phase difference: ±0.0573°
Effect of common mode voltage	±0.02% f.s. or less (600 V, 50/60 Hz, applied between input terminals and enclosure)
Effect of external magnetic field interference	400 A/m, DC and 50/60 Hz magnetic field Voltage :±1.5% f.s. or less Current :±1.5% f.s. or ±10 mA, whichever is greater, or less Active power :±3.0% f.s. or (voltage influence quantity) × (±10 mA), whichever is greater, or less
Magnetization effect	±10 mA equivalent or less (after inputting 100 A DC to the current direct input terminals)
Adjacent channel input effect	±10 mA equivalent or less (when inputting 50 A to adjacent channel)

Voltage/ Current/ Active Power Measurement Specifications

Measurement types	Rectifiers: AC+DC, DC, AC, FND, AC+DC Umn
Effective measuring range	Voltage: 1% to 130% of range (However, up to ±1500 V peak value and 1000 V RMS value) Current: 1% to 130% of range Active power: 0% to 169% of the range (However, defined when the voltage and current fall within the effective measurement range.)
Display range	Voltage/ Current: 0.5% to 140% of range (zero-suppression when less than 0.5%) Active power: 0% to 196% of the range (no zero-suppression)
Polarity	Voltage/ Current: Displayed when using DC rectifier Active power: +: Positive: Power consumption (no polarity display) –: Regenerated power

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

Wiring		X: *U* (Voltage) or *I* (Current)	*P* (Active power)
All channels	1P2W	$X_{(i)}$	$P_{(i)}$
Sum values	1P3W 3P3W	$X_{sum} = \frac{1}{2}(X_{(1)} + X_{(2)})$	$P_{sum} = (P_{(1)} + P_{(2)})$
	3P3W2M 3V3A 3P3W3M 3P4W	$X_{sum} = \frac{1}{3}(X_{(1)} + X_{(2)} + X_{(3)})$	$P_{sum} = (P_{(1)} + P_{(2)} + P_{(3)})$

(i): Measurement channel

Voltage Waveform Peak Value / Current Waveform Peak Value Measurement Specifications

Measurement method	Measures the waveform's peak value (for both positive and negative polarity) based on sampled instantaneous voltage values.
Sampling frequency	Approx. 700 kHz

Voltage peak range

Voltage range	15V	30V	60V	150V	300V	600V	1000V
Voltage peak range	90.000V	180.00V	360.00V	900.00V	1.8000kV	3.6000kV	6.0000kV

Current peak range

Current range	200mA	500mA	1A	2A	5A	10A	20A	50A
Current peak range	1.2000A	3.0000A	6.0000A	12.000A	30.000A	60.000A	120.00A	300.00A

Measurement accuracy	Same as the voltage or current measurement accuracy at DC and when 10 Hz ≤ f ≤ 1 kHz (f.s.: voltage peak range or current peak range). Provided as reference value when 0.1 Hz ≤ f < 10 Hz and when in excess of 1 kHz.
Effective measuring range	±5% to ±100% of voltage peak range (up to ±1500 V) or ±5% to ±100% of current peak range (up to ±100 A)
Display range	±0.3% to ±102% of voltage peak range or current peak range (values less than ±0.3% are subject to zero-suppression)

Voltage Crest Factor/ Current Crest Factor Measurement Specifications

Measurement method	Calculates values from display values once each display update interval for voltage and voltage waveform peak values or current and current waveform peak values.
Effective measuring range	As per voltage and voltage waveform peak value or current and current waveform peak value effective measurement ranges.
Display range	1.0000 to 612.00 (no polarity)

Voltage Ripple Rate / Current Ripple Factor 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 per voltage and voltage waveform peak value or current and current waveform peak value effective measurement ranges
Display range	0.00[%] to 500.00[%]
Polarity	None

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

Measurement types	Rectifiers Apparent Power/ Reactive Power/ Power Factor : AC+DC, AC, FND, AC+DC Umn Phase Angle : AC, FND
Effective measuring range	As per voltage, current, and active power effective measurement ranges.
Display range	Apparent Power/ Reactive Power : 0% to 196% of the range (no zero-suppression) Power Factor : ±0.0000 to ±1.0000 Phase Angle : +180.00 to -180.00
Polarity	Reactive Power/ Power Factor/ Phase Angle Polarity is assigned according to the lead/lag relationship of the voltage waveform rising edge and the current waveform rising edge. + : When current lags voltage (no polarity display) - : When current leads voltage

Power channel and sum value calculation formulas

Wiring		S : Apparent power	Q : Reactive power
All channels	1P2W	$S_{(i)} = U_{(i)} \times I_{(i)}$	$Q_{(i)} = si_{(i)}\sqrt{S_{(i)}^2 - P_{(i)}^2}$
Sum values	1P3W	$S_{sum} = S_{(1)} + S_{(2)}$	$Q_{sum} = Q_{(1)} + Q_{(2)}$
	3P3W	$S_{sum} = \frac{\sqrt{3}}{2}(S_{(1)} + S_{(2)})$	
	3P3W2M 3V3A	$S_{sum} = \frac{\sqrt{3}}{3}(S_{(1)} + S_{(2)} + S_{(3)})$	
	3P3W3M 3P4W	$S_{sum} = S_{(1)} + S_{(2)} + S_{(3)}$	$Q_{sum} = Q_{(1)} + Q_{(2)} + Q_{(3)}$

(i): Measurement channel

Wiring		λ : Power factor	ϕ : Phase angle
All channels	1P2W	$\lambda_{(i)} = si_{(i)}\left\lvert\frac{P_{(i)}}{S_{(i)}}\right\rvert$	$\phi_{(i)} = si_{(i)} \cos^{-1}\lvert\lambda_{(i)}\rvert$
Sum values	1P3W 3P3W 3P3W2M 3V3A 3P3W3M 3P4W	$\lambda_{sum} = si_{sum}\left\lvert\frac{P_{sum}}{S_{sum}}\right\rvert$	When $P_{sum} \geq 0$ $\phi_{sum} = si_{sum} \cos^{-1}\lvert\lambda_{sum}\rvert$ (0° to ±90°) When $P_{sum} \geq 0$ $\phi_{sum} = si_{sum}\lvert 180 - \cos^{-1}\lvert\lambda_{sum}\rvert\rvert$ (±90° to ±180°)

(i): Measurement channel ; The polarity symbol sisum is acquired from the Qsum symbol.

Frequency Measurement Specifications

Number of measurement channels	3 ch
Measurement source	Select from U (VHz) or I (AHz) by channel
Measurement method	Calculated from input waveform period (reciprocal method)
Measurement range	500 Hz/ 200 kHz (linked to zero-cross filter)
Measurement accuracy	±0.1% rdg. ±1 dgt. (0°C to 40°C)
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. Measurement lower limit frequency setting: 0.1 sec. / 1 sec. / 10 sec.
Display format	0.1000 Hz to 9.9999 Hz, 9.900 Hz to 99.999 Hz, 99.00 Hz to 999.99 Hz, 9900 kHz to 9.9999 kHz, 9.900 kHz to 99.999 kHz, 99.00 kHz to 220.00 kHz

Efficiency Measurement Specifications

Measurement method	Calculates the efficiency h [%] from the ratio of active power values for channels and wires
Wiring modes and calculation equations	Calculated based on the AC+DC rectifier active power PW3336

Wiring	CH1	CH2	Calculation formulas
1P2W × 2	1P2W	1P2W	η1=100×|P2| / |P1| η2=100×|P1| / |P2|
1P3W	1P3W		
3P3W	3P3W		
3P3W2M	3P3W2M		

PW3337

Wiring	CH1	CH2	CH3	Calculation formulas
1P2W × 3	1P2W	1P2W	1P2W	η1=100×|P3| / |P1| η2=100×|P1| / |P3|
1P3W & 1P2W	1P3W		1P2W	η1=100×|P3| / |Psum|
3P3W & 1P2W	3P3W		1P2W	η2=100×|Psum| / |P3|
3P3W2M	3P3W2M			
3V3A	3V3A			
3P3W3M	3P3W3M			
3P4W	3P4W			

Effective measuring range	As per the active power effective measurement range.
Display range	0.00[%] to 200.00[%]

Time Average Current / Time Average Active Power Measurement Specifications (T.AV)

Measurement method	Calculates the average by dividing the integrated value by the integration time
Measurement accuracy	±(Current or active power measurement accuracy) ±(±0.01%rdg. ±1dgt.)
Effective measuring range	As per the current or active power effective measurement range

Functional Specifications

Auto-range (AUTO)	Automatically changes the voltage and current range for each wiring mode according to the input Range up: The range is increased when input exceeds 130% 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 decreased when the peak is exceeded at the lower range.
Averaging (AVG)	· Averages the voltage, current, active power, apparent power, and reactive power. · The power factor and phase angle are calculated from averaged data. · Measured values other than peak values, power factor, frequency, integrated values, T.AV, crest factor, ripple rate, total harmonic distortion, and harmonics are averaged. Method : Simple averaging Number of averaging iterations and display update interval

Number of averaging iterations	1 (OFF)	2	5	10	25	50	100
Display update interval	200ms	400ms	1s	2s	5s	10s	20s

Scaling (VT, CT)	Applies user-defined VT and CT ratio settings to measured values. These settings can be configured separately for each wiring mode. VT ratio setting range : OFF (1.0), 0.1 to 1000 (setting: 0000) CT ratio setting range : OFF (1.0), 0.001 to 1000 (setting: 0000)
HOLD (HOLD)	· 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.
Maximum value/ minimum value hold (MAX/MIN HOLD)	· Detects maximum and minimum measured values as well as maximum and minimum values for the voltage and current waveform peak and holds them on the display. · For data with polarity, display of the maximum value and minimum value for the data's absolute values is held (so that both positive and negative polarity values are shown). · Internal calculations (including integration and integration elapsed time) will continue. · Analog output and waveform output are not held.
Zero Adjustment (0 ADJ)	Degausses the current input unit DCCT and then zeroes out the current input offset.
Key-lock (KEY LOCK)	Disables key input in the measurement state, except for the SHIFT key and KEY LOCK key.
Backup	Backs up settings and integration data if the instrument is turned off and if a power outage occurs.
System Reset	Initializes the instrument's settings. Communications-related settings (communications speed, address, and LAN-related settings) are not initialized.

Integration Measurement Specifications

Measurement items	Simultaneous integration of the following 6 parameters for each channel (total of 18 parameters): Sum of current integrated values (displayed as Ah on panel display) Positive current integrated value (displayed as Ah+ on panel display) Negative current integrated value (displayed as Ah- on panel display) Sum of active power integrated values (displayed as Wh on panel display) Positive active power integrated value (displayed as Wh+ on panel display) Negative active power integrated value (displayed as Wh- on panel display)
Measurement types	Rectifiers: AC+DC, AC+DC Umn Current: Displays the result of integrating current RMS value data (display values) once every display update interval (approx. 200 ms) 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 Displays the result of integrating instantaneous data obtained by sampling both current and active power by polarity as integrated values (When the active power contains both AC and DC, the DC component will not be integrated)
Integration time	1 min. to 10000 hr., settable in 1 min. blocks
Integration time accuracy	±100 ppm ±1 dgt. (0°C to 40°C)
Integration measurement accuracy	(Current or active power measurement accuracy) + (±0.01% rdg. ±1 dgt.)
Effective measuring range	Until PEAK OVER U or PEAK OVER I occurs
Display resolution	999999 (6 digits + decimal point)
Functions	· Stopping integration based on integration time setting (timer) · 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
External control	Stopping/starting integration and resetting integrated values based on external control
Measuring range	Corresponds to the range set for START integretation

Harmonic Measurement Specifications (built-in function)

Measurement method	· Zero-cross simultaneous calculation method (separate windows by channel according to the wiring mode) · 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
Synchronization source	Conforms to synchronization source (SYNC) for the basic measurement specifications
Measurement channels	3
Measurement items	·Harmonic voltage RMS value ·Harmonic voltage content % ·Harmonic voltage phase angle ·Harmonic current RMS value ·Harmonic current content % ·Harmonic current phase angle ·Harmonic active power ·Harmonic active power content % ·Harmonic voltage current phase difference ·Total harmonic voltage distortion ·Total harmonic current distortion ·Voltage fundamental waveform ·Current fundamental waveform · Active power fundamental waveform ·Apparent power fundamental waveform · Reactive power fundamental waveform ·Power factor fundamental waveform ·Voltage current phase difference fundamental waveform ·Interchannel voltage fundamental wave phase difference ·Interchannel current fundamental wave phase difference 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
FFT processing word length	32 bits
Number of FFT points	4096
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
Synchronization frequency range	10 Hz to 640 Hz

Maximum analysis order	Synchronization frequency (f) range	Analysis order
	10 Hz ≤ f < 45 Hz	50th
	45 Hz ≤ f < 56 Hz	50th
	56 Hz ≤ f ≤ 66 Hz	50th
	66 Hz < f ≤ 100 Hz	50th
	100 Hz < f ≤ 200 Hz	40th
	200 Hz < f ≤ 300 Hz	25th
	300 Hz < f ≤ 500 Hz	15th
	500 Hz < f ≤ 640 Hz	11th

PW3337 7 PW3336 6

Analysis order upper limit setting	2nd to 50th
Measurement accuracy	f.s.: Measurement range Frequency (f) / Voltage, Current, Active power DC: ±0.4%rdg.±0.2%f.s. 10 Hz ≤ f < 30 Hz: ±0.4%rdg.±0.2%f.s. 30 Hz ≤ f ≤ 400 Hz: ±0.3%rdg.±0.1%f.s. 400 Hz < f ≤ 1 kHz: ±0.4%rdg.±0.2%f.s. 1 kHz < f ≤ 5 kHz: ±1.0%rdg.±0.5%f.s. 5 kHz < f ≤ 8 kHz: ±4.0%rdg.±1.0%f.s. For DC, add ±1 mA to current and (±1 mA) x (voltage read value) to active power.

Display Specifications

Display	7-segment LED
Number of display parameters	4
Display resolution	Other than integrated values: 99999 count Integrated values: 999999 count
Display update rate	200 ms to 20 s (varies with number of averaging iterations setting)

Synchronized Control

Functions	Timing of calculations, display updates, data updates, integration start/stop/reset events, display hold operation, key lock operation, and zero-adjustment operation for the slave PW3336/ PW3337 are synchronized with the master PW3336/ PW3337.
Terminal	BNC terminal × 1 (non-isolated)
Terminal name	EXT SYNC
I/O settings	Off: Synchronized control function off In : The EXT SYNC terminal is set to input, and a dedicated synchronization signal can be input (slave). Out: The EXT SYNC terminal is set to output, and a dedicated synchronization signal can be output (master).
Number of units for which synchronized control can be performed	1 master unit and 7 slave units (total 8 units)

External Current Sensor Input Specifications (built-in feature)

Terminal	Isolated BNC terminals, 1 for each channel
Current sensor type switching	Off / Type 1 / Type 2 When set to off, input from the external current sensor input terminal is ignored.
Current sensor options	TYPE1 (100 A to 5000 A sensors) 9660, 9661, 9669, CT9667-01/-02/-03 TYPE2 (20 A to 1000 A sensors, Power supply is required to use) CT6862-05, CT6863-05, CT6875, CT6876, CT6877, 9272-05, CT6841-05, CT6843-05, CT6844-05, CT6845-05, CT6846-05, etc.
Current measurement range	Auto / 10 A / 20 A / 50 A (range noted on panel) User-selectable for each wiring mode. Can be read directly by manually setting the CT ratio.
Power range configuration	Depends on the combination of voltage and current ranges; from 60.000W to 15.000MW (also applies to VA, var)
Measurement accuracy Current, Active power	

Frequency	Input < 50%f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. ≤ Input
DC	±0.2%rdg. ±0.6%f.s.	±0.2%rdg. ±0.6%f.s.	±0.8%rdg.
0.1Hz≤ f <16Hz	±0.2%rdg. ±0.2%f.s.	±0.4%rdg.	±0.4%rdg.
16Hz≤ f < 45Hz	±0.2%rdg. ±0.2%f.s.	±0.4%rdg.	±0.4%rdg.
45Hz ≤ f ≤ 66Hz	±0.2%rdg. ±0.1%f.s.	±0.3%rdg.	±0.3%rdg.
66Hz < f ≤ 500Hz	±0.2%rdg. ±0.2%f.s.	±0.4%rdg.	±0.4%rdg.
500Hz < f ≤ 1kHz	±0.2%rdg. ±0.3%f.s.	±0.5%rdg.	±0.5%rdg.
1kHz < f ≤ 10kHz	±5.0%rdg.	±5.0%rdg.	±5.0%rdg.
10kHz < f ≤ 50kHz			
50kHz < f ≤ 100kHz			

f.s. : Each measurement range
•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 conform to the current sensor's specifications.
•Values for current, and active power for which 0.1 Hz ≤ f < 10 Hz are for reference only.
•Values for voltage in excess of 220 V active power for which 10 Hz ≤ f < 16 Hz are for reference only.

Temperature characteristics	Current, active power: ±0.08% f.s./°C (instrument temperature coefficient; f.s.: instrument measurement range) Add current sensor temperature coefficient to above.
Power factor effects	· Instrument: ±0.15% f.s. or less (45 Hz to 66 Hz with power factor = 0) · Internal circuit voltage/current phase difference: ±0.086° · Add the current sensor phase accuracy to the internal circuit voltage/current phase difference noted above.
Current peak value measurement accuracy	· (External current sensor input instrument accuracy) + (±2.0% f.s.) (f.s.:current peak range) · Add the current sensor accuracy to the above.
Harmonic measurement accuracy	Frequency / Voltage / Current, Active power DC: ±0.4%rdg. ±0.2%f.s. / ±0.6%rdg. ±0.8%f.s. 10Hz≤ f < 30Hz: ±0.4%rdg. ±0.2%f.s. / ±0.6%rdg. ±0.4%f.s. 30Hz≤ f ≤ 400Hz: ±0.3%rdg. ±0.1%f.s. / ±0.5%rdg. ±0.3%f.s. 400Hz < f ≤ 1kHz: ±0.4%rdg. ±0.2%f.s. / ±0.6%rdg. ±0.5%f.s. 1kHz < f ≤ 5kHz: ±1.0%rdg. ±0.5%f.s. / ±1.0%rdg. ±5.5%f.s. 5kHz < f ≤ 8kHz: ±4.0%rdg. ±1.0%f.s. / ±2.0%rdg. ±6.0%f.s. f.s.: Each measurement range •To obtain the current or active power accuracy, add the current sensor's accuracy to the above current and active power accuracy figures.

D/A Output Specifications (PW3336-02/-03 and PW3337-02/-03)

Number of output channels	16
Configuration	16-bit D/A converter (polarity + 15 bits)
Output parameters	U1 to U3 (voltage level) or u1 to u3 (instantaneous voltage waveform) (switchable) I1 to I3 (current level) or i1 to i3 (instantaneous current waveform) (switchable) P1 to P3 (active power level) or p1 to p3 (instantaneous power waveform) (switchable) Psum (active power level) or Hi-Psum (high-speed active power level) (switchable) Psum and Hi-Psum output is not available (0 V) when using the 1P2W wiring mode.P12 is output when using 1P3W, 3P3W, or 3P3W2M, and P123 is output when using 3V3A, 3P3W3M, or 3P4W. D/A1 to D/A3 : Select any 3 from channel or sum value for Voltage, Current, Active power, Apparent power, Reactive power, Power factor, Phase angle, Total harmonic voltage/current distortion, Inter-channel voltage/current fundamental wave phase difference, Voltage/current crest factor, Time average current/active power, Voltage/current ripple rate, Frequency, Efficiency, Current integration, Active power integration (Harmonic output is not available for individual orders). Hi-P1 to Hi-P3 and Hi-Psum (high-speed active power level): Fixed to AC+DC For other level output, select AC+DC, AC+DC Umn, DC, AC, or fnd.
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 active power level output : (Output parameter measurement accuracy) + (±0.2% f.s.) Instantaneous waveform output : (Output parameter measurement accuracy) + (±1.0% f.s.) Instantaneous voltage, instantaneous current: RMS value level Instantaneous power: Average value level
Output frequency band	Instantaneous waveform output, high-speed active power level output At DC or 10 Hz to 5 kHz, accuracy is as defined above.
Output voltage	Level output Voltage, Current, Active power, Apparent power, Reactive power, Time average current/active power : ±2 V DC for ±100% of range Power factor : ±2 V DC at ±0.0000, 0 V DC at ±1.0000 Phase angle : 0 V DC at 0.00°, ±2 V DC at ±180.00° Voltage/current ripple rate, total harmonic voltage/current distortion : + 2 V DC at 100.00% Voltage/current crest factor : +2 V DC at 10.000 Frequency : Varies with measured value. +2 V DC per 100 Hz from 0.1000 Hz to 300.00 Hz +2 V DC per 10 kHz from 300.01 Hz to 30.000 kHz +2 V DC per 100 kHz from 30.001 kHz to 220.00 kHz Efficiency : +2 V DC at 200.00% Current integration, active power integration : ±5 V DC at (range) × (integration set time) Waveform output : 1 V f.s. relative to 100% of range
Maximum output voltage	Approx. ±12 V DC
Output update rate	Level output : Fixed at 200 ms ±50 ms (approx. 5 times per sec.) Update rate is unrelated to number of averaging iterations setting and display hold operation. Waveform output : Approx. 11.4 µs (approx. 87.5 kHz) High-speed P level : Updated once every cycle for the input waveform set as the synchronization source.
Response time	Level output : 0.6 sec. or less (when the input changes abruptly from 0% to 90%, or from 100% to 10%, the time required in order to satisfy the accuracy range) Waveform output : 0.2 ms or less High-speed active power level output : 1 cycle
Temperature characteristic	±0.05% f.s./°C or less
Output resistance	100 Ω ±5 Ω

External control (built-in feature)

Functions	Integration start/stop, integration reset and hold via external control
External control	Input signal level: 0 to 5 V (high-speed CMOS level or shorted [Lo]/open [Hi])

Functions	External control signal	External control terminal
Start	Hi → Lo	START/STOP
Stop	Lo → Hi	
Reset	Lo interval of at least 200 ms	RESET
Hold on	Hi → Lo	HOLD
Hold off	Lo → Hi	

GP-IB interface (PW3336-01/-03, PW3337-01/-03)

Method	IEEE488.1 1978 compliant; see IEEE488.2 1987 Interface functions: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0 Remote control by controller
Address	00 to 30

RS-232C interface (built-in feature)

Connector	D-sub 9-pin connector × 1
Communication method	Full duplex, Start-stop synchronization, Stop bits: 1 (fixed), Data bits: 8 (fixed), Parity: None Remote control by controller
Communication Speed	9600bps/ 38400bps

LAN interface (built-in feature)

Connector	RJ-45 connector × 1
Electrical Specifications	IEEE802.3 compliant
Transmission Method	10BASE-T/100BASE-TX (automatic detection)
Protocol	TCP/IP
Functions	HTTP server (remote operation, firmware updates) Dedicated ports (command control, data transfer) Remote control by controller (REMOTE lamp will light up.)

General Specifications (product guaranteed for 3 year)

Operating environment	Indoors, altitude up to 2000 m (6562-ft.), pollution degree 2
Operating temperature and humidity	0 to 40°C (32 to 104°F), 80% RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C (14 to 122°F) 80% RH or less (non-condensating)
Dielectric strength	4290 Vrms AC (sensed current: 1 mA) Between voltage input terminals and (case, interface, and output terminals) Between current direct input terminals and (case, interface, and output terminals) Between voltage input terminals and current direct input terminals
Maximum rated voltage to earth	Voltage input terminal, Current direct 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 voltage input terminals U: 1000 V, ±1500 Vpeak
Maximum input current	Between +/- current direct input terminals I: ±70 A, ±100 Apeak
Applicable Standards	Safety : EN61010, EMC : EN61326 Class A/ EN61000-3-2/ EN61000-3-3
Rated supply voltage	100 VAC to 240 VAC, Rated power supply frequency : 50/60 Hz
Maximum rated power	40 VA or less
Dimensions	Approx. 305W(12.01") × 132H(5.20") × 256D(10.08") mm (excluding protrusions)
Mass	PW3336 series Approx. 5.2 kg (183.4 oz.) PW3337 series Approx. 5.6 kg (197.5 oz.)
Accessories	Instruction manual × 1, Measurement guide × 1, Power cord × 1

3-phase Power Meter

Model & Appearance	Model No. (Order Code)	Number of Channels	AC/ DC	Harmonic Measurement	LAN	RS-232C	GP-IB	D/A output	Current Sensor Input	Synchronized Control
POWER METER PW3337 	PW3337	3	AC/ DC	✔	✔	✔	×	×	✔	✔
	PW3337-01	3	AC/ DC	✔	✔	✔	✔	×	✔	✔
	PW3337-02	3	AC/ DC	✔	✔	✔	×	✔	✔	✔
	PW3337-03	3	AC/ DC	✔	✔	✔	✔	✔	✔	✔
POWER METER PW3336 	PW3336	2	AC/ DC	✔	✔	✔	×	×	✔	✔
	PW3336-01	2	AC/ DC	✔	✔	✔	✔	×	✔	✔
	PW3336-02	2	AC/ DC	✔	✔	✔	×	✔	✔	✔
	PW3336-03	2	AC/ DC	✔	✔	✔	✔	✔	✔	✔

Accessories: Instruction manual ×1, Measurement guide ×1, Power cord ×1

Single-phase Power Meter

Model & Appearance	Model No. (Order Code)	Number of Channels	AC/ DC	Harmonic Measurement	LAN	RS-232C	GP-IB	D/A output	Current Sensor Input	Synchronized Control
POWER METER PW3335 	PW3335	1	AC/ DC	✔	✔	✔	×	×	×	✔
	PW3335-01	1	AC/ DC	✔	✔	×	✔	×	×	✔
	PW3335-02	1	AC/ DC	✔	✔	✔	×	✔	×	✔
	PW3335-03	1	AC/ DC	✔	✔	✔	×	×	✔	✔
	PW3335-04	1	AC/ DC	✔	✔	✔	✔	✔	✔	✔
AC/ DC POWER HiTESTER 3334 	3334	1	AC/ DC	×	×	✔	×	✔	×	×
	3334-01	1	AC/ DC	×	×	✔	✔	✔	×	×
POWER HiTESTER 3333 	3333	1	AC	×	×	✔	×	✔	×	×
	3333-01	1	AC	×	×	✔	✔	✔	×	×

Accessories : Instruction manual ×1, Power cord ×1

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 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

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