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

(f)

HIOKI

#### AC/DC POWER HITESTER 3334

**POWER HITESTER 3333** 



# 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

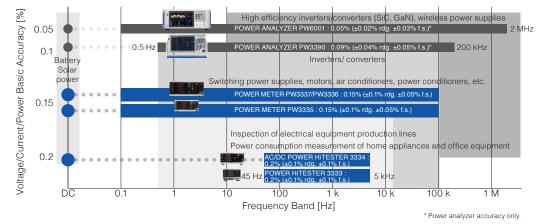
The PW3337 and PW3336 are suitable for a wide variety of connections, such as measuring three-phase circuits and single-phase 2-wire multiple circuits. There is little internal resistance for the current input, and large currents up to 65 A can be measured with great accuracy.



# Single-phase Power Meter

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





### Basic Accuracy and Frequency Bands

## Effective Measurement Range



# Comparison Chart

		PW3337	PW3336	PW3335	3334	3333
No. of channels		3	2	1	1	1
Supported conr	nections	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 measures range, voltage	irement	0.15 V to	o 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 t		10 µA to 30 A	1 mA to 30 A	5 mA to 30 A
Frequency band	b		DC, 0.1 Hz to 100 k	DC, 45 Hz to 5 kHz	45 Hz to 5 kHz	
Basic accuracy (Voltage, currer		±0.1% rdg. ±0.05% f.s.			±0.1% rdg. ±0.1% f.s.	±0.1% rdg. ±0.2% f.s.
Basic accuracy (Voltage, curren		±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		Ye	es	PW3335-03, -04	-	
	LAN		Yes		-	
Interface	RS-232C	Ye	es	PW3335, -02, -03, -04	Yes	
Intenace	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	

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### POWER METER PW3337/PW3336

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



### 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)

Voltage input terminal	Current input terminal	LAN connector	RS-232C connector	GP-IB connector
D/A output terminal	Current sensor input terminal	Synchronous control terminal	External control terminal	

### AC/DC POWER HITESTER 3334

Measurement of power consumption and integrated power for battery-operated equipment, home appliances, and office equipment



- Accuracy guaranteed up to 3 years
- Compliant with the SPECpower<sup>®</sup> server power evaluation test

## POWER HITESTER 3333

Low-price model for measurement of power consumption on production/inspection lines

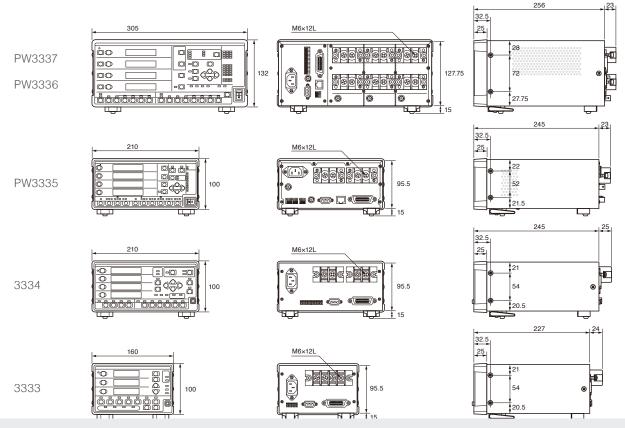


• Compact model for saving space, even when added to a system

Units: mm

• Accuracy guaranteed up to 3 years

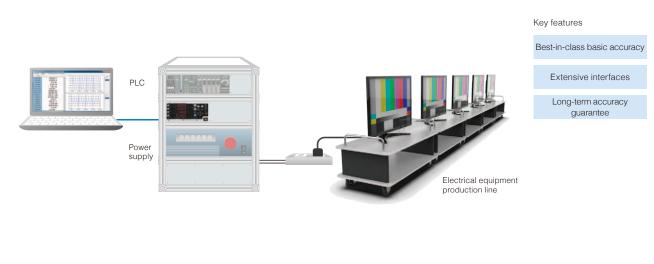
# **Dimensional Drawings**



(ES) Equipements Scientifiques SA - Département Tests & Mesures - 127 rue de Buzenval BP 26 - 92380 Garches Tél. 01 47 95 99 45 - Fax. 01 47 01 16 22 - e-mail: tem@es-france.com - Site Web: www.es-france.com

# Applications

### Inspection of Electrical Equipment Production Lines



#### Best-in-class Accuracy ±0.1% \* [PW333 6] [PW333 6] [PW333 6]

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.



\* For complete details, please refer to the specifications

#### Extensive Interfaces



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



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

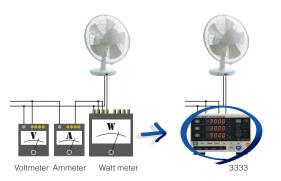


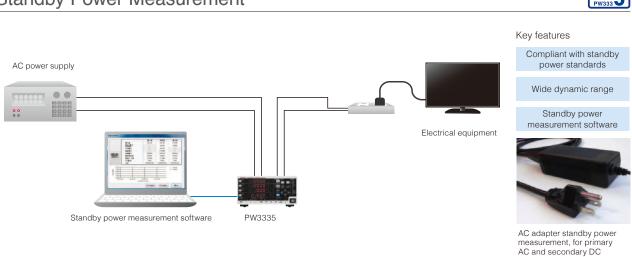
The 3333 and 3334 are guaranteed for accuracy for 3 years. Even after 3 years, they maintain an accuracy of  $\pm 0.5\%$  rdg. as required for measurements. This 3-year accuracy guarantee, the longest in the industry, helps to save on calibration expenses.



# Replacement for Analog Meters 334 333

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

Compliant with IEC62301 and EN50564 Standards

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

Requirements for Measurement Instruments for Standby Power Measurements (excernt)

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

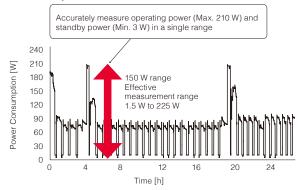
THD (Total Harmonic Distortion): Indicates to what extent harmonic components are present in an AC waveform

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

#### Wide Range of Effective Measurement

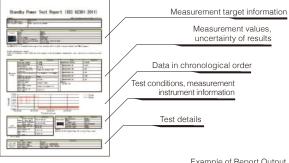
The PW3335 has an effective measurement range of 1% to 150%. Due to this wide range of effective measurement, even equipment with large load fluctuations, such as refrigerators, heaters, and pumps, can be measured accurately under all conditions from noload to full operation.



I ong-term Measurement of Refrigerator Power

#### 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.

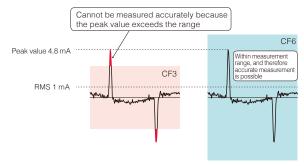


Example of Report Output

#### Support for CF6 (Crest Factor 6)

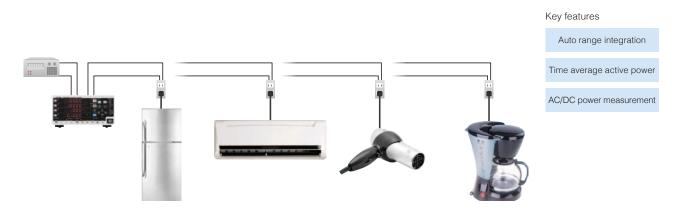
When an AC adapter or switching power supply operates with no load, the crest factor of the current waveform increases. The PW3335 can measure waveforms that exceed the range of watt meters that support crest factor 3.

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 (CE - Peak Value RMS - 1 8)

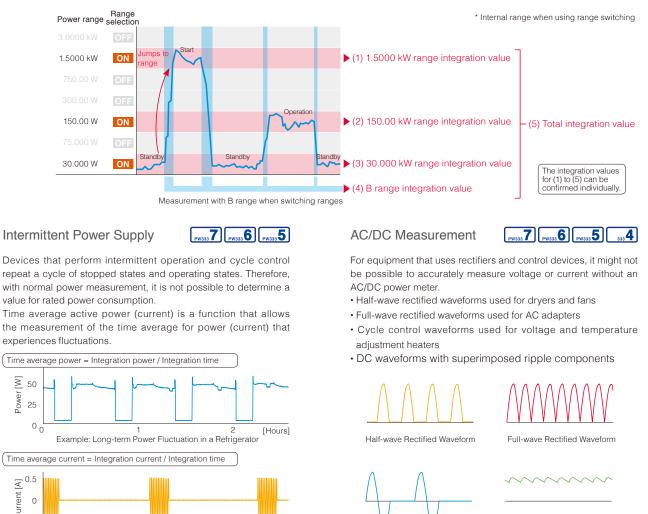
### Measurement of Fluctuating Loads and Power Supply Control



#### Auto Range Integration with Guaranteed Accuracy when Switching Ranges

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

**.5** 



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Cucle Control Waveform

DC Waveform with Superimposed Rinnle

1 [Seconds]

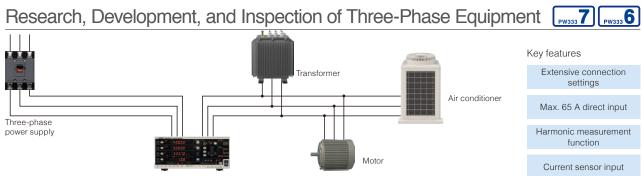
oform for Heat Retention Heate

Power

Current

-0.5

nla: Currant Way



#### 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

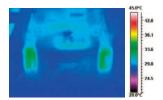
The PW3337 supports not only 3V3A, but also a variety of three-phase connections such as 3P4W, 3P3W2M, and 3P3W3M.

#### Accuracy Guaranteed for Currents Up to 65 A

Because DCCT allows a current with an input resistance of 1 m $\Omega$  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.



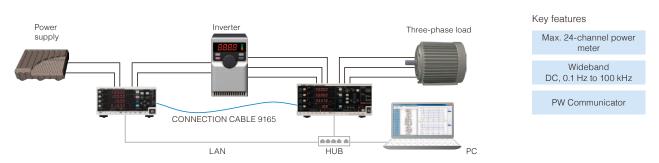
DCCT current sensor (in the PW3337)



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

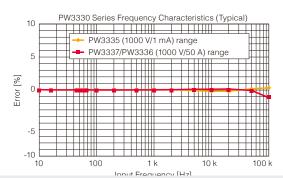
PW333 7 PW333 6 PW33

### Inverter Efficiency Measurement



#### 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.



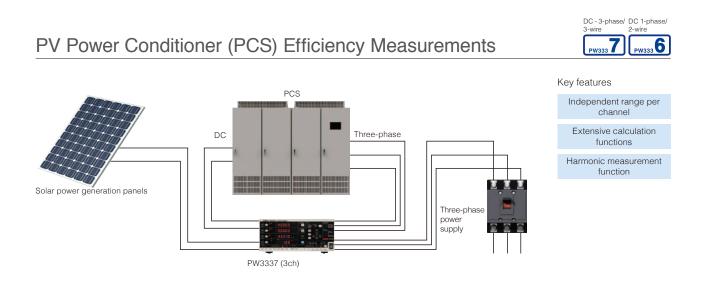
#### 24-channel Power Meter with Synchronous Control for up to 8 Units

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.



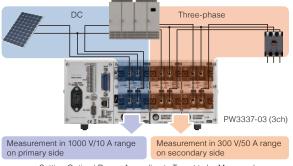
\* This software can be downloaded from the HIOKI website

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# 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.

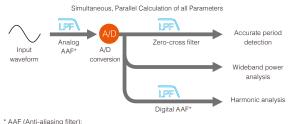


Setting Optimal Range According to Target to be Measured

# 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):

#### 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.

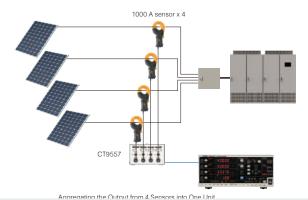
#### 1000 V Range for Evaluation of Large Power Conditioners

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.

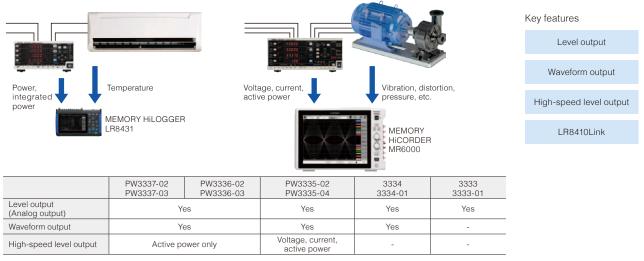


# Aggregation of Output from DC Current Sensors (Up to 4000 A)

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.



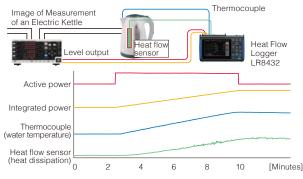
### Output Function Linked with Recorder



# Display Trends with a Data Logger



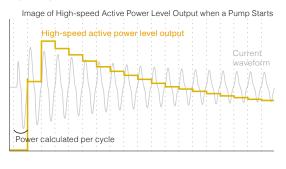
The level output (analog output) function delivers measured values that are displayed on the power meter with an analog voltage that is updated every 200 ms. Connect the unit to a data logger to check trends through synchronization with data such as temperature and heat flow\*.



\* 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 [PW33 7] [PW33 6] [PW33 5]

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.

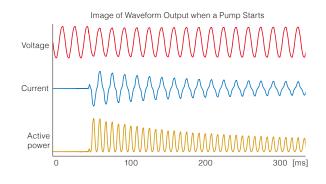


<sup>\*</sup> With the PW3335, high-speed level output is also possible for 45 Hz to 66 Hz

Observe Waveforms with a Memory Hicorder



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



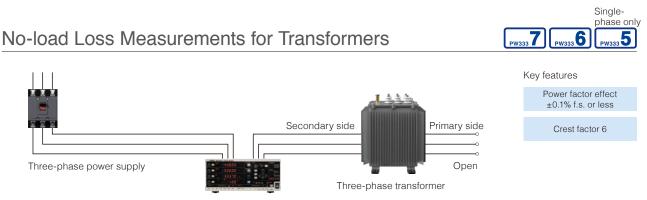
#### Transfer Information to Data Logger Wirelessly (LR8410Link)



Connect the PW3335 (excluding model -01) and a data logger (with support for LR8410 Link) via Bluetooth® wireless technology\* to wirelessly transmit 8 measurement parameters from the power meter to the data logger. In addition to the voltage and temperature measured by the multichannel data logger, you can also integrate current and power and observe and record them in real time.



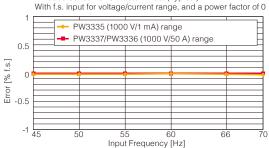
\* Connection requires the serial - Bluetooth® wireless technology conversion



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

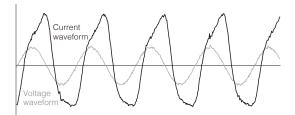
A no-load loss test is one indicator for evaluating energy conservation for transformers and motors. The PW3337 and PW3336 are affected very little by power factor, at  $\pm 0.1\%$  f.s. or less, allowing active power to be measured with a high level of accuracy at low power factors.

PW3330 Series Power Factor Effect (Typical)



#### 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

Key features

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

### DC Power Measurement for Batteries and Power Supplies



Best-in-class DC Power Accuracy



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

> PW3337/PW3336 PW3335 DC power accuracy

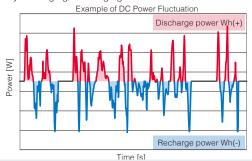
> > \* For complete details, please refer to the specifications



PW333 Current and Power Integration Function by Polarity



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



# Options

#### TYPE 1 Current Sensor (General Current Measurements)

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

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
	1	CLAMP ON SENSOR 9660	100 A	40 Hz to 5 kHz	🛛 15 mm (0.59 in)	±0.3% rdg. ±0.02% f.s. Within ±1°		
		CLAMP ON SENSOR 9661	500 A	40 Hz to 5 kHz	🛛 46 mm (1.81 in)	±0.3% rdg. ±0.01% f.s. Within ±0.5°		Not used
Clamp method		CLAMP ON SENSOR 9669	1000 A	40 Hz to 5 kHz	⊠ 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°	3 m (9.84 ft)	
metriou	e contra	FLEXIBLE CLAMP ON SENSOR CT9667-01	500 A/ 5000 A 10 Hz to		🛛 100 mm (3.94 in)	±2.0% rdg. ±0.3% f.s. Within ±1°	(9.04 11)	AA (LR6) Alkaline Batteries x
	80	FLEXIBLE CLAMP ON SENSOR CT9667-02			🛛 180 mm (7.09 in)			2 (approx. 7 days) or
	- Ali	FLEXIBLE CLAMP ON SENSOR CT9667-03			🛛 254 mm (10.00 in)			AC ADAPTER 9445-02 (optional)
C	Options for CT9667-01/-02/-03							
	External Product name/ appearance model no.		Functions					Power supply
		AC ADAPTER 9445-02		F	or supplying power to CT96	For supplying power to CT9667-01/-02/-03		

#### TYPE 2 Current Sensor (Highly Accurate Current Measurements) Connect this unit to the current sensor input terminal (BNC) on the PW3337/PW3336/PW3335. SENSOR UNIT CT9555 or CT9557 and CONNECTION CABLE L9217 are required.

Wiring Rated Frequency Diameter of measurable Basic accuracy (amplitude) Cord External Product name/ Power supply lengths method appearance model no. current band conductors Basic accuracy (phase) CT6862-05 50 A DC to 1 MHz Ø 24 mm (0.94 in) ±0.05% rdg. ±0.01% f.s. Within ±0.2° CT6863-05 200 A DC to 500 kHz 24 mm (0.94 in) Through CT6875 500 A DC to 2 MHz 🛛 36 mm (1.42 in) method ±0.04% rdg. ±0.008% f.s. CT6876 DC to 1.5 MHz 1000 A 🛛 36 mm (1.42 in) Within ±0.1° 0 CT6877 2000 A DC to 1 MHz 🛙 80 mm (3.15 in) CT9555 3 m Ð, CT6841-05 DC to 1 MHz 20 A 20 mm (0.79 in) (9.84 ft) CT9557 ٩ DC to 500 kHz CT6843-05 200 A 🛛 20 mm (0.79 in) ±0.3% rdg. ±0.01% f.s. ٩ CT6844-05 500 A DC to 200 kHz ⊠ 20 mm (0 79 in) Within ±0.1° Clamp method CT6845-05 500 A DC to 100 kHz 🛛 50 mm (1.97 in) CT6846-05 1000 A DC to 20 kHz ⊠ 50 mm (1.97 in) 20 A/ ±0.3% rdg. ±0.01% f.s. 9272-05 1 Hz to 100 kHz 🛛 46 mm (1.81 in) 200 A Within ±0.2°

#### Options for Current Sensor TYPE 2

External appearance	Product name/ model no.	Max. no. of sensors	Functions	Power supply	Cord lengths	Connection Im
	SENSOR UNIT CT9555	1	For supplying power to the TYPE 2 current sensor	100 V to 240 V AC	-	
22000	SENSOR UNIT CT9557	4	For supplying power to the TYPE 2 current sensor With addition output function	100 V to 240 V AC	-	TYPE 2 current sensor
//	CONNECTION CORD L9217	-	For connecting CT9555/CT9557 and PW3330 series units	-	1.6 m (5.25 ft)	Sensor

#### CT9555 or CT9555 or CT9557 L9217 VPE 2 urrent ensor

#### 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

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

#### Printing example

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

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



#### Thermal serial dot method, 112 mm (4.41 in) paper width Power supply: AC ADAPTER 9443-02, or the

 
 Power supply:
 AC ADAPTER 9443-02, or the included nickel hydride batteries

 Dimensions, mas:
 160 mm W × 67 mm H × 170 mm D (6.30 in W × 2.64 in H × 6.69 in D),

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

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# 733**7** PW3336 PW3335

PW333 7 PW333 6 PW333 5





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### **PW** Communicator

PW333 7 PW333 6 PW333 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.

Measurement val	ue <pw3335_04 lan:192.168.1.35="" ser140799556=""></pw3335_04>		x
Auto Update	Update 📝 Display Waveform(8kHz or more decayed)		
Item Num 16	-		U
Urms INST	100.20 V		U1
Irms INST	0.0852 A		
Prms INST	3.16 W ≥		
Srms INST	8.54 VA	-50,007	
Qrms INST	– 7.93 var 🕑		
PFrms INST	-0.3707		
FREQ_U INST	60.002 Hz	-150.00V	
FREQ_I INST	6 Numerical value	Waveform monitoring	T
Upk INST			-
Ipk INST	0.4782 Apk	0.40A	
Uthd INST	0.25 %	0.20A	
Ithd INST	202.97 %		
IH TOTAL	1.679mAh	-0.20A	
WH TOTAL	0.0624 Wh	-0.40A	
P.TAV TOTAL	3.16 W	-0.60A	
MCR INST	15.145 🕑	0.00ms 50.00ms 100.00ms 150.00ms 200.00ms	

Regist A Regist B	Communicator Status Host information READY PW337 LAN 192.168.13 ser130000008 MeasValue settings Save settings READY PW337 LAN 192.168.13 ser130000008 MeasValue settings Save settings READY PW337 LAN 192.168.13 ser130000008 MeasValue settings Save settings
Numerical value monitoring	Display the PW3337/PW3336/PW3335 measurement values on the PC screen. You can freely select up to 64 values, such as voltage, current, power, and harmonics.
Waveform monitoring	The voltage, current, and waveforms measured by the unit can be monitored on the PC screen.
Meter setting	The configuration of the connected power meter can be changed on the PC screen.
Synchronous measurement	Efficiency calculations, such as input/output of the power supply conversion device, are possible between multiple power meters. Use a sync cable to connect and synchronize the control of up to 8 units.
Save in chronological order	More than 180 pieces of measured data can be recorded to a file in CSV format at regular time intervals. The minimum time interval for recording is 200 ms.

## LabVIEW Driver

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

## Sample Software

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

• The 3333/3334 front panel is displayed on the PC screen. Operate the power meter or change settings directly on the PC.

• The measured values for the 3333/3334 are displayed in real time on the PC screen. Save data as a CSV file.

(ES) Equipements Scientifiques SA - Département Tests & Mesures - 127 rue de Buzenval BP 26 - 92380 Garches Tél. 01 47 95 99 45 - Fax. 01 47 01 16 22 - e-mail: tem@es-france.com - Site Web: www.es-france.com



333**4** 

333

PW333 7 PW333 6 PW333 5

### Standby Power Measurement Software

"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 5. Run test Configure the settings for communication with a The consumed power is measured according to the configured power meter. Connect the PC to a power meter, and settings. enter the settings required for the interface used (LAN/RS-232C/GP-IB). Start 6. Create report Create a report of the test results. Output either a PDF report or CSV file. Standby Power Test Report (IEC 62301:2011) 2. Configure the test target Enter the information of the device under test. The 4/10/0 erature r supliied by EP6 information to be entered includes manufacturer name, model name, serial number, and operation mode. You can also register an image of the test target. y function mode 3.1129 facturer details 8.086V# 0.080A 0.415A 5.546 large Average power Integrated power Measurement UNCERTAINTY\_UE 011 ):24 integration) time tability detection .00 [Sampling method1:LR] Condition CERTAINTY\_US 0. 5W 15.078mil/h < 26. Measure value Sampling interva ERTAINTY\_UT . 01 0ms RTAINTY\_U 0. 2W 14.878 EC62301 Ed. arks . 09VA/7. 08V l End (min./max.) Real nower factu (LEAD) 0. 39/ (LEAD) ( Expand Shrink Graph (min./max.) Crest factor ( 3.200 Power Slope 3.079 2 958 2.837 3. Configure the test power supply 2.716 2.594 00:20:00 Time(hh:mm:ss 00:30:00 Enter the information of the test power supply. Information 00:10:00 to be entered includes rating and frequency. Also, enter the values of uncertainty due to the connection method, (min./max.) est frequency wiring, power supply, and temperature. 60. OHz/60. OH in./max.) nt period -60. 1 4203 4. Configure the test conditions Set the current range, stop conditions, algorithm used to Example of report output judge stability, cycle time, and upper limit for test time. erial Numbe er1 40799556 V0.07 tart Time 2014 14 32 150V oltage Rang 200mA 200ms SP dition1(LR)] Test frequency(Hz) U-THD(%) Crest Factor U Crest Cycle Time(



99.49 99.49 99.49 99.49 99.49 60.002 60.002 15 15.2 15.4 15.6 15.8 15.8 .4199 5.6585 5.6696 60.002 .4198 6652 99.49 60.002 0.28 4199 6665 99.49 60.002 41.99 5.6484 16.2 99.49 60.002 1 41

CSV output example

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# **6** PW3337 and PW3336 Specifications

#### Input Specifications

PW333

0113				
PW3336 series				
			se 3-wire (	1P3W),
Three-phase 3-wire	e (3P3W, 3F	P3W2M)		
Wiring	CH1	CH2		
1P2W×2	1P2W	1P2W		
1P3W	1P	3W		
3P3W	3P	ЗW		
3P3W2M	3P3\	W2M		
PW3337 series				
Single-phase 2-wire	e (1P2W), S	Single-pha	se 3-wire (	1P3W).
Three-phase 4-wire	e (3P4W)			
Wiring	CH1	CH2	CH3	
1P2W×3	1P2W	1P2W	1P2W	
1P3W&1P2W	1P3W		1P2W	
3P3W&1P2W			1P2W	
	3P3\			
3P4W		3P4W		
				0 V/
			sensor inp	out, see the
			so applies	to vA, var)
Current airect input ter	rminal : 1	1 mu or les	S	
	PW3336 series Single-phase 2-wirr Three-phase 3-wire PW22 1P3W 3P3W 3P3W 3P3W W3337 series Single-phase 2-wirr Three-phase 2-wirr Three-phase 2-wirr Three-phase 2-wirr Three-phase 3-wire Three-phase 3-wire PP3W&1P2W 3P3W&1P2W	PW3336 series           Single-phase 2-wire (1P2W), 5           Three-phase 3-wire (3P3W, 3I           Wiring         CH1           1P2W×2         1P2W           1P3W         1P           3P3W         3P           Single-phase 3-wire (1P2W), 5           Three-phase 3-wire (3P3W, 3I           Three-phase 3-wire (3P3W, 3I           Three-phase 4-wire (3P4W)           Wiring         CH1           1P2W×3         1P2W           1P3W&1P2W         1P           3P3W8         3P3           3P3W8         1P2W           1P2W×3         1P2W           3P3W8         3P3           3P3W2M         3P3'           3P3W3M         3P4'W           Voltage         Isolated input, resistanc           Current         Isolated input, CCT meth           AUTO/ 15.000 V/ 30.000 V (50.00 A (50.000 A (50.00	PW3336 series           Single-phase 2-wire (1P2W), Single-phase           Three-phase 3-wire (3P3W, 3P3W2M)           Wiring         CH1           1P2W×2         1P2W           1P3W         1P3W           3P3W         3P3W           3P3W         3P3W           3P3W2M         3P3W2M           3P3W2M         3P3W2M           3P3W2M         3P3W2M           3P3W2M         3P3W2M           PW3337 series         Single-phase 2-wire (1P2W), Single-pha           Three-phase 2-wire (3P3W, 3P3W2M, 3Y           Three-phase 4-wire (3P4W)           Wiring         CH1           1P2W×3         1P2W           1P3W&1P2W         1P3W           3P3W2M         3P3W2M           3P3W2M         3P3W3M           3P3W2M         3P3W3M           3P3W2M         3P3W3M           3P3W3M         3P3W3M           3P3W3M         3P3W3M           3P3W3M         3P3W3M           3P4W         3P4W           3P4W         3P4W           3P4W         3P4W           0.000 / 20.000 A / 50.000 A (sotoo 00 / 150.00 A / 20.000 A / 20.000 A / 50.000 A (sotor each For more information about external current exter	PW3336 series           Single-phase 2-wire (1P2W), Single-phase 3-wire (1           Three-phase 2-wire (3P3W, 3P3W2M)           Wiring         CH1           1P2W×2         1P2W           1P3W         1P3W           3P3W         3P3W           3P3W2M         3P3W2M           3P3W2M         3P3W2M           3P3W2M         3P3W2M           3P3W2M         3P3W2M           PW3337 series         Single-phase 2-wire (1P2W), Single-phase 3-wire (1P2W)           Three-phase 3-wire (3P3W, 3P3W2M, 3V3A, 3P3W           Three-phase 4-wire (3P4W)           Wiring         CH1         CH2           1P2Wx3         1P2W         1P2W           3P3W8         1P2W         1P2W           3P3W8         3P3W2         3P3W2M           3P3W2M         3P3W2M         3P3W2M           3P3W3M         3P3W2M         3P3W2M           3P3W3M         3P3W2M         3P3W3M           3P4W         3P4W         3P4W           Voltage         Isolated input, CCT method Isolated input from CAUTO/ 15.000 V/ 30.000 V/ 60.000 V/ 10.000 A/ 2.0000 A/ 50.000 A/ 1.000 A/ 2.0000 A/ 50.000 A/ 1.0000 A/ 2.0000 A/ 50.000 A/ 2.0000 A/ 50.000 A/ 2.0000 A/ 50.000 A/ 2.0000 A/ 50.000 A/ 2.0000 A/ 50.0000 A/ 0.0000 V/ 30.000 V/ 30.000 V/ 30.000 V/ 30.0

#### **Basic Measurement Specifications**

Measurement method	Simultaneous voltage and current digital sampling, zero-cross				
Compling frequency	simultaneous calculati	on			
Sampling frequency					
A/D converter Frequency bands	16-bit resolution DC, 0.1 Hz to 100 kHz				
Synchronization	U1, U2, U3, I1, I2, I3, E	C (fixed at 200 ms)			
sources	Can be set separately	for each wiring mode.			
Measurement items			ver . Apparent power		
	· Reactive power · Pow				
	<ul> <li>Efficiency</li> </ul>	<ul> <li>Current inf</li> </ul>			
		Active power integration Integrated time			
	Voltage waveform pe		aveform peak value		
	· Voltage crest factor	· Current cr			
	Time average current     Voltage ripple factor	· Current rip	age active power		
			ple laciol		
	Harmonic parameters		DMO		
	Harmonic voltage RM     Harmonic active pow	IS value · Harmonic	current RMS value		
		nt distortion · Voltage fu	onic voltage distortion		
		waveform · Active powe			
		ntal waveform · Reactive power			
		ental waveform (displa			
	· Voltage current phase	e difference fundamen	tal waveform		
		fundamental wave pha			
		fundamental wave pha			
	· Harmonic voltage co		current content %		
	· Harmonic active pow	er content %			
		ers can be downloade	d as data during PC		
	communication but no	ot displayed:			
	Harmonic voltage ph	ase angle Harmonic	current phase angle		
D		rrent phase difference			
Rectifiers	AC+DC: AC+DC meas	surement S values for both voltag	o and current		
	AC+DC Umn: AC+DC		e and current		
		value rectified RMS co	nverted values for		
	voltage and true RM	VS values for current			
	DC: DC measurement				
		verages for both voltag			
		alculated by (voltage D	C value)× (current DC		
	value) for active po	wer			
	AC: AC measurement	alculated by fo <u>r both vo</u>	ltage and current		
	Display of values c	alculated by $\sqrt{(AC+DC)}$	value) <sup>2</sup> - (DC value) <sup>2</sup>		
	for active power	······································	(= = = = = = = = = = = = = = = = = = =		
	FND				
		play of the fundamental	wave component		
7 0 .	from harmonic measurement				
Zero-Crossing Filter	500 Hz/200 kHz	Hz, 200 kHz: 0.1 Hz to	200 14		
Measurement accuracy	<u>1500 Hz. 0.1 Hz to 500</u>	112, 200 KHZ. 0.1 HZ IO	200 KI IZ		
Voltage					
-	Input < 50% f.s.	50%f.s. ≤ Input < 100%f.s.	100% f.a. < Input		
Frequency (f) DC	±0.1%rdg. ±0.1%f.s.	±0.1%rdg. ±0.1%f.s.	100%f.s. ≤ Input ±0.2%rdg.		
0.1Hz ≤ f < 16Hz	±0.1%rdg. ±0.1%r.s. ±0.1%rdg. ±0.2%f.s.	±0.1%rdg. ±0.1%r.s. ±0.3%rdg.	±0.2%rdg.		
	1 ±0.1 /0109. ±0.2 /01.S.	±0.0 /010Q.			
	+0.1%rda +0.1%fo	+0.2%rda			
$16Hz \le f < 45Hz$ $45Hz \le f \le 66Hz$	$\pm 0.1\%$ rdg. $\pm 0.1\%$ f.s.	±0.2%rdg.	±0.2%rdg.		
45Hz ≤ f ≤ 66Hz	±0.1%rdg. ±0.05%f.s.	±0.15%rdg.	±0.2%rdg. ±0.15%rdg.		
$\begin{array}{l} 45\text{Hz} \leq f \leq 66\text{Hz} \\ 66\text{Hz} < f \leq 500\text{Hz} \end{array}$	±0.1%rdg. ±0.05%f.s. ±0.1%rdg. ±0.1%f.s.	±0.15%rdg. ±0.2%rdg.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg.		
$\begin{array}{l} 45\text{Hz} \leq \text{f} \leq 66\text{Hz} \\ 66\text{Hz} < \text{f} \leq 500\text{Hz} \\ 500\text{Hz} < \text{f} \leq 10\text{kHz} \end{array}$	±0.1%rdg. ±0.05%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg.		
$\begin{array}{l} 45 \text{Hz} \leq f \leq 66 \text{Hz} \\ 66 \text{Hz} < f \leq 500 \text{Hz} \\ 500 \text{Hz} < f \leq 10 \text{kHz} \\ 10 \text{kHz} < f \leq 50 \text{kHz} \end{array}$	±0.1%rdg. ±0.05%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s. ±0.5%rdg. ±0.3%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg.		
$\begin{array}{l} 45Hz \leq f \leq 66Hz \\ 66Hz < f \leq 500Hz \\ 500Hz < f \leq 10kHz \\ 10kHz < f \leq 50kHz \\ 50kHz < f \leq 100kHz \end{array}$	±0.1%rdg.±0.05%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.2%f.s. ±0.5%rdg.±0.3%f.s. ±2.1%rdg.±0.3%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg.		
$\begin{array}{l} 45\text{Hz} \leq f \leq 66\text{Hz} \\ 66\text{Hz} < f \leq 500\text{Hz} \\ 500\text{Hz} < f \leq 10\text{kHz} \\ 10\text{kHz} < f \leq 50\text{kHz} \\ 50\text{kHz} < f \leq 100\text{kHz} \\ \hline \\ \text{Current (direct input)} \end{array}$	±0.1%rdg.±0.05%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.2%f.s. ±0.5%rdg.±0.3%f.s. ±2.1%rdg.±0.3%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±0.8%rdg.		
$\begin{array}{c} 45Hz \leq f \leq 66Hz \\ 66Hz < f \leq 500Hz \\ 500Hz < f \leq 10kHz \\ 10kHz < f \leq 50kHz \\ 50kHz < f \leq 100kHz \\ \\ \hline \\ Current (direct input) \\ \hline \\ Frequency (f) \end{array}$	±0.1%rdg. ±0.05%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s. ±0.5%rdg. ±0.3%f.s. ±2.1%rdg. ±0.3%f.s. ±2.1%rdg. ±0.3%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. 50%f.s. ≤ Input < 100%f.s.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. ±2.4%rdg.		
$\begin{array}{c} 45\text{Hz} \leq f \leq 66\text{Hz} \\ 66\text{Hz} < f \leq 500\text{Hz} \\ 500\text{Hz} < f \leq 10\text{kHz} \\ 10\text{kHz} < f \leq 50\text{kHz} \\ 50\text{kHz} < f \leq 50\text{kHz} \\ 6 \leq 100\text{kHz} \\ \hline \\ $	±0.1%rdg.±0.05%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.2%f.s. ±0.5%rdg.±0.3%f.s. ±2.1%rdg.±0.3%f.s. Input < 50% f.s. ±0.1%rdg.±0.1%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. 50%f.s. ≤ Input < 100%f.s. ±0.1%rdg. ±0.1%f.s.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. 100%f.s. ≤ Input ±0.2%rdg.		
$\begin{array}{c} 45\text{Hz} \leq f \leq 66\text{Hz} \\ 66\text{Hz} < f \leq 500\text{Hz} \\ 500\text{Hz} < f \leq 10\text{kHz} \\ 500\text{Hz} < f \leq 10\text{kHz} \\ 50\text{kHz} < f \leq 50\text{kHz} \\ 50\text{kHz} < f \leq 100\text{kHz} \\ \hline \\ $	±0.1%rdg.±0.05%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.2%f.s. ±0.5%rdg.±0.3%f.s. ±2.1%rdg.±0.3%f.s. ±1%rdg.±0.3%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.1%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. 50%f.s.≤ Input < 100%f.s. ±0.1%rdg. ±0.1%f.s. ±0.3%rdg.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. 100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg.		
$\begin{array}{c} 45\text{Hz} \leq f \leq 66\text{Hz}\\ 66\text{Hz} < f \leq 500\text{Hz}\\ 500\text{Hz} < f \leq 10\text{kHz}\\ 10\text{kHz} < f \leq 50\text{kHz}\\ 10\text{kHz} < f \leq 50\text{kHz}\\ 50\text{kHz} < f \leq 100\text{kHz}\\ \hline \\ & \text{Frequency}(f)\\ \hline \\ & \text{DC}\\ 0.1\text{Hz} \leq f < 16\text{Hz}\\ 16\text{Hz} \leq f < 45\text{Hz}\\ \end{array}$	±0.1%rdg.±0.05%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.2%f.s. ±0.5%rdg.±0.3%f.s. ±2.1%rdg.±0.3%f.s. ±2.1%rdg.±0.3%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.2%f.s. ±0.1%rdg.±0.2%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. ±2.4%rdg. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s. ±0.3%rdg.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.3%rdg. ±2.4%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg.		
$\begin{array}{c} 45\text{Hz} \leq f \leq 66\text{Hz}\\ 66\text{Hz} < f \leq 500\text{Hz}\\ 500\text{Hz} < f \leq 500\text{Hz}\\ 10\text{kHz} < f \leq 50\text{kHz}\\ 10\text{kHz} < f \leq 50\text{kHz}\\ 50\text{kHz} < f \leq 100\text{kHz}\\ \hline \\ \hline \\ 10\text{kHz} < f \leq 100\text{kHz}\\ \hline \\ \hline$	±0.1%rdg. ±0.05%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s. ±0.5%rdg. ±0.3%f.s. ±2.1%rdg. ±0.3%f.s. ±1%rdg. ±0.3%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. 50%f.s.≤ Input < 100%f.s. ±0.1%rdg. ±0.1%f.s. ±0.3%rdg.	±0.2%rdg. ±0.15%rdg. ±0.3%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. ±0.0%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.3%rdg. ±0.15%rdg.		
$\begin{array}{c} 45Hz\leq f\leq 66Hz\\ 66Hz< f\leq 500Hz\\ 500Hz< f\leq 10kHz\\ 10kHz< f\leq 50kHz\\ 50kHz< f\leq 100kHz\\ 0kHz< f\leq 100kHz\\ 0kHz\\ 0kHz \leq f\leq 100kHz\\ 0kHz\\ 0$	±0.1%rdg.±0.05%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.2%f.s. ±0.5%rdg.±0.3%f.s. ±2.1%rdg.±0.3%f.s. ±2.1%rdg.±0.3%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.1%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±2.4%rdg. ±2.4%rdg. 50%f.s.≤Input<100%f.s. ±0.1%rdg. ±0.1%f.s. ±0.3%rdg. ±0.2%rdg. ±0.15%rdg.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.3%rdg. ±2.4%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg.		
$\begin{array}{c} 45 \text{Hz} \leq f \leq 66 \text{Hz} \\ 66 \text{Hz} < f \leq 500 \text{Hz} \\ 500 \text{Hz} < f \leq 50 \text{Hz} \\ 500 \text{Hz} < f \leq 10 \text{Hz} \\ 50 \text{Hz} < f \leq 50 \text{Hz} \\ 50 \text{Hz} < f \leq 50 \text{Hz} \\ 50 \text{Hz} < f \leq 100 \text{Hz} \\ \hline 0.1 \text{Hz} \leq f < 100 \text{Hz} \\ \hline 0.1 \text{Hz} \leq f < 16 \text{Hz} \\ 16 \text{Hz} \leq f < 45 \text{Hz} \\ 45 \text{Hz} \leq f \leq 60 \text{Hz} \\ \hline 66 \text{Hz} < f \leq 500 \text{Hz} \\ \end{array}$	±0.1%rdg. ±0.05%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s. ±0.5%rdg. ±0.3%f.s. ±2.1%rdg. ±0.3%f.s. ±2.1%rdg. ±0.3%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s. ±0.1%rdg. ±0.2%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±2.4%rdg. ±2.4%rdg. 50%f.s.≤  nput < 100%f.s. ±0.1%rdg.±0.1%f.s. ±0.3%rdg. ±0.15%rdg. ±0.15%rdg.	±0.2%rdg. ±0.15%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±2.4%rdg. 100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±0.15%rdg.		
$\begin{array}{c} 45\text{Hz} \leq f \leq 66\text{Hz} \\ 66\text{Hz} < f \leq 500\text{Hz} \\ 500\text{Hz} < f \leq 50\text{Hz} \\ 500\text{Hz} < f \leq 10\text{kHz} \\ 50\text{kHz} < f \leq 50\text{kHz} \\ 50\text{kHz} < f \leq 50\text{kHz} \\ 50\text{kHz} < f \leq 100\text{kHz} \\ \hline 0.1\text{Hz} \leq f < 10\text{Hz} \\ \hline 0.1\text{Hz} \leq f < 16\text{Hz} \\ 16\text{Hz} \leq f < 45\text{Hz} \\ 45\text{Hz} \leq f \leq 500\text{Hz} \\ 500\text{Hz} < f \leq 500\text{Hz} \\ \hline 500\text{Hz} < f \leq 500\text{Hz} \\ \hline 10\text{kHz} < f \leq 10\text{kHz} \\ \hline 10\text{kHz} = 10\text{kHz} \\ \hline 10\text{kHz} < f \leq 10\text{kHz} \\ \hline 10\text{kHz} = 10\text{kHz} \\ \hline 10\text{kHz} = 10\text{kHz} \\ \hline 10\text{kHz} = 10\text{kHz} \\ \hline 10\text{kHz} $	$\begin{array}{c} \pm 0.1\% rdg. \pm 0.05\% f.s. \\ \pm 0.1\% rdg. \pm 0.1\% f.s. \\ \pm 0.1\% rdg. \pm 0.2\% f.s. \\ \pm 0.5\% rdg. \pm 0.3\% f.s. \\ \pm 2.1\% rdg. \pm 0.3\% f.s. \\ \pm 2.1\% rdg. \pm 0.3\% f.s. \\ \pm 0.1\% rdg. \pm 0.1\% f.s. \\ \pm 0.1\% rdg. \pm 0.1\% f.s. \\ \pm 0.1\% rdg. \pm 0.1\% f.s. \\ \pm 0.1\% rdg. \pm 0.2\% f.s. \\ \pm 0.1\% rdg. \pm 0.05\% f.s. \\ \pm 0.1\% rdg. \pm 0.1\% f.s. \\ \pm 0.1\% rdg. \pm 0.1\% f.s. \\ \pm 0.1\% rdg. \pm 0.2\% f.s. \\ \pm 0.1\% rdg. \pm 0.2\% f.s. \\ \pm 0.03 + 0.07 \times F)\% rdg. \\ \pm 0.2\% f.s. \\ \pm 0.2\% f.s. \\ \end{array}$	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±2.4%rdg. ±2.4%rdg. 50%f.s. ≤ Input < 100%f.s. ±0.1%rdg. ±0.1%f.s. ±0.3%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±0.2%rdg.	±0.2%rdg. ±0.15%rdg. ±0.3%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±0.3%rdg.		
$\begin{array}{c} 45Hz \leq f \leq 66Hz\\ 66Hz < f \leq 500Hz\\ 500Hz < f \leq 500Hz\\ 500Hz < f \leq 10kHz\\ 10kHz < f \leq 50kHz\\ 50kHz < f \leq 50kHz\\ 60kHz < f \leq 100kHz\\ \hline 0.1Hz \leq f < 16Hz\\ 16Hz \leq f < 45Hz\\ 45Hz < f \leq 60Hz\\ 66Hz < f \leq 500Hz\\ 500Hz < f \leq 1kHz\\ \hline \end{array}$	±0.1%rdg. ±0.05%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s. ±0.5%rdg. ±0.3%f.s. ±2.1%rdg. ±0.3%f.s. ±2.1%rdg. ±0.3%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.05%f.s. ±0.1%rdg. ±0.05%f.s. ±0.1%rdg. ±0.05%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s. ±0.1%rdg. ±0.2%f.s.	±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg. ±2.4%rdg. ±0.1%rdg. ±0.1%r.s. ±0.1%rdg. ±0.1%r.s. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg.	±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.3%rdg. ±2.4%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg.		

	iency (f)	Input < 50% f.s.	50%f.s. ≤ Inpu		100%f.s. ≤ Input	
	DC ≨f < 16Hz	±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s.	±0.1%rdg. ±0.3%		±0.2%rdg. ±0.3%rdg.	
	$\leq 1 < 16Hz$ $\leq f < 45Hz$	±0.1%rdg. ±0.2%i.s. ±0.1%rdg. ±0.1%f.s.	±0.3% ±0.2%		±0.3%rdg.	
	f ≤ 66Hz	±0.1%rdg. ±0.05%f.s.	±0.159		±0.15%rdg.	
66Hz <	$f \le 500Hz$	±0.1%rdg. ±0.1%f.s.	±0.2%	6rdg.	±0.2%rdg.	
	< f ≤ 1kHz		±0.3%		±0.3%rdg.	
	$f \le 10 \text{ kHz}$	±0.2%f.s.	±(0.23+0.0	, 0	±(0.23+0.07×F)%rdg	
	$f \le 50$ kHz	±(0.07×F)%rdg. ±0.3%f.s. ±(0.6+0.07×F)%rdg.	±(0.3+0.07 ±(0.9+0.07		±(0.3+0.07×F)%rdg	
SUKHZ <	IS IUUKHZ	±0.3%f.s.			±(0.9+0.07×F)%rdç	
		<ul> <li>Values for f.s. depen</li> <li>"F" in the tables refer</li> <li>Add ±1mA to DC me</li> <li>Add (±1mA) x (voltage reapower.</li> <li>When using the 200r current and active po</li> <li>Values for voltage, cr</li> </ul>	rs to the frec asurement a ad value) to DC mA or 500m wer for whic	quency in k accuracy fo measuremen A range, ao h 1kHz < f	Hz. or current. tt accuracy for active dd ±0.1% rdg. to ≤ 10kHz.	
		0.1Hz $\leq$ f < 10Hz are f Values for voltage, ci 20A for which 10Hz $\leq$ Values for current an 500Hz < f $\leq$ 50kHz ar Values for current an 50kHz < f $\leq$ 100kHz a Values for voltage ar 30kHz < f $\leq$ 100kHz a	for reference urrent, and a f < 16Hz ar d active pow e for referen d active pow are for referen d active pow	e only. active powe e for refere wer in exce nce only. wer in exce ence only. wer in exce	er in excess of 220V nce only. ss of 20A for which ss of 15A for which	
Guarantee		1 year				
accuracy Post-adjus		6 months				
accuracy g	uaranteed effective	±600% of each voltage	e range			
	effective	However, for 300 V, 60 ±600% of each curren	t range			
beak curr		However, for 20 A rang				
Condition guarantee accuracy			utes power facto ter zero adju	or of 1, term stment; wit	inal-to-ground hin range in which th	
	characteristic tor effects	±0.03% f.s. per °C or I ±0.1% f.s. or less (45 to	fundamental wave satisfies synchronization source conditions ±0.03% f.s. per °C or less ±0.1% f.s. or less (45 to 66 Hz, at power factor = 0)			
Effect of c		Internal circuitry voltage ±0.02% f.s. or less				
node volt Effect of e	external	(600 V, 50/60 Hz, applied between input terminals and enclosure) 400 A/m, DC and 50/60 Hz magnetic field				
nagnetic nterferen		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 ±10 mA equivalent or less (after inputting 100 A DC to the current direct input terminals)				
	ation			rrent direct	input terminals)	
effect Adjacent	channel		DC to the cu ess		input terminals)	
effect Adjacent nput effe	channel ct	(after inputting 100 A E ±10 mA equivalent or I	DC to the cu ess p adjacent c	hannel)		
effect Adjacent nput effec <b>/oltage</b> / Measurem	channel ct ' Curren	(after inputting 100 A E ±10 mA equivalent or I ((when inputting 50 A to t/ Active Power Me Rectifiers: AC+DC, DC	DC to the cu ess adjacent c asureme c, AC, FND,	hannel) Int Speci	fications	
effect Adjacent nput effect /oltage/ Measurem Effective	channel ct Curren ent types	(after inputting 100 A E ±10 mA equivalent or 1 (when inputting 50 A to t/ Active Power Me Rectifiers: AC+DC, DC Voltage: 1% to 133 (However, 1 Current: 1% to 133	DC to the cu ess coadjacent c casureme c, AC, FND, . 2% of range up to ±1500 V 2% of range	hannel) I <b>nt Speci</b> AC+DC Un peak value a	fications	
effect Adjacent nput effect /oltage/ Measurem Effective measuring	channel ct Curren Curren contypes g range	(after inputting 100 A E ±10 mA equivalent or 1 (when inputting 50 A to t/ Active Power Me Rectifiers: AC+DC, DC Voltage: 1% to 130 (However, 1 Current: 1% to 130 Active power: 0% to 168 (However within the	DC to the cu ess adjacent c casureme c, AC, FND, 0% of range up to ±1500 V 0% of range of the ran , defined wh effective m	hannel) Int Speci AC+DC Un peak value a nge nen the volt easuremen	fications nn nd 1000 V RMS value) age and current fall t range.)	
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Adjacent Adjacent <b>/oltage/</b> Measurem Effective measuring	channel ct Curren Curren contypes g range	(after inputting 100 A I ±10 mA equivalent or 1 (when inputting 50 A to t/ Active Power Me Rectifiers: AC+DC, DC Voltage: 1% to 130 (However, 1 Current: 1% to 133 Active power: 0% to 165 (However within the Voltage/Current: 0.5% to Active power: 0% to Voltage/Current: Displa Active power: +: Pos	DC to the cu ess cadjacent co cadjacent co cadureme c, AC, FND, .)% of range up to ±1500 V 0% of the rai , defined wf effective m 140% of range 196% of the yed when us	hannel) Int Speci AC+DC Un peak value a nge nen the volt easuremen (zero-suppre range (no sing DC rec consumptior	fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression)	
Adjacent Adjacent nput effer <b>/oltage</b> / <u>/oltage</u> / <u>/easurem</u> Effective neasuring Display ra	channel ct ( Curren ent types g range	(after inputting 100 A I ±10 mA equivalent or 1 (when inputting 50 A to t/ Active Power Me Rectifiers: AC+DC, DC Voltage: 1% to 130 (However, 1 Current: 1% to 133 Active power: 0% to 165 (However within the Voltage/Current: 0.5% to Active power: 0% to Voltage/Current: Displa Active power: +: Pos	DC to the cu ess o adjacent c b adjacent c c adjacent c adjacent c c adjacent c c adjacent c adjacent adjacent c adjacent adjacent	hannel) nt Speci AC+DC Un peak value a nge hen the volt easuremen (zero-suppre range (no sing DC rec consumption ower	fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tifier i (no polarity display)	
Adjacent i Adjacent i nput effec /oltage/ Measurem Effective neasuring Display ra Polarity /oltage/	channel ct ( Curren ent types g range	(after inputting 100 A I ±10 mA equivalent or 1 (when inputting 50 A to <b>// Active Power Me</b> Rectifiers: AC+DC, DC Voltage: 1% to 130 Active power: 0% to 163 (However, Current: 1% to 130 Active power: 0% to 163 (However, Voltage/ Current: 0.5% to Voltage/ Current: 0.5% to Voltage/ Current: 0.5spla Active power: +: Pos _: Reg	DC to the cu ess o adjacent c b adjacent c c adjacent c c c c c c c c c c c c c c c c c c c	hannel) Int Speci AC+DC Un peak value a nge ten the volt easuremer (zero-suppre range (no sing DC rec consumption ower n value ca	fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tifier i (no polarity display)	
effect Adjacent i nput effec /oltage/ Measurem Effective neasuring Display ra Polarity /oltage/ Wir	channel ct Curren ent types g range inge Current/. ing 1P2W	[after inputting 100 A L $\pm$ 10 mA equivalent or 1         (when inputting 50 A tr         V Active Power Me         Rectifiers: AC+DC, DC         Voltage:       1% to 130         (However, IC         Current:       1% to 130         Active power:       0% to 165         (However, Within the         Voltage/Current:       0.5% to         Active power:       0% to         Voltage/Current:       Distage         Active power:       +: Pos         -: Reg       -: Reg         Active power channe       X: U(Voltage) or I(C         X: U(Voltage) or I(C       X(I)	DC to the cu ess adjacent c adjucent c assureme c, AC, FND, % of range of the rai defined wh effective m 140% of range 196% of the yed when us enerated power elenerated power current)	hannel) int Speci AC+DC Un peak value a nge ten the volt easuremer (zero-suppre range (no sing DC rec consumption wer to value ca P( P(i)	fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tifier i (no polarity display) Iculation formulas (Active power)	
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offect Adjacent i Adjacent i Adjacent i Adjacent i Adjacent i Alexan Display ra Display ra	channel ct Current ent types g range g range Current/ ing 1P2W 1P3W 3P3W2M 3P3W2M 3V3A 3P3W3M	$\frac{(after inputting 100 A L ±10 mA equivalent or 1(when inputting 50 A to 1(when inputting 50 A to 1V Active Power MeRectifiers: AC+DC, DCVoltage: 1% to 130Active power: 0% to 160(However, 1% to 130Active power: 0% to 106(However within theVoltage/Current: DisplaActive power: 0% to 1Voltage/Current: DisplaActive power: 0% to 1Voltage/Current: DisplaActive power: 0% to 1(Voltage/Current: DisplaActive power: -: RegActive power channeX: U (Voltage) or I (CX(i)Xsum = \frac{1}{2}(X_{(1)} + X_{(2)})$	DC to the cu ess o adjacent c b adjacent c adjacent c adjacent c adjacent c adjacen	hannel) int Speci AC+DC Un peak value a nge ten the volt easuremen (zero-suppre range (no. sing DC rec consumption ower to value ca P ( P(i) Psum =	fications find 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tifier (no polarity display) Iculation formulas (Active power) (P(t) + P(z))	
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Iffect     Adjacent     Adjacentt     Adjacentt     Adjacent     Adjacent     Adjacent	channel ct (Current ange ange ange (Uurrent/ ing 1P2W 1P3W 3P3W2M 3V3A 3P3W2M 3V3A 3P3W2M 3V3A 3P3W2M 3P3W3	$\frac{(after inputting 100 A L ±10 mA equivalent or 1(when inputting 50 A to 1(when inputting 50 A to 1V Active Power MeRectifiers: AC+DC, DCVoltage: 1% to 130Active power: 0% to 160(However, 1% to 130Active power: 0% to 106(However within theVoltage/Current: DisplaActive power: 0% to 1Voltage/Current: DisplaActive power: 0% to 1Voltage/Current: DisplaActive power: 0% to 1(Voltage/Current: DisplaActive power: -: RegActive power channeX: U (Voltage) or I (CX(i)Xsum = \frac{1}{2}(X_{(1)} + X_{(2)})$	$\frac{\text{OC to the cu}}{\text{ess}}$ $\frac{\text{OC to the cu}}{\text{ess}}$ $\frac{\text{OC to the cu}}{\text{ess}}$ $\frac{\text{OC to the cu}}{\text{C}}$ $\frac{\text{AC, FND,}}{\text{C}}$ $\frac{\text{P}}{\text{Of range}}$ $\frac{\text{P}}{\text{Of targe}}$ $\frac{\text{P}}{\text{Of the range}}$	hannel) int Speci AC+DC Un peak value a nge len the volt easurement (zero-suppre range (no. sing DC rec consumption wer Nalue Ca P(U) Psum = Psum = alue Measu	fications find 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tifier (no polarity display) <b>Iculation formulas</b> (Active power) (P(1) + P(2) + P(3)) rement Specifications	
Iffect     Adjacent     Adjacent     Adjacent     Adjacent     Adjacent     Adjacent     Adjacent     Adjacent     Adjacent     Allocate     Display ra     Display ra	channel ct Current ent types g range g range inge 1P2W 1P3W 3P3W2M 3P3W2M 3P3W2M 3P3W2M 3P3W3M 3P3W3M 3P4W urement ch aveform Pe nent	$\begin{array}{c} (after inputting 100 A L \pm 10 mA equivalent or 1 (when inputting 50 A ti t/ Active Power Me Rectifiers: AC+DC, DC Voltage: 1 % to 130 (However, 1 % to 130 Active power: 1 % to 130 Active power: 0 % to 160 (However within the Voltage/ Current: 0.5% to 100 Active power: 0 % to 100 Active po$	DC to the cu         ess $adjacent c$ $adjacent c$ $assureme$ $c, AC, FND,$ $y%$ of range $yh to \pm 1500 V$ $yh to \pm 100 V$	hannel) int Speci AC+DC Un peak value a nge ten the volt easuremer (zero-suppre range (no. sing DC rec consumption wer to value ca P(U) Psum = Psum = alue Measul ue (for bott	fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tiffier i (no polarity display) <b>Iculation formulas</b> (Active power) (P(1) + P(2) + P(3)) rement Specifications in positive and	
iffect     Adjacent     Ad	channel ct (Current arg range arge arge Current/. arge Current/. arge Current/. arge	(after inputting 100 A I ±10 mA equivalent or 1 (when inputting 50 A to <b>X</b> Active Power Me Rectifiers: AC+DC, DC Voltage: 1% to 130 Active power: 1% to 130 Active power: 0% to 150 (However, Uurrent: 1% to 130 Active power: 0% to 150 (However within the Voltage/ Current: 0.5% to Voltage/ Current: 0.5% to Voltage/ Current: 0.5% to Voltage/ Current: 0.5% to Voltage/ Current: 0.5% to Xotive power: +: Pos -: Reg Active power channe X: U (Voltage) or I (to X(i) Xsum = $\frac{1}{3}$ (X(i) + X(z)) annel ak Value / Current Wave Measures the waveforr negative polarity) base Approx.700 kHz	$\frac{OC}{2} to the cu}{ess}$ $\frac{OC}{2} to the cu}{ess}$ $\frac{OC}{2} to the cu}{ess}$ $\frac{OC}{2} to adjacent c}{2} to adjacen$	hannel) int Speci AC+DC Un peak value a nge ten the volt easuremer (zero-suppre range (no sing DC rec consumption wer to value ca P(U) Psum = Psum = alue Measu ue (for bott ed instanta	fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tiffier (no polarity display) <b>Iculation formulas</b> (Active power) ( $P(1) + P(2) + P(3)$ ) rement Specifications n positive and neous voltage value	
Affect     Adjacent     Display     ra     ra	channel ct (Current ange ange Current/ ing 1P2W 1P3W 3P3W2M 3V3A 3P3W3M 3P3W3M 3P3W3M 3P4W arement ch aveform Pe nent frequency eak range peak range	(after inputting 100 A L         ±10 mA equivalent or 1         (when inputting 50 A to         V Active Power Me         Rectifiers: AC+DC, DC         Voltage:       1% to 130         Active power:       1% to 130         Active power:       1% to 130         Active power:       0% to 130         Active power:       0% to 150         Voltage/ Current:       0.5% to 100         Voltage/ Current:       Displa         Active power:       0% to 100         Voltage/ Current:       Displa         Active power:       0% to 100         Voltage/ Current:       Displa         Active power:       0% to 100         Xsum =       1/2 (X(t) + X(z))         Xsum =       1/2 (X(t) + X(z))         xsum =       1/2 (X(t) + X(z))         annel       ak Value / Current Waveforn negative polarity) base         Approx.700 kHz       15V	DC to the culless         ess $adjacent c$ <b>2aSureme 2aSureme 2astrone 2astrone</b> <t< td=""><td>hannel) int Speci AC+DC Un peak value a nge internet the volt easurement (zero-supper range (no sing DC rec consumption wer n value Ca P(i) Psum = Psum = alue Measul ue (for bott ed instanta</td><td>fications         nn         and 1000 V RMS value)         age and current fall         trange.)         ssion when less than 0.59         zero-suppression)         ctifier         (no polarity display)         Iculation formulas         Active power)         (P(1) + P(2) + P(3))         rement Specifications         n positive and         neous voltage values         /         600V       1000V</td></t<>	hannel) int Speci AC+DC Un peak value a nge internet the volt easurement (zero-supper range (no sing DC rec consumption wer n value Ca P(i) Psum = Psum = alue Measul ue (for bott ed instanta	fications         nn         and 1000 V RMS value)         age and current fall         trange.)         ssion when less than 0.59         zero-suppression)         ctifier         (no polarity display)         Iculation formulas         Active power)         (P(1) + P(2) + P(3))         rement Specifications         n positive and         neous voltage values         /         600V       1000V	
Iffect     Adjacent     Display     ra     doltage     Voltage     Voltage     Current     Display     Current     Display     Current     Display     Sum     Sum	channel ct Current ange ange Current/ ing 1P2W 3P3W 3P3W2M 3P3W2M 3P3W2M 3P3W2M 3P3W2M 3P3W2M 3P3W2M 3P3W2M av3A 3P3W2M av3A 3P3W2M av3A avage av avage avage avage avage av avage av avage av av	(after inputting 100 A I         ±10 mA equivalent or 1         (when inputting 50 A ti         V Active Power Me         Rectifiers: AC+DC, DC         Voltage:       1% to 130         Active power:       0% to 165         Voltage/ Current:       0.5% to 10         Active power:       0% to 105         Active power:       0% to 100         Active power:       0% to 100         Xsum =       1         Active polarity) base       Approx. 700 kHz         15V       30V       6         90.000V       180.00V       36	DC to the culless         ess $adjacent closed         2asureme         c, AC, FND, prodestressed         prodestrese         prodestressed$	hannel)           int Speci           AC+DC Un           peak value a           inge           ien the volt           easurement           (zero-supper consumption)           ing DC rec           Nalue Ca           P(i)           Psum =           alue Measur           ue (for bott           ed instanta           instanta           instanta           instanta           instanta           instanta           instanta	fications         nn	
Effect     Adjacent     Adjacent     Adjacent     Adjacent     Adjacent     Adjacent     instant     instant	channel ct Current g range g range g range Current/ ing 1P2W 1P3W 3P3W2M 3P3W2M 3P3W2M 3P3W2M 3P3W3M 3P3W3M 3P4W urement ch aveform Pe nent frequency eak range peak range peak range peak range	(after inputting 100 A I         ±10 mA equivalent or 1         (when inputting 50 A tr         (When inputting 50 A tr         Zetive Power Me         Rectifiers: AC+DC, DC         Voltage:       1% to 130         Active power:       1% to 130         Active power:       1% to 130         Active power:       0% to 165         (However, uthin the       Voltage/ Current:         Voltage/ Current:       Displa         Active power:       0% to 105         Active power:       0% to 100         Active power:       0% to 100         Xsum =       1         Active polarity) base       Approx. 700 kHz         15V       30V       6         90.000V       180.00V       36         200mA       500mA       1A         1.2000A       3.0000A [6.000V       36         200mA       500mA       1A         1.2000	DC to the culless         ess $adjacent closed         2asureme         2and sum         2and sum    $	hannel) int Speci AC+DC Un peak value a nge ten the volt assurement (zero-suppre range (no sing DC rec consumption wer i value Caa P(( P(i) Psum = Psum = alue Measur ue (for bott ed instanta volt 5A 5A 5A 5A 5A 5A 5A 5A 5A 5A	fications         nn       Ind 1000 V RMS value)         age and current fall       it range.)         ssion when less than 0.59       zero-suppression)         stifier       (no polarity display)         Icculation formulas       Active power)         ( $P(1) + P(2) + P(3)$ )       ( $P(1) + P(2) + P(3)$ )         rement Specifications       positive and         neous voltage values       ( $P(1) = P(2) + P(3)$ )         ( $P(1) = P(2) + P(3)$ )       ( $P(1) = P(3) + P(3)$ )         rement Specifications       ( $P(3) + P(3) + P(3)$ )         ( $P(3) + P(3) + P(3) + P(3)$ )       ( $P(3) + P(3) + P(3) + P(3)$ )         rement Specifications       ( $P(3) + P(3) + P(3) + P(3)$ )         ( $P(3) + P(3) + P(3) + P(3) + P(3) + P(3) + P(3)$ ( $P(3) + P(3) $	
Effect     Adjacent     Display     ra     Adjacent     Display     ra     Corrent     Current     Curre	channel ct Current or ange or ange or ange current/ ing 1P2W 1P3W 3P3W2M 3P3W2M 3P3W2M 3P3W3M 3P3W3M 3P3W3M 3P3W3M 3P3W3M 3P3W3M 3P3W3M 3P3W3M 3P3W3M apage ange range peak range range peak range range peak range range peak range range peak range range	[after inputting 100 A I ±10 mA equivalent or 1 (when inputting 50 A to V Active Power Me Rectifiers: AC+DC, DC Voltage: 1% to 130 Active power: 0% to 160 (However, Current: 1% to 130 Active power: 0% to 160 (However within the Voltage/Current: Displa Active power: 0% to Voltage/Current: Displa Active power channe X: U (Voltage) or I (C X(i) Xsum = $\frac{1}{2}(X(i) + X(z))$ mannel ak Value / Current Wave(Measures the waveform Measures the waveform Measures the waveform 15V 30V ( 90.000V 180.00V 36 200mA 500mA 1A 1.2000A 3.0000A 6.000C Same as the voltage on when 10 Hz ≤ f ≤ 1 kHz range). Provided as ref when in excess of 1 kH ±5% to ±100% of volta	DC to the culless $adjacent culless         adjacent culless         adjacent culless         adjacent culless         asuremelless         asuremelless         adjacent culless         asuremelless         adjacent culless         asuremelless         adjacent culless         asuremelless         adjacent culless         asuremelless         adstress         adstress   $	hannel)           int Speci           AC+DC Un           peak value a           inge           ieasuremer           czac-supper           inge (zero-supper           inge (up to ±	fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) itifier (no polarity display) ilculation formulas Active power) (P(t) + P(z) + P(a)) rement Specifications n positive and neous voltage value V 600V 1000V kV 3.6000kV 6.0000k 120.00A 300.00 accuracy at DC and ge or current peak Hz < f < 10 Hz and 1500 V) or	
Measurem Effective measuring Display ra Polarity /oltage/ Wir All channels Sum values i ): Measuren method Sampling Voltage p Voltage p Voltage C Current p Current p	channel ct Current ange ange Current/ ing 1P2W 1P3W 3P3W2M 3P3W2M 3P3W2M 3P3W2M 3P3W2M 3P3W3M 3	[after inputting 100 A L ±10 mA equivalent or 1 (when inputting 50 A tr <i>t</i> <b>Active Power Me</b> Rectifiers: AC+DC, DC Voltage: 1% to 130 Active power: 0% to 163 Active power: 0% to 100 Active power: 0% to 100 Act	DC to the culles $adjacent c$ $adjacent c$ $adjacent c$ $aasureme$ $asureme$ $acsureme$ $adjacent c$ $aasureme$ $adjacent c$ $asureme$ $adjacent c$ $asureme$ $adjacent c$ $adj$	hannel)           int Speci           AC+DC Un           peak value a           nge           easuremen           (zero-suppre           range (no)           ing DC rec           ing DC rec           now           A value ca           P(i)           Psum =           Resum =           alue Measu           ue (for both           ed instanta           0000 1.8000           5.0           5.0           9.000 1.8000           1.8000           1.8000           1.900           1.900           1.900	fications         nn         ind 1000 V RMS value)         age and current fall         it range.)         ssion when less than 0.59         zero-suppression)         tiffier         in opolarity display)         Iculation formulas         Active power)         (P(1) + P(2) + P(3))         (P(1) + P(2) + P(3))         rement Specifications         n positive and         neous voltage values         (V       600V         (00A       20A         3.6000kV       6.0000k         IOA       20A         50A       000A         120.00A       300.00C         accuracy at DC and         1500 V) or         100 A)         rent peak range	
Iffect     Adjacent     Display ra     Display ra     Display ra     Olarity     All channels     Sum     values     i     ): Measu     Adjacent     Adjacent     Current     Current	channel ct Current or ange g range g range current/ ing 1P2W 1P3W 3P3W2M 3P3W2M 3P3W2M 3P3W3M 3P3W 3P3W 3P3W 3P3W 3P3W3M 3P3W	[after inputting 100 A L ±10 mA equivalent or 1 (when inputting 50 A to X Active Power Ma Rectifiers: AC+DC, DC Voltage: 1% to 130 Active power: 0% to 163 Active power: 0% to 163 Active power: 0% to 163 Active power: 0% to 163 Active power: 0% to 164 Active power: 0% to 164 Active power: 0% to 100 Active power: 0% to 100% of cura ±5% to ±100% of cura ±5% to ±100% of cura ±5% to ±100% of cura	DC to the culles $adjacent c$ $adjacent c$ $adjacent c$ $adjacent c$ $assureme$ $adjacent c$ $adjalog c$ $a$	hannel)  int Speci AC+DC Un peak value a nge uen the volt easuremer (zero-suppre range (no sing DC rec consumption wer  value Ca P(( P(i) Psum = Psum = Psum = alue Measu ue (for bott ed instanta vv	fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tiffier (no polarity display) (culation formulas Active power) ( $P(1) + P(z) + P(s)$ ) ( $P(1) + P(z) + P(s)$ ) rement Specifications n positive and neous voltage value ( $V = 600V + 1000V$ kV 3.6000kV 6.0000k 120.00A 300.00 accuracy at DC and ge or current peak Hz ≤ f < 10 Hz and 1500 V) or 100 A) rent peak range uppression)	
Iffect     Adjacent     Display ra     Display ra     Olarity     Adjacent     Adjacent     Adjacent     Display ra     Adjacent     Adjacent     Adjacent     Adjacent     Adjacent     Display ra     Adjacent     Adjacent	channel ct Current ent types g range g range Current/ ing 1P2W 1P3W 3P3W 3P3W 3P3W2M 3P3W2M 3P3W3M 3P3W2M 3P3W3M 3P3W2M 3P3W3M 3P3W2M 3P3W5M 3P3W5M 3P3W5M 3P3W5M 3P3W 3P3W5M	[after inputting 100 A L         ±10 mA equivalent or 1         (when inputting 50 A tr         (When inputting 50 A tr         Zetifiers: AC+DC, DC         Voltage:         1% to 130         (However, 1% to 130         Active power:         (However, 1% to 130         Active power:         0% to 165         Active power:         0% to 162         Active power:         0% to 163         Active power:         0% to 163         Active power:         0% to 164         Active power:         0% to 164         Active power:         150         200mer         Assum =         15V         30000V         18000V         36         200mA         150         30000A         18000V         36         200mA         150         30000A         18000V         36         200mA         150         30000A         30000A         30000A         300000A <td>DC to the culless         <math>adjacent column         <math>adjacent column   </math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></math></td> <td>hannel) int Speci AC+DC Un peak value a nge ten the volt easuremer (zero-suppre range (no sing DC rec consumption wer range (no sing DC rec sing D</td> <td>fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tifier (no polarity display) <b>Iculation formulas</b> (Active power) (P(1) + P(2) + P(3)) (P(1) + P(2) + P(3)) rement Specifications n positive and neous voltage value (P(1) + P(2) + P(3)) rement Specifications n positive and neous voltage value (P(1) + O(3) + O(3)) (P(1) + P(2) + P(3)) rement Specifications n positive and neous voltage value (P(1) + O(3) + O(3)) (P(1) + P(2) + P(3)) rement Specifications (P(1) + P(2) + P(3)) rement Specifications (P(1) + P(2) + P(3)) rement Specifications (P(1) + P(3) + O(3)) (P(1) + P(2) + P(3)) rement Specifications (P(1) + P(3) + O(3)) (P(1) + O(3) + O</td>	DC to the culless $adjacent column         adjacent column   $	hannel) int Speci AC+DC Un peak value a nge ten the volt easuremer (zero-suppre range (no sing DC rec consumption wer range (no sing DC rec sing D	fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tifier (no polarity display) <b>Iculation formulas</b> (Active power) (P(1) + P(2) + P(3)) (P(1) + P(2) + P(3)) rement Specifications n positive and neous voltage value (P(1) + P(2) + P(3)) rement Specifications n positive and neous voltage value (P(1) + O(3) + O(3)) (P(1) + P(2) + P(3)) rement Specifications n positive and neous voltage value (P(1) + O(3) + O(3)) (P(1) + P(2) + P(3)) rement Specifications (P(1) + P(2) + P(3)) rement Specifications (P(1) + P(2) + P(3)) rement Specifications (P(1) + P(3) + O(3)) (P(1) + P(2) + P(3)) rement Specifications (P(1) + P(3) + O(3)) (P(1) + O(3) + O	
Iffect     Adjacent     Display     ra     doltage     Voltage     Voltage     Voltage     Voltage     Voltage     Voltage     Voltage     Torrent     Current     Current     Current     Current     Current     Display     ra     Colsplay     Torrent     Current     C	channel ct Current ent types g range g range Current/ ing 1P2W 1P3W 3P3W 3P3W 3P3W2M 3P3W2M 3P3W3M 3P3W2M 3P3W3M 3P3W2M 3P3W3M 3P3W2M 3P3W5M 3P3W5M 3P3W5M 3P3W5M 3P3W 3P3W5M	(after inputting 100 A I         ±10 mA equivalent or 1         (when inputting 50 A ti         (When inputting 50 A ti         Zetive Power Magnetics         Rectifiers: AC+DC, DC         Voltage:       1% to 130         Active power:       1% to 130         Active power:       1% to 130         Active power:       0% to 165         (However, utility to 100, to	DC to the culless         DC to the culless         Dadjacent collaboration         Dot 1500 V         Dot 500 V         Defective mathematical collaboration         Dadjacent	hannel) int Speci AC+DC Un peak value a nge enen the volt easurement (zero-suppre range (no- sing DC rec consumption wer  Nalue Ca P(( P(i) Psum = Psum = Psum = alue Measur ue (for bott ed instanta ange or cui tto zero-s easurement ge (up to ± ge or cui tto zero-s easurement use sonce e veform peak " m peak va	fications nn ind 1000 V RMS value) age and current fall it range.) ssion when less than 0.59 zero-suppression) tifier (no polarity display) ilculation formulas (Active power) (P(1) + P(2) + P(3)) (P(1) + P(2) + P(3)) (P(1) + P(2) + P(3)) (P(1) + P(2) + P(3)) (P(1) + P(2) + P(3)) rement Specifications n positive and neous voltage value (V 600V 1000V kV 3.6000kV 6.0000k 100A 20A 50A 000A 120.00A 300.00 accuracy at DC and ge or current peak Hz ≤ f < 10 Hz and 1500 V) or 100 A) rent Specifications ach display update kvalues or current and	

#### Voltage Ripple Rate / Current Ripple Factor Measurement Specifications

		Calculates the AC component (peak to peak [peak width]) as a proportion of the voltage or current DC component
		As per voltage and voltage waveform peak value or current and current waveform peak value effective measurement ranges
Î	Display range	0.00[%] to 500.00[%]
ĺ	Polarity	None
Ì	Display range	0.00[%] to 500.00[%]

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

Measurement	Rectifiers	
types	Apparent Power/ Reactive Power	r/ Power Factor : AC+DC, AC, FND, AC+DC Umn
	Phase Angle	: AC, FND
Effective measuring range	As per voltage, current, and ac	tive 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 Fact	tor/ Phase Angle
		ling to the lead/lag relationship of the
		ge and the current waveform rising edge.
		oltage (no polarity display)
	<ul> <li>: When current leads</li> </ul>	voltage

#### Power channel and sum value calculation formulas

Wiring		S: Apparent power	<b>Q</b> : Reactive power	
		O. Apparent power		
All channels 1P2W		$S_{(i)} = U_{(i)} \times I_{(i)}$	$Q(i) = si(i)\sqrt{S(i)^2 - P(i)^2}$	
	1P3W	$S_{sum} = S_{(1)} + S_{(2)}$		
Sum	3P3W	$S_{sum} = \frac{\sqrt{3}}{2} (S_{(1)} + S_{(2)})$	$Q_{sum} = Q_{(1)} + Q_{(2)}$	
values	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		$\lambda$ : Power factor	$oldsymbol{\phi}$ : Phase angle	
All channels 1P2W		$\lambda(i) = SI(i) \left  \frac{P(i)}{S(i)} \right $	$\phi_{(i)} = si_{(i)} \cos^{-1}l \lambda_{(i)}l$	
Sum values	1P3W 3P3W 3P3W2M 3V3A 3P3W3M 3P4W	$\lambda_{sum} = Si_{sum} \left  \frac{P_{uum}}{S_{sum}} \right $	$ \begin{array}{l} \label{eq:when Psum \geq 0} \\ \varphi_{sum} = sisum \ cos^{-1}   \ \lambda \ suml \\ (0^\circ \ to \ \pm 90^\circ) \\ \ When \ Psum \geq 0 \\ \varphi_{sum} = sisum \ 180 \ - \ cos^{-1}   \ \lambda \ suml   \\ (\pm 90^\circ \ to \ \pm 180^\circ) \\ \end{array} $	

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

#### **Frequency Measurement Specifications**

	channels	5 61
	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 0.1 Hz to 100 kHz		
	range For sine wave input that is at least 20% of the measurer	
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		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 Calculated based on the AC+DC rectifier active power PW3336 equations  $\begin{array}{c} Calculation \ formulas \\ \eta 1 = 100 \times |P2| \ / \ |P1| \\ \eta 2 = 100 \times |P1| \ / \ |P2| \end{array}$ Wirina CH1 CH2 1P2W × 2 1P2W 1P2W 1P3W 1P3W 3P3W 3P3W2M 3P3W2M PW3337 CH1 CH2 CH3 Wiring  $\begin{array}{c} Calculation formulas \\ \eta 1 = 100 \times |P3| \ / \ |P1| \\ \eta 2 = 100 \times |P1| \ / \ |P3| \\ \eta 1 = 100 \times |P3| \ / \ |Psum| \end{array}$ 1P2W × 3 1P2W 1P2W 1P2W 1P3W & 1P2W 3P3W & 1P2W 3P3W2M 1P3W 1P2W 3P3W 1P2W η2=100×|Psum| / |P3 P3w 3P3W2M 3V3A 3P3W3M 3P3W3M 3V3A 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

i anotional opoc	celleations				
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 (0FF) 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)			
HOLD	CT ratio setting range : OFF (1.0), 0.001 to 1000 (setting: 0000 • Stops display updates for all measured values and fixes the			
(HOLD)	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	Detects maximum and minimum measured values as well as maximum and minimum values for the voltage and current			
hold (MAX/MIN HOLD)	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).			
	<ul> <li>Internal calculations (including integration and integration elapsed time) will continue.</li> <li>Analog output and waveform output are not held.</li> </ul>			
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			
System Reset	Ioff and if a power outage occurs. Initializes the instrument's settings. Communications-related settings (communications speed, address, and LAN-related settings) are not initialized.			
Integration Mea	surement Specifications			
Measurement items	Simultaneous integration of the following 6 parameters for each channel (total of 18 parameters):			
Magguramont tupog	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 Integration time accuracy	1 min. to 10000 hr., settable in 1 min. blocks ±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 Functions	999999 (6 digits + decimal point) • 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 outage • Stopping integration when power returns			
External control Measuring range	Stopping the state of the state			
Harmonic Meas Measurement	urement Specifications (built-in function) · Zero-cross simultaneous calculation method (separate windows			
method	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 Measurement channels	3			
Measurement items	Harmonic voltage RMS value     Harmonic voltage phase angle     Harmonic current Content %     Harmonic current phase angle			
	Harmonic active power     Harmonic active power content %     Harmonic voltage current phase difference     Total harmonic current distortion     Total harmonic current distortion     Current fundamental waveform     Active power fundamental waveform			
FET progressing word longet	Harmonic active power     Harmonic active power content %     Harmonic voltage current phase difference     Total harmonic voltage distortion     'Total harmonic current distortion     'Voltage fundamental waveform     Apparent power fundamental waveform     Power factor fundamental waveform     Voltage current phase difference fundamental waveform     Voltage current phase difference 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 current phase difference     Harmonic voltage current phase difference			
Number of FFT points	Harmonic active power     Harmonic active power content %     Harmonic voltage current phase difference     Total harmonic current distortion     Voltage fundamental waveform     Apparent power fundamental waveform     Apparent power fundamental waveform     Power factor fundamental waveform     Voltage current phase difference fundamental waveform     Voltage current phase difference fundamental waveform     Interchannel voltage fundamental wave phase difference     Interchannel voltage fundamental wave phase difference     Interchannel voltage phase angle     Harmonic voltage current phase difference			
Number of FFT points Window function	Harmonic active power     Harmonic active power content %     Harmonic voltage current phase difference     Total harmonic current distortion     Voltage fundamental waveform     Apparent power fundamental waveform     Power factor fundamental waveform     Voltage current phase difference fundamental waveform     Voltage current phase difference fundamental waveform     Voltage current phase difference fundamental waveform     Interchannel voltage fundamental wave phase difference     Interchannel current fundamental wave phase difference     Interchannel current fundamental wave phase difference     Harmonic voltage phase angle     Harmonic current phase angle     Harmonic voltage current phase difference     S2 bits			
Number of FFT points Window function Analysis window width	$\label{eq:approx_star} \begin{array}{llllllllllllllllllllllllllllllllllll$			
Number of FFT points Window function Analysis window width Data update rate Synchronization	- Harmonic active power       - Harmonic active power content %         - Harmonic voltage current phase difference       - Total harmonic voltage distortion         - Total harmonic current distortion       - Voltage fundamental waveform         - Apparent power fundamental waveform       - Active power fundamental waveform         - Power factor fundamental waveform       - Notive power fundamental waveform         - Voltage current phase difference fundamental waveform       - Notive power fundamental waveform         - Notage current phase difference fundamental wave phase difference       - Interchannel voltage fundamental wave phase difference         - Interchannel voltage phase angle       - Harmonic current phase difference         - Harmonic voltage current phase difference       - Harmonic voltage current phase difference         32 bits       4096         Rectangular       45 Hz ≤ f < 56 Hz: 178.57 ms to 222.22 ms (10 cycles)			
Number of FFT points Window function Analysis window width Data update rate Synchronization frequency range Maximum	- Harmonic active power       - Harmonic active power content %         - Harmonic vultage current phase difference       - Total harmonic vultage distortion         - Total harmonic current distortion       - Voltage fundamental waveform         - Apparent power fundamental waveform       - Active power fundamental waveform         - Power factor fundamental waveform       - Active power fundamental waveform         - Notage current phase difference fundamental waveform       - Notage current phase difference fundamental waveform         - Interchannel outrent fundamental wave phase difference       - Interchannel current fundamental wave phase difference         - Interchannel current fundamental wave phase difference       - Harmonic voltage phase angle       - Harmonic current phase angle         - Harmonic voltage current phase angle       - Harmonic voltage current phase difference       - Harmonic voltage current phase angle         - Harmonic voltage current phase angle       - Harmonic voltage current phase difference       - Harmonic voltage current phase difference         32 bits       4096       - Ketangular       - Ketangular       - Ketangular         45 Hz ≤ f < 56 Hz: 178.57 ms to 222.22 ms (10 cycles)			
Number of FFT points Window function Analysis window width Data update rate Synchronization frequency range	$\label{eq:approx_stress} \begin{array}{l c c c c c c c c c c c c c c c c c c c$			
Window function Analysis window width Data update rate Synchronization frequency range Maximum	-Harmonic active power       -Harmonic active power content %         -Harmonic voltage current distortion       -Voltage fundamental waveform         -Current fundamental waveform       - Active power fundamental waveform         -Apparent power fundamental waveform       - Active power fundamental waveform         -Power factor fundamental waveform       - Reactive power fundamental waveform         -Voltage current phase difference fundamental waveform       - Notice power fundamental waveform         -Interchannel voltage fundamental wave form       - Notice power fundamental waveform         -Interchannel voltage fundamental wave phase difference       - Interchannel voltage fundamental wave phase difference         -Interchannel voltage phase angle       - Harmonic current phase angle       - Harmonic voltage phase angle         - Harmonic voltage current phase difference       - Harmonic voltage current phase difference       - 4096         32 bits       - 4098       - 4098       - 4098         6Hz ≤ f < 56 Hz: 178.57 ms to 222.22 ms (10 cycles)			
Number of FFT points Window function Analysis window width Data update rate Synchronization frequency range Maximum	$\label{eq:response} \begin{array}{l lllllllllllllllllllllllllllllllllll$			

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	<u> </u>				
Analysis order	2nd to 50th				
upper limit setting Measurement	f.s.: Measurement range				
accuracy	Frequenc		Voltage, Current, Active power		
			$\pm 0.4\%$ rdg. $\pm 0.2\%$ f.s.		
	$\frac{10 \text{ Hz} \le \text{f} < 30 \text{ Hz}}{30 \text{ Hz} \le \text{f} \le 400 \text{ Hz}}$		±0.4%rdg.±0.2%f.s. ±0.3%rdg.±0.1%f.s.		
	400 Hz < f ≤ 1 kHz		±0.4%rdg.±0.2%f.s.		
	$1 \text{ kHz} < f \le 5 \text{ kHz}$			1.0%rdg.±0.5%f.s.	
	<u>5 kHz &lt; f ≤</u>			4.0%rdg.±1.0%f.s.	
		urrent and (±1 mA	) × (voltag	e read value) to active power.	
Display Specific					
Display	7-segment LED				
Number of display parameters Display resolution	4 Other than integrate	ed values: 999	99 cour	t	
	Integrated values: 9	999999 count			
Display update rate	200 ms to 20 s (var	ies with numb	er of ave	raging iterations setting)	
Synchronized C	ontrol				
Functions	Timing of calculations, o			es, 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 $\times$ 1 (r		ronized wi	In the master PW3336/ PW3337.	
Terminal name	EXT SYNC	ion ioolatoa)			
I/O settings	Off: Synchronized of				
	In : The EXT SYNC				
	synchronization Out: The EXT SYNC	C terminal is se	et to outr	slave). out, and a dedicated	
	synchronization	n signal can b	e outpuṫ	(master).	
Number of units for which	1 master unit and 7	slave units (to	otal 8 uni	ts)	
synchronized control can be performed					
External Current					
Terminal	Isolated BNC termi		h chann	el	
Current sensor type switching	Off / Type 1 / Type 2		current co	ensor input terminal is ignored.	
Current sensor	TYPE1 (100 A to 50			ansor input terminar is ignored.	
options	9660, 9661, 966				
				pply is required to use)	
				876, CT6877, 9272-05, 6845-05, CT6846-05, etc.	
Current	Auto / 10 A / 20 A /				
measurement				n be read directly by	
range	manually setting the	e CT ratio.	- 14		
Power range configuration	60.000W to 15.000			nd current ranges; from	
Measurement accuracy	10.000 10.000	initi (albo app	100 10 17	(, ver)	
Current, Active power					
Frequency	Input < 50%f.s.	50%f.s. ≤ Inp			
DC 0.1Hz≤ f <16Hz	±0.2%rdg. ±0.6%f.s ±0.2%rdg. ±0.2%f.s		. ±0.6%t.s %rdg.	±0.8%rdg. ±0.4%rdg.	
16Hz≤ f < 45Hz	±0.2%rdg. ±0.2%f.s	. ±0.4	%rdg.	±0.4%rdg.	
$45Hz \le f \le 66Hz$	±0.2%rdg. ±0.1%f.s.		%rdg.	±0.3%rdg.	
$\frac{66Hz < f \le 500Hz}{500Hz < f \le 1kHz}$	±0.2%rdg. ±0.2%f.s ±0.2%rdg. ±0.3%f.s	. ±0.4	%rdg. %rdg.	±0.4%rdg. ±0.5%rdg.	
$1 \text{kHz} < f \le 10 \text{kHz}$	±5.0%rdg.		%rdg.	±5.0%rdg.	
$10$ kHz < f $\leq$ $50$ kHz					
$50$ kHz < f $\le$ 100kHz	f.s.: Each measure	ement rango			
			er accura	cy, add the current sensor's	
	accuracy to the abor	ve current and a	active pov	ver accuracy figures.	
	<ul> <li>The effective means conform to the cur</li> </ul>			frequency characteristics	
	<ul> <li>Values for current,</li> </ul>				
	0.1 Hz ≤ f < 10 Hz	are for referer	ice only.		
	<ul> <li>Values for voltage</li> <li>10 Hz ≤ f &lt; 16 Hz ;</li> </ul>	in excess of 2	20 V act	ive power for which	
Temperature	Current, active pow		ce only.		
characteristics	±0.08% f.s./°C (	instrument ten			
				rement range)	
Power factor	Add current sensor			z with power factor = 0)	
effects	Internal circuit volt				
				to the internal circuit	
Current peak value	voltage/current ph				
measurement	<ul> <li>(External current sensor input instrument accuracy) + (±2.0% f.s.)</li> <li>(f.s.:current peak range)</li> </ul>				
accuracy	Add the current se	ensor accuracy			
Harmonic measurement	Frequency DC	Voltage		Current, Active power	
accuracy	10Hz≤ f < 30Hz	±0.4%rdg. ±0 ±0.4%rdg. ±0	).2%f.s	±0.6%rdg. ±0.8%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.	
	$400$ Hz < f $\leq$ 1kHz			±0.6%rdg. ±0.5%f.s.	
	$\frac{1 \text{kHz} < f \le 5 \text{kHz}}{5 \text{kHz} < f \le 8 \text{kHz}}$	±1.0%rdg. ±0 ±4.0%rdg. ±1		±1.0%rdg. ±5.5%f.s. ±2.0%rdg. ±6.0%f.s.	
				120.07010g. 10.0701.3.	
	<ul> <li>To obtain the current</li> </ul>	<ul><li>f.s.: Each measurement range</li><li>To obtain the current or active power accuracy, add the current sensor's</li></ul>			
				wer accuracy figures.	

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

DIA Output Specifications (FW3336-027-03 and FW3337-027-03)				
Number of	16			
output channels				
Configuration	16-bit D/A converter (polarity + 15 bits)			
Output parameters	Ut to U3 (voltage level) or ut to u3 (instantaneous voltage waveform) (switchable) I1 to I3 (current level) or it to i3 (instantaneous current waveform) (switchable) P1 to P3 (active power level) or J1 to p3 (instantaneous power waveform) (switchable) Psum (active power level) or J1 to p3 (instantaneous power waveform) (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 rost factor, Time average current/active power, Voltage/current ripple rate, Frequency, Efficiency, Current integration, Active power indegration (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 Erd other level output.			

Output accuracy	T.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				
		parameter measurement acc	curacy) + (±0.2% t.s.)		
	Instantaneous waveform output				
		parameter measurement acc			
	Instantaneous voltage, instantaneous current: RMS value level				
<b>A</b>		eous power: Average value l			
Output frequency		s waveform output, high-speed a			
band		Hz to 5 kHz, accuracy is as o	lefined above.		
Output voltage	Level output				
		Current, Active power, Appar			
	Reactive power, Time average current/active power				
	: ±2 V DC for ±100% of range				
	Power fa				
		DC at ±0.0000, 0 V DC at ±	1.0000		
	Phase ar		0.00		
		DC at 0.00°, ±2 V DC at ±180			
		urrent ripple rate, total harmon	ic voltage/current distortion		
		/ DC at 100.00%			
		current crest factor			
		DC at 10.000			
	Frequence				
	: 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				
	Efficienc	V DC per 100 kHz from 30.0	01 KHZ 10 220.00 KHZ		
		y DC at 200.00%			
			ration		
	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				
Output update rate	Level output				
Output update fate		200 ms ±50 ms (approx. 5 ti	mas par soc )		
	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				
neoponoe ame		or less (when the input changes ab	ruptly from 0% to 90% or from		
		10%, the time required in order to s			
	Waveform o				
	: 0.2 ms				
	High-speed active power level output				
	: 1 cycle				
Temperature characteristic					
Output resistance					
	100 17 10 17				
External control	(built-in fe	eature)			
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		
	Ston	$I_0 \rightarrow Hi$	,		

Output accuracy [.s.: Belative to the output voltage rated value for each output parameter

Atomai oontioi	inpat signal level, o to o v (liigh speed office level of shorted [Ee]/open [i ii])			
	Functions	External control signal	External control terminal	
	Start	Hi → Lo	START/STOP	
	Stop	$Lo \rightarrow Hi$	SIAIII/SI SI	
	Reset	Lo interval of at least 200 ms	RESET	
	Hold on	$Hi \rightarrow Lo$	HOLD	
	Hold off	$Lo \rightarrow Hi$	HOLD	

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

GF-ID Intenace	(FW3330-017-03, FW3337-017-03)			
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 interfa	ace (built-in feature)			
Connector	D-sub 9-pin connector × 1			
Communication	Full duplex, Start-stop synchronization, Stop bits: 1 (fixed),			
method	Data bits: 8 (fixed), Parity: None			
Remote control by controller				
Communication Speed 9600bps/ 38400bps				
LAN interface (built-in feature)				

 
 Connector
 RJ-45 connector x 1

 Electrical Specifications
 IEEE802.3 compliant

 Transmission Method
 10BASE-T/100BASE-TX (automatic detection)
 Protocol HTTP server (remote operation, firmware updates) Dedicated ports (command control, data transfer) Remote control by controller (REMOTE lamp will light up.) Functions General Specifications (product guaranteed for 3 year) Operating environment Indoors, altitude up to 2000 m (6562-ft.), pollution degree 2 Operating temperature 0 to 40°C (32 to 104°F), 80% RH or less (non-condensating) and humidity Storage temperature -10 to 50°C (14 to 122°F) 80% RH or less (non-condensating) -10 to 50°C (14 to 122°F) 80% RH or less (non-condensating) and humidity 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 current direct input terminals Between voltage input terminals and current direct input terminals Voltage input terminal, Current direct input terminal Measurement category III 600 V (anticipated transient overvoltage 6000 V) Measurement category III 1000 V (anticipated transient overvoltage 6000 V) Between voltage input terminal L1: 1100.V (±1500 Vogak Maximum rated voltage to earth 
 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 v/- 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

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

(ES) Equipements Scientifiques SA - Département Tests & Mesures - 127 rue de Buzenval BP 26 - 92380 Garches Tél. 01 47 95 99 45 - Fax. 01 47 01 16 22 - e-mail: tem@es-france.com - Site Web: www.es-france.com

# **PW3335 Specifications**

#### Input Specifications

Measurement line type	Single-phase 2-wire(1P2W)		
Input methods	Voltage Isolated input, resistive voltage divider method		
	Current Isolated input, shunt input method		
Voltage measurement	AUTO/ 6 .0000 V/ 15.000 V/ 30.000 V/ 60.000 V/ 150.00 V/		
ranges	300.00 V/ 600.00 V/ 1.0000 kV		
Current	AUTO/ 1.0000 mA/ 2.0000 mA/ 5.0000 mA/ 10.000 mA/		
measurement	20.000 mA/ 50.000 mA/ 100.00 mA/ 200.00 mA/ 500.00 mA/		
ranges	1.0000 A/ 2.0000 A/ 5.0000 A/ 10.000 A/ 20.000 A		
Power ranges	Depends on the combination of voltage and current ranges;		
	From 6.0000 mW to 20.000 kW (also applies to VA, var)		
	The details are as below.		
Input resistance	Voltage input terminal: 2 MΩ		
	Current input terminal: 1 mA to 100 mA range 520 mΩ or less		
	200 mA to 20 A range 15 mO or less		

#### **Basic Measurement Specifications**

Measurement Simultaneous voltage and current digital sampling, zero-cross method simultaneous calculation

method	simultaneous calculation				
Sampling frequency	Approx. 700 kHz				
A/D converter resolution					
Frequency bandwidth			Hz are for reference only)		
Synchronization sources					
Measurement items					
	Apparent power	Reactive power	Power factor		
	Phase angle	Frequency	Current integration		
	Active power integration Integration time				
	Voltage waveform p		aveform peak value		
	Voltage crest factor	Current cr			
	Maximum current ra		age current		
	Time average active				
	Voltage ripple rate	Current rip	ppie rate		
		Harmonic parameters Harmonic voltage RMS value Harmonic current RMS val			
	Harmonic active por		ionic voltage distortion		
	Total harmonic curren		ntal wave voltage		
	Fundamental wave of		ntal wave active power		
			tal wave reactive power		
		ower factor (Displace			
		oltage current phase			
	Harmonic voltage co				
	Harmonic current co	ontent percentage			
		ver content percentag	e		
	(The following parameters	can be downloaded as d	ata via PC communication)		
	Harmonic voltage pl				
	Harmonic current pl				
		urrent phase difference	Э		
Rectifiers	AC+DC : AC+DC mea	surement			
		values for both voltage	e and current		
	AC+DC Umn : AC+DC				
	Display of average v	alue rectified RMS co	nverted values for		
	voltage and true RM				
	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		rent DC value) for active power		
	Display of values calculated by $\sqrt{(AC+DC value)^2}$ (DC value) <sup>2</sup> for both voltage and current Display of values calculated by				
	Display of values ca	Iculated by	jo and outlone		
	(AC+DC value) - (DC	C value) for active pow	er		
	FND : Extraction and display	of the fundamental wave compor	nent from harmonic measurement		
Zero-cross Filter	100 Hz: 0.1 Hz to 100				
	5 kHz: 0.1 Hz to 5 kHz	100 kHz: 0.1 Hz to	100 kHz		
Measurement accuracy					
Voltage					
Frequency (f)	Input < 50%f.s.	50%f.s. ≤ Input < 100%f.s.	. 100%f.s. ≤ Input		
DC	±0.1rdg.±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.	±0.2%rdg.	±0.2%rdg.		
	Ŭ		Ŭ		
66Hz <f≤500hz< td=""><td>±0.1%rdg.±0.1%f.s.</td><td>±0.2%rdg.</td><td>±0.2%rdg.</td></f≤500hz<>	±0.1%rdg.±0.1%f.s.	±0.2%rdg.	±0.2%rdg.		
500Hz <f≤10khz< td=""><td>±0.1%rdg.±0.2%f.s.</td><td>±0.3%rdg.</td><td>±0.3%rdg.</td></f≤10khz<>	±0.1%rdg.±0.2%f.s.	±0.3%rdg.	±0.3%rdg.		
10kHz <f≤50khz< td=""><td>±0.5%rdg.±0.3%f.s.</td><td>±0.8%rdg.</td><td>±0.8%rdg.</td></f≤50khz<>	±0.5%rdg.±0.3%f.s.	±0.8%rdg.	±0.8%rdg.		
50kHz <f≤100khz< td=""><td>±2.1%rdg.±0.3%f.s.</td><td>±2.4%rdg.</td><td>±2.4%rdg.</td></f≤100khz<>	±2.1%rdg.±0.3%f.s.	±2.4%rdg.	±2.4%rdg.		
Current					
Frequency (f)	Input < 50%f.s. ≤ Input < 100%f.s. ≤ Input < 100%f.s. ≤ Inp				
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.±0.1%l.s. ±0.1%rdg.±0.1%l.s. ±0.2% ±0.1%rdg.±0.2%f.s. ±0.3%rdg. ±0.3%				
16Hz≤f<45Hz	±0.1%rdg.±0.1%f.s.	±0.2%rdg.	±0.2%rdg.		
45Hz≤f≤66Hz	$\pm 0.1\%$ rdg. $\pm 0.1\%$ rdg. $\pm 0.2\%$ rdg. $\pm 0.2\%$ rdg. $\pm 0.2\%$ rdg. $\pm 0.15\%$ rdg. $\pm 0.15\%$ rdg.				
66Hz <f≤500hz< td=""><td colspan="3"><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></td></f≤500hz<>	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				
500Hz <f≤1khz< td=""><td>±0.1%rdg.±0.1%i.s.</td><td>±0.2%rdg.</td><td>±0.2%rdg.</td></f≤1khz<>	±0.1%rdg.±0.1%i.s.	±0.2%rdg.	±0.2%rdg.		
1kHz <f≤10khz< td=""><td>±(0.03+0.07×F)%rdg.</td><td>±(0.23+0.07×F)%rdg.</td><td>±(0.23+0.07×F)%rdg.</td></f≤10khz<>	±(0.03+0.07×F)%rdg.	±(0.23+0.07×F)%rdg.	±(0.23+0.07×F)%rdg.		
	$\pm (0.23 \pm 0.07 \times F)$ (0.23 $\pm (0.23 \pm 0.07 \times F)$ (0.23 $\pm (0.23 \pm 0.07 \times F)$ (0.24 $\pm 0.2\%$ f.s.				
10kHz <f≤100khz< td=""><td></td><td>±(0.6+0.04×F)%rdg.</td><td>±(0.6+0.04×F)%rdg.</td></f≤100khz<>		±(0.6+0.04×F)%rdg.	±(0.6+0.04×F)%rdg.		
TONTIZ STOTION IZ	±0.3%f.s.	/.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.			
	10.0701.0.	L	1		

Active power							
	loout + E00/f.o	E00/fe_classit_1000/fe	100%60 classit				
Frequency (f) DC	Input < 50%f.s. ±0.1%rdg.±0.1%f.s.	50%f.s. ≤ Input < 100%f.s. ±0.1%rdg.±0.1%f.s.	100%f.s. ≤ Input ±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< td=""><td>±0.1%rdg.±0.1%f.s.</td><td>±0.2%rdg.</td><td>±0.2%rdg.</td></f≤500hz<>	±0.1%rdg.±0.1%f.s.	±0.2%rdg.	±0.2%rdg.				
500Hz <f≤1khz< td=""><td>±0.1%rdg.±0.2%f.s.</td><td>±0.3%rdg.</td><td>±0.3%rdg.</td></f≤1khz<>	±0.1%rdg.±0.2%f.s.	±0.3%rdg.	±0.3%rdg.				
1kHz <f≤10khz< td=""><td>±(0.03+0.07×F)%rdg.</td><td>±(0.23+0.07×F)%rdg.</td><td>±(0.23+0.07×F)%rdg.</td></f≤10khz<>	±(0.03+0.07×F)%rdg.	±(0.23+0.07×F)%rdg.	±(0.23+0.07×F)%rdg.				
	±0.2%f.s.						
10kHz <f≤50khz< td=""><td>±(0.07×F)%rdg. ±0.3%f.s.</td><td>±(0.3+0.07×F)%rdg.</td><td>±(0.3+0.07×F)%rdg.</td></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< td=""><td colspan="6">±(0.6+0.07×F)%rdg. ±(0.9+0.07×F)%rdg. ±(0.9+0.07×F)%rdg.</td></f≤100khz<>	±(0.6+0.07×F)%rdg. ±(0.9+0.07×F)%rdg. ±(0.9+0.07×F)%rdg.						
Effective measuring range Maximum effective peak voltage Maximum effective	<ul> <li>"F" in the tables reference of the second second</li></ul>	o 100 kHz measureme the read value) to 0.1 Hz cy for active power. mA/ 500 mA/ 1 A/ 2 A/ asurement accuracy for da value) to DC measurement mA/ 500 mA/ 1 A/ 2 A/ to the measurement accuracy for value) to DC measurement and mA/ 500 mA/ 1 A/ 2 A/ to the measurement accuracy for control kHz < f < 100 or following input are consident, and active power in excess of 200 Aror power in excess of 200 Aror power in excess of 200 Aror power in excess of 500 Aror and the range (when using the target (when using the active power in excess of 500 Aror power in excess of 500 Aror box of the range (when using the active power in excess of 500 Aror box of the range (baror active power in excess of 500 Aror power in excess	Hz. to 100 kHz to 100 kHz 5 A/ 10 A/ 20 A range: or current. taccuracy for active power. 50 mA/ 100 mA range: or current. curacy for active power. 5 A/ 10 A/ 20 A range: curacy for current 5 A/ 10 A/ 20 A range: curacy for current 0 kHz). ered reference values: which 0.1 Hz $\leq f < 10$ Hz. 10 kHz. 10 kHz $\leq f \leq 100$ kHz. which 30 kHz $\leq f \leq 100$ kHz. V range, up to 1000 V) 000 V range, up to 150%) d current fall within the				
peak current Guaranteed accuracy	However, for 20 A rang 1 year						
period							
Post-adjustment	6 months						
accuracy guaranteed Conditions of	Tomporature and humidit	hy range: 22°C+5°C (72°E	+0°E) 20% PH or loce				
guaranteed accuracy	Warm-up time: 30 min Input: Sine v of 0 V the fu sourc	Temperature and humidity range: 23°C±5°C (73°F±9°F), 80% RH or less         Warm-up time:       30 minutes         Input:       Sine wave input, power factor of 1, voltage to earth of 0 V, after zero-adjustment; within range in which the fundamental wave satisfies synchronization source conditions					
Temperature	±0.03%f.s. per °C or le						
coefficient Effect of power		ge, ±0.06%f.s. per °C ( 66 Hz, at power factor					
factor Effect of common	+0.01%fs_or_less/60/	ge/current phase differe 0 V, 50 Hz/60 Hz, appli	ed between input				
mode voltage	terminals and enclosu		ou between input				
Effect of magnetic field	400 A/m, DC and 50 H Voltage ±1.5%f.s. or less Current	400 A/m, DC and 50 Hz/60 Hz magnetic field Voltage ±1.5%f.s. or less					
	±1.5%f.s. or less than a 200 mA/ 500 mA/ 1	or equal to the following va A/ 2 A/ 5 A/ 10 A/ 20 A D mA/ 20 mA/ 50 mA/ 10	range: ±20 mA 00 mA range: ±200 μA				
	±3.0%f.s. or less than a 200 mA/ 500 mA/ 1 A/ 2 A/ 5 A	or equal to the following va / 10 A/ 20 A range: (Voltage influen mA/ 50 mA/ 100 mA range: (Voltage	ce quantity)×(±20 mA)				
Effect of self- heating	±3.0%f.s. or less than ( 200mA/500mA/1A/2A/5A 1mA/2mA/5mA/10mA/207 With input of at least 1: Current AC input signal ±(0.025+0.005×(1 DC input signal 200 mA/500 mA/ ±((0.025+0.005 1 mA/2 mA/5 mA ±((0.025+0.005 I: Current read vali Active power (above current influe)	<ul> <li>/10.4/20.A range: (Voltage influen nA/50 mA/100 mA range: (Voltage 5 A to current input terr</li> <li>-15))%rdg. or less</li> <li>1 A/ 2 A/ 5 A/ 10 A/ 20 x(I-15))% rdg.+(0.5+0. / 10 mA/ 20 mA/50 m x(I-15))% rdg.+(5+1x(I-</li> </ul>	ce quantity/x(±20 mA) influence quantity/x(±200 µA) ninals A range 1xx(1-15))mA) or less A/ 100 mA range -15))µA) or less te read value) or less				

#### Range table (Power ranges)

0 (	σ,							
Current Voltage	6.0000 V	15.000 V	30.000 V	60.000 V	150.00 V	300.00 V	600.00 V	1.0000 kV
1.0000 mA	6.0000 mW	15.000 mW	30.000 mW	60.000 mW	150.00 mW	300.00 mW	600.00 mW	1.0000 W
2.0000 mA	12.000 mW	30.000 mW	60.000 mW	120.00 mW	300.00 mW	600.00 mW	1.2000 W	2.0000 W
5.0000 mA	30.000 mW	75.000 mW	150.00 mW	300.00 mW	750.00 mW	1.5000 W	3.0000 W	5.0000 W
10.000 mA	60.000 mW	150.00 mW	300.00 mW	600.00 mW	1.5000 W	3.0000 W	6.0000 W	10.000 W
20.000 mA	120.00 mW	300.00 mW	600.00 mW	1.2000 W	3.0000 W	6.0000 W	12.000 W	20.000 W
50.000 mA	300.00 mW	750.00 mW	1.5000 W	3.0000 W	7.5000 W	15.000 W	30.000 W	50.000 W
100.00 mA	600.00 mW	1.5000 W	3.0000 W	6.0000 W	15.000 W	30.000 W	60.000 W	100.00 W
200.00 mA	1.2000 W	3.0000 W	6.0000 W	12.000 W	30.000 W	60.000 W	120.00 W	200.00 W
500.00 mA	3.0000 W	7.5000 W	15.000 W	30.000 W	75.000 W	150.00 W	300.00 W	500.00 W
1.0000 A	6.0000 W	15.000 W	30.000 W	60.000 W	150.00 W	300.00 W	600.00 W	1.0000 kW
2.0000 A	12.000 W	30.000 W	60.000 W	120.00 W	300.00 W	600.00 W	1.2000 kW	2.0000 kW
5.0000A	30.000 W	75.000 W	150.00 W	300.00 W	750.00 W	1.5000 kW	3.0000 kW	5.0000 kW
10.000 A	60.000 W	150.00 W	300.00 W	600.00 W	1.5000 kW	3.0000 kW	6.0000 kW	10.000 kW
20.000 A	120.00 W	300.00 W	600.00 W	1.2000 kW	3.0000 kW	6.0000 kW	12.000 kW	20.000 kW
		-	~	~		-	~	

<sub>2w333</sub> 5
oltage/ Current/ Active Power Measurement Specifications

Measurement types	Rectifiers: AC+DC, DC, AC, FND, AC+DC Umn
Effective	Voltage
measuring range	$\pm 1\%$ to $\pm 150\%$ of the range.
incasuring range	However, up to ±1500 V peak value and 1000 V RMS value
	Current
	$\pm 1\%$ to $\pm 150\%$ of the range
	5
	Active Power
	±0% to ±225% of the range.
	However, valid when the voltage and current fall within the
	effective measurement range.
Display range	Voltage
	Up to $\pm 152\%$ of the range. However, zero-suppression when less than $\pm 0.5\%$
	Current
	Up to ±152% of the range.
	However, zero-suppression when less than $\pm 0.5\%$ or less than $\pm 9 \ \mu$ A.
	Active Power
	±0% to ±231.04% of the range (no zero-suppression)
Polarity	Voltage/ Current
	Displayed when using DC rectifier
	Active Power
	Positive : Power consumption (no polarity display)
	Negative : generation or regenerated power

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

method Range configuration	Voltage           Voltage range           6.0000 V           15.000 V           30.000 V           60.000 V           300.00 V           60.000 V           150.00 V           0.000 V           60.000 V           150.00 V           0.000 V           0.000 V           0.000 V           Current           Current range           1.0000 mA	Ampled instantaneous voltage value           Voltage peak range           36.000 V           90.000 V           180.00 V           360.00 V           900.00 V           1.8000 kV           3.6000 kV		
	Voltage range           6.0000 V           15.000 V           30.000 V           60.000 V           150.00 V           300.00 V           600.00 V           150.00 V           000.00 V           000.00 V           000.00 V           00000 kV           Current           Current range           1.0000 mA	36.000 V 90.000 V 180.00 V 360.00 V 900.00 V 1.8000 kV 3.6000 kV 6.0000 kV		
	6.0000 V 15.000 V 30.000 V 60.000 V 150.00 V 300.00 V 600.00 V 1.0000 kV Current range 1.0000 mA	36.000 V 90.000 V 180.00 V 360.00 V 900.00 V 1.8000 kV 3.6000 kV 6.0000 kV		
	15.000 V           30.000 V           60.000 V           150.00 V           300.00 V           600.00 V           1.0000 kV           Current           Current range           1.0000 mA	90.000 V 180.00 V 360.00 V 900.00 V 1.8000 kV 3.6000 kV 6.0000 kV		
	30.000 V 60.000 V 150.00 V 300.00 V 600.00 V 1.0000 kV Current Current range 1.0000 mA	180.00 V 360.00 V 900.00 V 1.8000 kV 3.6000 kV 6.0000 kV		
	60.000 V 150.00 V 300.00 V 600.00 V 1.0000 kV Current Current range 1.0000 mA	360.00 V 900.00 V 1.8000 kV 3.6000 kV 6.0000 kV		
	150.00 V 300.00 V 600.00 V 1.0000 kV Current Current range 1.0000 mA	900.00 V 1.8000 kV 3.6000 kV 6.0000 kV		
	300.00 V 600.00 V 1.0000 kV Current Current range 1.0000 mA	1.8000 kV 3.6000 kV 6.0000 kV		
	600.00 V 1.0000 kV Current Current range 1.0000 mA	3.6000 kV 6.0000 kV		
	1.0000 kV Current Current range 1.0000 mA	6.0000 kV		
	Current Current range 1.0000 mA			
	Current range 1.0000 mA			
	1.0000 mÅ			
	1.0000 mÅ	Current peak range		
	2 0000 ~ 4	6.0000 mA		
	2.0000 mA	12.000 mA		
	5.0000 mA	30.000 mA		
	10.000 mA	60.000 mA		
	20.000 mA	120.00 mA		
	50.000 mA	300.00 mA		
	100.00 mA	600.00 mA		
	200.00 mA	1.2000 A		
	500.00 mA	3.0000 A		
	1.0000 A 2.0000 A	6.0000 A 12.000 A		
	5.0000 A	30.000 A		
	10.000 A	60.000 A		
	20.000 A	120.00 A		
Measurement		$z \le f \le 1$ kHz (f.s.: current peak range).		
accuracy		$z \le t \le T$ KHz (f.s.: current peak range). en 0.1 Hz $\le$ f < 10 Hz and when 1 kHz < f.		
accuracy		icy is multiplied by 2 for the 1 mA range.		
Effective		ak range, however, up to $\pm 60$ A		
measuring range	Leve to £100 % of current pee			
Display range	Up to +102% of current peak	range, however, the value 0 will be		
- p		value triggers the instrument's zero		
	suppression function.			
/oltage Crest F		r Measurement Specifications		
Measurement		tage waveform peak value to the		
method	voltage RMS value.			
Effective		aveform peak value, or current and		
measuring range		effective measurement ranges.		
Display range	1.0000 to 612.00 (no polarity	)		
Altono Diant-	Data/ Ourrant Dianta Dat	he Measurement Oreality atte		
• • •		te Measurement Specification		
Measurement		nt (peak to peak [peak width]) as a		
method Effective	proportion of the voltage or c			
Effective measuring range		aveform peak value, or current and effective measurement ranges.		
		enective measurement ranges.		
Display range	0.00 to 500.00 (No polarity)			
Annaront Pow	er/ Reactive Power/ Pow	er Factor/ Phase Angle		
	Specifications	er i actor Fridse Angle		
Measurement	Rectifiers			
		wer/ Power Factor		
		Apparent Power/ Reactive Power/ Power Factor		
Measurement types	AC+DC, AC, FND, AC+DC Umn			
	IPhase Angle			
	Phase Angle AC, FND			
	AC, FND	tive power effective measurement		
types Effective	AC, FND As per voltage, current, and ac	ctive power effective measurement		
types Effective measuring range	AC, FND As per voltage, current, and ac ranges			
types Effective	AC, FND As per voltage, current, and ac ranges Apparent Power/ Reactive Po	wer		
types Effective measuring range	AC, FND As per voltage, current, and ac ranges	wer		
types Effective measuring range	AC, FND As per voltage, current, and ac ranges Apparent Power/ Reactive Po	wer		

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 Calculation Formulas

	- or in a lab			
S : Apparent power	$S = U \times I$			
Q : Reactive power	$Q = si\sqrt{S^2 - P^2}$			
$\lambda$ : Power factor	$\lambda = si \mid P/S \mid$			
$\phi$ : Phase angle	φ = si cos <sup>-1</sup> λ l φ = si l 180 - cos <sup>-1</sup> λ l	(±90° to ±180°) ( 0° to ±90°)		

U: Voltage, I: Current, P: Active Power, si: Policy symbol (acquired based on voltage waveform and current waveform lead and lag)

#### **Frequency Measurement Specifications**

Number of	2 (Voltage, current)			
measurement channels				
Measurement method	Calculated from input waveform			
Measurement ranges Measurement accuracy	100 Hz/ 500 Hz/ 5 kHz/ 100 kHz (linked to zero-cross filter) ±0.1% rdg. ±1 dgt. However, for 1 mA range, ±0.2% rdg. ±1 dgt.			
Effective	0.1 Hz to 100 kHz	TTIATange, ±0.2 % tug. ±1 ugi.		
measuring range	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. (linked to synchronization timeout setting)			
Display format	0.1000 Hz to 9.9999 Hz, 99.00 Hz to 999.99 Hz, 9.900 kHz to 99.999 kHz,	9.900 Hz to 99.999 Hz, 0.9900 kHz to 9.9999 kHz, 99.00 kHz to 100.00 kHz		
Maximum Curre	ent Ratio Measurement S	Specifications (MCR)		
Measurement	n	ent crest factor to the power factor		
method	(MCR) = (Current Crest Factor)			
Effective	As per power factor (voltage, current, active power) and current crest factor			
measuring range	(current, current waveform peak valu			
Display range	1.0000 to 6.1200 M (no polarity	/)		
Time Average Curi	rent/ Time Average Active Po	wer Measurement Specificatio		
Measurement	Calculates the average by divid			
method	integrated value by the integrat			
Measurement accuracy		nent accuracy) + (±0.01% rdg. ±1 dgt		
Effective measuring range	As per the current or active power int	egration effective measurement range.		
Display range	Time Average Current			
	±0% to ±612% of the range (Has	polarity when using the DC rectifier.)		
	Time Average Active Power			
	±0% to ±3745.4% of the range	e (Has polarity)		
Functional Spec	cifications			
Auto-range (AUTO)	Automatically changes the voltage a	nd current range according to the input.		
	Range up: The range is increased when i when the peak is exceeded.	nput exceeds 150% of the range of		
		input falls below 15% of the range reased when the peak is exceede		
		e range is switched over multiple range		
		e ranges so that they are not selected.		
Range select	Selects whether to enable (turn voltage and current ranges.	on) or disable (turn off) individual		
	Enabled (use):			
	Ranges can be selected with t	he range kevs.		
	Range switching occurs using Range switching occurs during	auto-range operation.		
		th the range keys. ur using auto-range operation. ur during auto-range integration.		
Zero-cross filter's threshold level		d level for voltage and current ranges s). Synchronization occurs when the		
Averaging	Averages the voltage, current, activ power. (Other than harmonic meas The power factor and phase angle	ve power, apparent power, and reacti		
	Number of averaging iterations	and display update interval		
	Number of averaging iterations	Display update interval		
	1 (OFF)	200 ms		
	2	400 ms		
	5	1 s		
	10	2 s		
	25	5 s		
	50	10 s		
	100	20 s		
Scaling (VT, CT)	VT ratio setting range OFF	T ratio settings to measured value (1.0), 0.001 to 1000		
	CT ratio setting range OFF			
Hold	<ul> <li>Stops display updates for all r display values at that point in Measurement data acquired t that point in time.</li> <li>Internal calculations (includin elapsed time) will continue.</li> </ul>	time. by communications is also fixed at		

Maximum value/ minimum value hold (MAX/MIN HOLD)	<ul> <li>Detects maximum and minimum measured values (except current integration, active power integration, integration elapsed time, time average current, and time average active power values) as well as maximum and minimum values for the voltage waveform peak and current waveform peak and holds them on the display.</li> <li>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). However, this does not apply to the voltage waveform peak value.</li> <li>Internal calculations (including integration and integration elapsed time) will continue.</li> <li>The maximum and minimum values during integration are detected (maximum/minimum value measurement during the integration interval).</li> <li>Analog output and waveform output are not held.</li> </ul>
Zero Adjustment	Zeroes out the voltage and current input offset.
Key-lock	Disables key input in the measurement state, except for the 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.
Integration Mea	asurement Specifications
Integration	Switchable between fixed-range integration and auto-range integration.
operation modes	Fixed-range integration Integration can be performed for all voltage and current ranges. The voltage and current ranges are fixed once integration starts.

	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	Rectifiers: AC+DC, AC+DC Umn			
types	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 Displays the result of integrating instantaneous data obtained by sampling both current and active power by polarity as integrated values (these values are not integrated values for the DC component when active power contains both DC and AC components)			
Integration time	1 min. to 10000 hr., settable in 1 min. blocks			
Integration time accuracy	±0.01% rdg. ±1 dgt.			
Integration measurement accuracy	(Current or active power measurement accuracy) + (±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	<ul> <li>Stopping integration based on integration time setting (timer)</li> <li>Stopping/starting integration and resetting integrated values based on external control</li> <li>Displaying the integration elapsed time (displayed as TIME on panel display)</li> <li>Additional integration by repeatedly starting/stopping integration</li> <li>Backing up integrated values and the integration elapsed time during power outages</li> <li>Stopping integration when power returns</li> </ul>			
	urement 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.			
Synchronization source	Conforms to synchronization source (SYNC) for the basic measurement specifications.			
Measurement items				

Harmonic current content percentage Harmonic current phase angle

Harmonic active power Harmonic active power content percentage Harmonic voltage current phase difference Total harmonic voltage distortion Total harmonic current distortion Fundamental wave voltage Fundamental wave active power Fundamental wave apparent power Fundamental wave reactive power Fundamental wave power factor

(The following parameters can be downloaded as data with communications) Harmonic voltage phase angle Harmonic current phase angle Harmonic voltage current phase difference

Fundamental wave voltage current phase difference

FFT processing	FFT processing word length : 32 Number of FFT points : 4096 poi			
Window function	Rectangular	Rectangular		
Analysis window width	$\begin{array}{l} 45 \mbox{ Hz} \leq f < 56 \mbox{ Hz}: 178.57 \mbox{ ms to } 222.22 \mbox{ ms (10 cycles)} \\ 56 \mbox{ Hz} \leq f < 66 \mbox{ Hz}: 181.82 \mbox{ ms to } 214.29 \mbox{ ms (12 cycles)} \\ Frequencies other than the above : 185.92 \mbox{ ms to } 214.08 \mbox{ ms} \end{array}$			
Data update rate	Depends on window width.			
Maximum analysis	Synchronization frequency (f) range Analysis orde			
order	$10 \text{ Hz} \le \text{f} < 45 \text{ Hz}$	unge	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	
Analysis order upper limit setting	2nd to 50th			
Measurement	f.s.: Measurement range			
accuracy	Frequency (f)		ge, Current, Active powe	
	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.	
	$400 \text{ Hz} < f \le 1 \text{ kHz}$		±0.4% rdg. ±0.2%f.s.	
	$1 \text{ kHz} < f \le 5 \text{ kHz}$		±1.0% rdg. ±0.5%f.s.	
	5 kHz < f ≤ 8 kHz		±4.0% rdg. ±1.0%f.s.	
	<ul> <li>When using the 1 mA/ 2 mA ran Add ±1 µA to 10 Hz to 8 kHz me</li> </ul>		nent accuracy for ourse	
	Add ±1 µA to 10 Hz to 8 kHz me Add (±1 µA) × (voltage read val measurement accuracy for activ	ue) to 1	IO Hz to 8 kHz	
	<ul> <li>When using the 200 mA/ 500 mA/ 1 A/ 2 A/ 5 A/ 10 A/ 20 A rang Add ±1 mA to DC measurement accuracy for current. Add (±1 mA) × (voltage read value) to DC measurement accuracy for active power.</li> </ul>			
	<ul> <li>When using the 1 mA/2 mA/5 mA/10 mA/20 mA/50 mA/100 mA rang Add ±10 μA to DC measurement accuracy for current. Add (±10 μA) × (voltage read value) to DC measurement accura for active power.</li> </ul>			
Display Number of display	7-segment LED			
Display	7-segment LED			
Number of display parameters	7-segment LED 4 (display area a, b, c, and d) Other than integrated values: 99	t (6 dig tes per	its)	
Display Number of display parameters Display resolution Display update	7-segment LED         4 (display area a, b, c, and d)         Other than integrated values: 99         Integrated values: 999999 count         200 ms ±50 ms (approx. 5 upda number of averaging iterations s	t (6 dig tes per	its)	
Display Number of display parameters Display resolution Display update rate	7-segment LED         4 (display area a, b, c, and d)         Other than integrated values: 99         Integrated values: 999999 count         200 ms ±50 ms (approx. 5 upda number of averaging iterations s	t (6 dig ates per setting)	its) to 20 s (varies with	
Display Number of display parameters Display resolution Display update rate Synchronized of	7-segment LED     4 (display area a, b, c, and d)     Other than integrated values: 90     Integrated values: 999999 coun     200 ms ±50 ms (approx. 5 upda     number of averaging iterations s control	t (6 dig setting) update ay hold peration W3335 s	its) sec.) to 20 s (varies with s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w	
Display Number of display parameters Display resolution Display update rate Synchronized c Functions	<ul> <li>7-segment LED</li> <li>4 (display area a, b, c, and d)</li> <li>Other than integrated values: 92</li> <li>Integrated values: 999999 coun</li> <li>200 ms ±50 ms (approx. 5 upda number of averaging iterations s</li> <li>control</li> <li>The timing of calculations; display start, stop, and reset events; display operation; and zero-adjustment op is synchronized with the master PV the PW3336 series and PW3337 s</li> <li>BNC terminal × 1 (non-isolated)</li> </ul>	t (6 dig ates per setting) update ay hold beration W3335 s eries is	its) sec.) to 20 s (varies with s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w also supported.	
Display Number of display parameters Display resolution Display update rate Synchronized of Functions	7-segment LED     4 (display area a, b, c, and d)     Other than integrated values: 99     Integrated values: 999999 coun     200 ms ±50 ms (approx. 5 upda     number of averaging iterations s     control     The timing of calculations; display     start, stop, and reset events; displ     operation; and zero-adjustment op     is synchronized with the master P     the PW3336 series and PW3337 s     BNC terminal × 1 (non-isolated)     External synchronization termina	t (6 dig ates per setting) update ay hold beration W3335 s eries is	its) sec.) to 20 s (varies with s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w also supported.	
Display Number of display parameters Display resolution Display update rate Synchronized c Functions	7-segment LED         4 (display area a, b, c, and d)         Other than integrated values: 92         Integrated values: 999999 count         200 ms ±50 ms (approx. 5 update)         number of averaging iterations start, stop, and reset events; display         start, stop, and reset events; display         operation; and zero-adjustment op is synchronized with the master PV the PW3336 series and PW3337 s         BNC terminal × 1 (non-isolated)	update ay hold beration W3335 s eries is al (EXT.)	its) s sec.) to 20 s (varies with s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w also supported. SYNC) als input to the external	
Display Number of display parameters Display resolution Display update rate Synchronized of Functions	7-segment LED     4 (display area a, b, c, and d)     Other than integrated values: 99     Integrated values: 999999 coun     200 ms ±50 ms (approx. 5 upda     number of averaging iterations s     control     The timing of calculations; display     start, stop, and reset events; displ     operation; and zero-adjustment or     is synchronized with the master PV     the PW3336 series and PW3337 s     BNC terminal × 1 (non-isolated)     External synchronization termina     Off     Synchronized control function c	t (6 dig ttes per setting) update ay hold beration W3335 s eries is il (EXT.: off (sign SYNC) a rminal (	its) sec.) to 20 s (varies with s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w also supported. SYNC) als input to the external are ignored) (EXT.SYNC) is set to inp	
Display Number of display parameters Display resolution Display update rate Synchronized of Functions	7-segment LED     4 (display area a, b, c, and d)     Other than integrated values: 99     Integrated values: 999999 coun     200 ms ±50 ms (approx. 5 upda     number of averaging iterations s     control     The timing of calculations; display     start, stop, and reset events; displ     operation; and zero-adjustment oc     is synchronized with the master P     the PW3336 series and PW3337 s     BNC terminal × 1 (non-isolated)     External synchronization terminal     Off     Synchronized control function c     synchronization terminal (EXT.S     In     The external synchronization terminal (EXT.S	t (6 dig utes peri- vetting) update av hold beration N3335 5 ul (EXT.: (sign syNC) a urminal (E) inn signa	its) sec.) to 20 s (varies with s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization we also supported. SYNC) als input to the external are ignored) EXT.SYNC) is set to input al can be input (slave). XT.SYNC) is set to output	
Display Number of display parameters Display resolution Display update rate Synchronized c Functions Terminal Terminal name I/O settings	7-segment LED     4 (display area a, b, c, and d)     Other than integrated values: 99     Integrated values: 999999 coun     200 ms ±50 ms (approx. 5 upda     number of averaging iterations s     control     The timing of calculations; display     start, stop, and reset events; displ-     operation; and zero-adjustment og     is synchronized with the master PV     the PW3336 series and PW3337 s     BNC terminal × 1 (non-isolated)     External synchronization termina     Off     Synchronized control function c     synchronized control function c     synchronization terminal (EXT.S     In     The external synchronization terminal     Out     The external synchronization terminal	t (6 dig update ay hold eration V3335 ceries is ul (EXT.: fff (sign rminal (E) signal (E)	its) sec.) to 20 s (varies with s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w also supported. SYNC) als input to the external are ignored) EXT.SYNC) is set to inp al can be input (slave). XT.SYNC) is set to output can be output (master).	
Display Number of display parameters Display resolution Display update rate Synchronized of Functions Terminal Terminal name I/O settings	7-segment LED     4 (display area a, b, c, and d)     Other than integrated values: 99     Integrated values: 999999 coun     200 ms ±50 ms (approx. 5 upda     number of averaging iterations s     control     The timing of calculations; display     start, stop, and reset events; displ     operation; and zero-adjustment og     is synchronized with the master PN     the PW3336 series and PW3337 s     BNC terminal × 1 (non-isolated)     External synchronization terminal     Off     Synchronized control function c     synchronized control function c     synchronization terminal (EXT.S     In     The external synchronization ter     and a dedicated synchronization     Up to 7 slaves per master     (total of 8 units including the PW:	t (6 dig update ay hold ya335 erries is d (EXT.: hoff (sign n signal signal of 3336/P	its) sec.) to 20 s (varies with s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w also supported. SYNC) als input to the external are ignored) EXT.SYNC) is set to inp al can be input (slave). XT.SYNC) is set to output can be output (master).	
Display Number of display parameters Display resolution Display update rate Synchronized of Functions Terminal Terminal name I/O settings Number of units for which synchronized control can be performed External Currer (PW3335-03 ar Terminal	7-segment LED     4 (display area a, b, c, and d)     Other than integrated values: 99     Integrated values: 999999 coun     200 ms ±50 ms (approx. 5 upda     number of averaging iterations s     control     The timing of calculations; display     start, stop, and reset events; displ     operation; and zero-adjustment og     is synchronized with the master P     the PW3336 series and PW3337 s     BNC terminal × 1 (non-isolated)     External synchronization terminal     Off     Synchronized control function c     synchronized control function c     synchronization terminal (EXT.S     In     The external synchronization term     and a dedicated synchronization     Up to 7 slaves per master     (total of 8 units including the PW     Isolated BNC terminals	t (6 dig update ay hold ya335 erries is d (EXT.: hoff (sign n signal signal of 3336/P	its) sec.) to 20 s (varies with s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w also supported. SYNC) als input to the external are ignored) EXT.SYNC) is set to inp al can be input (slave). XT.SYNC) is set to output can be output (master).	
Display Number of display parameters Display resolution Display update rate Synchronized of Functions Terminal Terminal name I/O settings Number of units for which synchronized control can be performed External Currer (PW3335-03 ar	7-segment LED 4 (display area a, b, c, and d) Other than integrated values: 99 Integrated values: 999999 coun 200 ms ±50 ms (approx. 5 upda number of averaging iterations s control The timing of calculations; display start, stop, and reset events; displ operation; and zero-adjustment op is synchronized with the master PV the PW3336 series and PW3337 s BNC terminal × 1 (non-isolated) External synchronization terminal Off Synchronized control function c synchronization terminal (EXT.S In The external synchronization term and a dedicated synchronization Out The external synchronization term and a dedicated synchronization Up to 7 slaves per master (total of 8 units including the PW: <b>th Sensor Input Specification</b> PM (Start) Cont Con	t (6 dig update ay hold vration vratio	its) sec.) to 20 s (varies wit s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w also supported. SYNC) als input to the external are ignored) EXT.SYNC) is set to inp al can be input (slave). XT.SYNC) is set to output can be output (master). W3337 series)	
Display Number of display parameters Display resolution Display update rate Synchronized of Functions Terminal Terminal name I/O settings Number of units for which synchronized control can be performed External Currer (PW3335-03 ar Terminal Current sensor type	7-segment LED     4 (display area a, b, c, and d)     Other than integrated values: 99     Integrated values: 999999 coun     200 ms ±50 ms (approx. 5 upda     number of averaging iterations s     control     The timing of calculations; display     start, stop, and reset events; displ-     operation; and zero-adjustment op     is synchronized with the master P     W3336 series and PW3337 s     BNC terminal × 1 (non-isolated)     External synchronization terminal     Off     Synchronized control function c     synchronized control function c     synchronization terminal (EXT.S     In     The external synchronization term     and a dedicated synchronization     Up to 7 slaves per master     (total of 8 units including the PW:     the Sensor Input Specification     d PW3335-04)     Isolated BNC terminals     Off / TYPE.1 / TYPE.2	t (6 dig update ay hold ay hold eration with the service signal of signal of 33336/P DNS	its) sec.) to 20 s (varies with sec.) to 20 s (varies with sec.) to 20 s (varies with operation; key lock for the slave PW3335 se series. Synchronization w also supported. SYNC) als input to the external are ignored) (EXT.SYNC) is set to input al can be input (slave). XT.SYNC) is set to output can be output (master). W3337 series) current sensor input	
Display Number of display parameters Display resolution Display update rate Synchronized of Functions Terminal Terminal name I/O settings Number of units for which synchronized control can be performed External Currer (PW3335-03 ar Terminal Current sensor type switching Current sensor	7-segment LED     4 (display area a, b, c, and d)     Other than integrated values: 99     Integrated values: 999999 coun     200 ms ±50 ms (approx. 5 upda     number of averaging iterations s     control     The timing of calculations; display     start, stop, and reset events; displi     operation; and zero-adjustment op     is synchronized with the master PV     W3336 series and PW3337 s     BNC terminal × 1 (non-isolated)     External synchronization terminal     Off     Synchronized control function c     synchronized control function c     synchronization terminal (EXT.S     In     The external synchronization term     and a dedicated synchronization     Up to 7 slaves per master     (total of 8 units including the PW:     Isolated BNC terminals     Off / TYPE.1 (TYPE.2     When set to off, input from the external is ignored.     TYPE1 (100 A to 5000 A sensors	t (6 dig tes per vertes per	its) sec.) to 20 s (varies with s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w also supported. SYNC) als input to the external are ignored) (EXT.SYNC) is set to input (slave). XT.SYNC) is set to output (master). W3337 series) current sensor input 03 supply is required to usa	
Display Number of display parameters Display resolution Display update rate Synchronized of Functions Terminal name I/O settings Number of units for which synchronized control can be performed External Currer (PW3335-03 ar Terminal Current sensor type switching Current sensor options	7-segment LED 4 (display area a, b, c, and d) Other than integrated values: 99 Integrated values: 999999 coun 200 ms ±50 ms (approx. 5 upda number of averaging iterations s control The timing of calculations; display start, stop, and reset events; displ operation; and zero-adjustment og- is synchronized with the master PV the PW3336 series and PW3337 s BNC terminal × 1 (non-isolated) External synchronization terminal Off Synchronized control function c synchronization terminal (EXT.S In The external synchronization term and a dedicated synchronization Out The external synchronization term and a dedicated synchronization Up to 7 slaves per master (total of 8 units including the PW: <b>th Sensor Input Specification</b> Men set to off, input from the ex- terminal is ignored. TYPE1 (100 A to 5000 A sensors 9660, 9661, 9669, CT9667-0 TYPE2 (20 A to 1000 A sensors, CT6862-05, CT6863-05, CT6	t (6 dig update ay hold with the speri- update ay hold with the speri- signal di the speri- signal di minal (E) signal di minal (E) minal (E) signal di minal (E) minal (E)	its) sec.) to 20 s (varies wit s; data updates; integrati operation; key lock for the slave PW3335 se series. Synchronization w also supported. SYNC) als input to the external are ignored) EXT.SYNC) is set to input can be input (slave). XT.SYNC) is set to output can be output (master). W3337 series) Current sensor input D3 supply is required to use T6876, CT6877, 9272-0; CT6845-05, CT6846-05,	

PW333			
Power range	Depends on the com	nbination of voltage and	d current ranges;
configuration	from 24.000 W to 5.0	0000 MW (also applies	to VA, var)
Measurement			
accuracy			
Current/ Active Po		500/1 1 1 1000/1	1000/1
Frequency (f)	Input < 50%f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. ≤ Input
DC	±0.1%rdg.±0.2%f.s.	±0.1%rdg.±0.2%f.s.	±0.3%rdg.
0.1Hz≤f<16Hz	±0.1%rdg.±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
16Hz≤f<45Hz	±0.1%rdg.±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
45Hz≤f≤66Hz	±0.1%rdg.±0.1%f.s.	±0.2%rdg.	±0.2%rdg.
66Hz <f≤500hz< td=""><td>±0.1%rdg.±0.2%f.s.</td><td>±0.3%rdg.</td><td>±0.3%rdg.</td></f≤500hz<>	±0.1%rdg.±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
500Hz <f≤1khz< td=""><td>±0.1%rdg.±0.2%f.s.</td><td>±0.3%rdg.</td><td>±0.3%rdg.</td></f≤1khz<>	±0.1%rdg.±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
Current			
Frequency (f)	Input < 50%f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. ≤ Input
1kHz <f≤10khz< td=""><td>±(0.03+0.07×F)%rdg. ±0.2%f.s.</td><td>±(0.23+0.07×F)%rdg.</td><td>±(0.23+0.07×F)%rdg.</td></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< td=""><td>±(0.3+0.04×F)%rdg. ±0.3%f.s.</td><td>±(0.6+0.04×F)%rdg.</td><td>±(0.6+0.04×F)%rdg.</td></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
1kHz <f≤10khz< td=""><td>±(0.03+0.07×F)%rdg. ±0.2%f.s.</td><td>±(0.23+0.07×F)%rdg.</td><td>±(0.23+0.07×F)%rdg.</td></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< td=""><td>±(0.07×F)%rdg. ±0.3%f.s.</td><td>±(0.3+0.07×F)%rdg.</td><td>±(0.3+0.07×F)%rdg.</td></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< td=""><td>±(0.6+0.07×F)%rdg. ±0.3%f.s.</td><td>±(0.9+0.07×F)%rdg.</td><td>±(0.9+0.07×F)%rdg.</td></f≤100khz<>	±(0.6+0.07×F)%rdg. ±0.3%f.s.	±(0.9+0.07×F)%rdg.	±(0.9+0.07×F)%rdg.

- ±0.3%15.
  Values for f.s. depend on measurement ranges.
  "F" in the tables refers to the frequency in kHz.
  To obtain the current or active power accuracy, add the current sensor's accuracy to the above current and active power accuracy figures.
  The effective measurement range and frequency characteristics conform to the current sensor's specifications.
  The following input are considered reference values: Values for voltage, current, and active power in excess of 220 V for which 10 Hz ≤ f < 10 Hz.</li>
  Values for voltage and active power in excess of 750 V for which 10 Hz ≤ f < 10 kHz.</li>
  When using the CT684x-05 series, add ±2 mV to the CT684x-05 series accuracy after performing CT684x-05 series zero adjustment using the 1 A range noted on the panel.

Temperature coefficient	Current, active power: ±0.08%f.s./°C or less (instrument temperature coefficient; f.s. : instrument measurement range) Add current sensor temperature coefficient to above.			
Effect of power factor	Instrument: ±0.15%f.s. or less (45 to 66 Hz with power factor = 0) Internal circuit voltage/current phase difference: ±0.0859° Add the current sensor phase accuracy to the internal circuit voltage/current phase difference noted above.			
Current waveform peak value measurement specifications	$\pm 2.0\%$ at DC or 10 Hz $\leq$ f $\leq$ 1 kHz (f.s.: current peak range) Add the current sensor accuracy to the above.			
Harmonic	External current sensor input instru	ment measurement accuracy only		
measurement	Frequency (f)	Voltage, Current, Active power		
accuracy	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.		
	<ul> <li>Values for f.s. depend on measurement ranges.</li> <li>To obtain the current or active power accuracy, add the current sensor's accuracy to the above current and active power accuracy figures.</li> <li>When using the CT684x-05 series, add ±2 mV to the CT684x-05 series accuracy after performing CT684x-05 series zero adjustment using the 1 A range noted on the panel.</li> </ul>			

#### v3335-02 and Pvv3335-04)

Number of output channels	7 channels		Between the current input terminals and a connection of chassis, interfaces, and output terminals		
Configuration	16-bit D/A converter (polarity + 15 bits)	Maximum rated	Between the voltage input terminals and current input		
Output voltage	The output level, output speed, and waveform output can be selected. Level output 2 Vf.s. or 5 Vf.s., linked to display updates	voltage to earth	Voltage input terminal, Current input terminal Measurement category III 600 V (anticipated transier overvoltage: 6000 V) Measurement category II 1000 V (anticipated transier overvoltage: 6000 V)		
	High-speed level output 2 Vf.s. or 5 Vf.s., linked to synchronization interval Waveform output	Maximum input voltage	Between the voltage input terminals U and ± 1000 V, ±1500 V peak		
Output	1 Vf.s., linked to sampling Output parameters for all channels	Maximum input current	Between the current input terminals I and ± 200 mA to 20 A range 30 A, ±100 A peak 1 mA to 100 mA range 20 A, ±30 A peak		
parameters	Available selections vary with the output parameter. Level output/ High-speed level output/ Waveform output Voltage, current, active power Only Level output	Applicable Standards	Safety EN61010 EMC EN61326 Class A EN61000-3-2 EN61000-3-3		
	Apparent power, reactive power, power factor, phase angle, total harmonic voltage distortion, total harmonic current distortion,	Rated supply voltage	100 V AC to 240 V AC 50 Hz/60 Hz		
	voltage ripple rate, current ripple rate, voltage crest factor, current crest factor, time average current, time average active	Maximum rated power	30 VA or less		
	power, maximum current ratio Only Level output 5 Vf.s.	Dimensions	Approx. 210W × 100H × 245D mm (8.27"W × 3.94"H : (excluding protrusions)		
	Frequency, current integration, active power integration	Mass	Approx. 3 kg (105.8 oz.)		
	The rectifier can be selected. Harmonic-order output is not supported.	Accessories	Instruction manual ×1 Power cord ×1 Voltage and current input terminal safety cover ×2		

Output accuracy	f.s.: Relative to the output voltage rated value for each output
	parameter Level output
	(Output parameter measurement accuracy) + (±0.2%f.s.) High-speed level output
	(Output parameter measurement accuracy) + (±0.2%f.s.) Waveform output
	(Output parameter measurement accuracy) + (±1.0%f.s.)
Output frequency band	Waveform output, high-speed level output At DC or 10 Hz to 30 kHz, accuracy is as defined above.
Maximum output	Approx. ±12 V DC
voltage Output update	Level output
rate	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 µs (approx. 700 kHz)
Response time	Level output 0.6 sec. or less
	High-speed level output 2 ms or less
	Waveform output
Temperature	0.2 ms or less ±0.05%f.s./°C or less
coefficient Output resistance	Αρρrox. 100 Ω
External contro	
Functions	Integration start/stop, integration reset and hold via external
Input signal level	control 0 to 5 V (high-speed CMOS level) or shorted [Lo]/ open [Hi]
GP-IB interface	9
(PW3335-01 a	nd PW3335-04)
Method	Compliant with IEEE488.1 1987, in reference to IEEE488.2 1987 Interface functions
Address	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0 00 to 30
RS-232C interf	
(PW3335, PW3	335-02, PW3335-03, and PW3335-04)
Connector Communication	D-sub 9-pin connector × 1 Full duplex, Start-stop synchronization
method	Stop bits: 1 (fixed)
	Data length: 8 (fixed) Parity: None
Communication speed	9600 bps/ 38400 bps
LAN interface	
Connector Electrical	RJ-45 connector × 1
specifications	Compliant with IEEE802.3
Transmission method	10Base-T/ 100Base-TX (automatic detection)
Protocol Functions	TCP/ IP HTTP server (remote operation, firmware updates)
1 unctions	Dedicated ports (command control, data transfer)
Conoral Specif	Remote control by controller
General Specif Product warranty	3 year
period Operating	Indoors, altitude up to 2000 m (6562 ft.), pollution degree 2
environment	
Operating temperature and humidity	0°C to 40°C (32°F to 104°F), 80% RH or less (no condensation)
Storage temperature and humidity	-10°C to 50°C (14°F to 122°F), 80% RH or less (no condensation)
Dielectric strength	4290 V rms AC (current sensitivity: 1 mA) Between the voltage input terminals and a connection consisting
	of chassis, interfaces, and output terminals
	Between the current input terminals and a connection consisting of chassis, interfaces, and output terminals
Maximum rated	
	Between the voltage input terminals and current input terminals Voltage input terminal, Current input terminal
voltage to earth	Between the voltage input terminals and current input terminals           Voltage input terminal, Current input terminal           Measurement category III 600 V (anticipated transient
voltage to earth	Between the voltage input terminals and current input terminals           Voltage input terminal, Current input terminal           Measurement category III 600 V (anticipated transient overvoltage: 6000 V)           Measurement category II 1000 V (anticipated transient
Voltage to earth	Between the voltage input terminals and current input terminals Voltage input terminal, Current input terminal Measurement category III 600 V (anticipated transient overvoltage: 6000 V)
Maximum input voltage	Between the voltage input terminals and current input terminals         Voltage input terminal, Current input terminal         Measurement category III 600 V (anticipated transient         overvoltage: 6000 V)         Measurement category II 1000 V (anticipated transient         overvoltage: 6000 V)         Between the voltage input terminals U and ±         1000 V, ±1500 V peak
Maximum input voltage Maximum input current	Between the voltage input terminals and current input terminals         Voltage input terminal, Current input terminal         Measurement category III 600 V (anticipated transient         overvoltage: 6000 V)         Measurement category II 1000 V (anticipated transient         overvoltage: 6000 V)         Between the voltage input terminals U and ±         1000 V, ±1500 V peak         Between the current input terminals I and ±         200 mA to 20 A range 30 A, ±100 A peak         1 mA to 100 mA range 20 A, ±30 A peak
Maximum input voltage Maximum input	Between the voltage input terminals and current input terminals         Voltage input terminal, Current input terminal         Measurement category III 600 V (anticipated transient overvoltage: 6000 V)         Measurement category II 1000 V (anticipated transient overvoltage: 6000 V)         Between the voltage input terminals U and ± 1000 V, ±1500 V peak         Between the current input terminals I and ± 200 mA to 20 A range 30 A, ±100 A peak         1 mA to 100 mA range 20 A, ±30 A peak         Safety       EN61010
Maximum input voltage Maximum input current Applicable	Between the voltage input terminals and current input terminals         Voltage input terminal, Current input terminal         Measurement category III 600 V (anticipated transient overvoltage: 6000 V)         Measurement category III 1000 V (anticipated transient overvoltage: 6000 V)         Between the voltage input terminals U and ± 1000 V, ±1500 V peak         Between the current input terminals I and ± 200 mA to 20 A range 30 A, ±100 A peak         1 mA to 100 mA range 20 A, ±30 A peak         Safety       EN61010         EMC       EN6128C Class A EN61000-3-2
Maximum input voltage Maximum input current Applicable	Between the voltage input terminals and current input terminals         Voltage input terminal, Current input terminal         Measurement category III 600 V (anticipated transient overvoltage: 6000 V)         Measurement category II 1000 V (anticipated transient overvoltage: 6000 V)         Between the voltage input terminals U and ± 1000 V, ±1500 V peak         Between the current input terminals I and ± 200 mA to 20 A range 30 A, ±100 A peak         Safety       EN61010         EMC       EN61326 Class A EN6100-3-2         EN61000-3-3         100 V Ac to 240 V AC
Maximum input voltage Maximum input current Applicable Standards Rated supply voltage	Between the voltage input terminals and current input terminals         Voltage input terminal, Current input terminal         Measurement category III 600 V (anticipated transient overvoltage: 6000 V)         Measurement category II 1000 V (anticipated transient overvoltage: 6000 V)         Between the voltage input terminals U and ± 1000 V, ±1500 V peak         Between the current input terminals I and ± 200 mA to 20 A range 30 A, ±100 A peak         1 mA to 100 mA range 20 A, ±30 A peak         Safety       EN61010         EMC       EN61326 Class A EN61000-3-2         EN61000-3-2         EN61000-3-3         100 V AC to 240 V AC 50 Hz
Maximum input voltage Maximum input current Applicable Standards Rated supply voltage Maximum rated power	Between the voltage input terminals and current input terminals         Voltage input terminal, Current input terminal         Measurement category III 600 V (anticipated transient overvoltage: 6000 V)         Measurement category III 1000 V (anticipated transient overvoltage: 6000 V)         Between the voltage input terminals U and ± 1000 V, ±1500 V peak         Between the current input terminals I and ± 200 mA to 20 A range 30 A, ±100 A peak 1 mA to 100 mA range 20 A, ±30 A peak         Safety       EN61010         EMC       EN61326 Class A EN61000-3-2 EN61000-3-2         EN61000-3-3       100 V AC to 240 V AC 50 Hz/60 Hz         30 VA or less       Soft A range 20 A A context A range 20 A A range 20 A A range 20 A A range 20 A ra
Maximum input voltage Maximum input current Applicable Standards Rated supply voltage Maximum rated	Between the voltage input terminals and current input terminals         Voltage input terminal, Current input terminal         Measurement category III 600 V (anticipated transient overvoltage: 6000 V)         Measurement category II 1000 V (anticipated transient overvoltage: 6000 V)         Between the voltage input terminals U and ± 1000 V, ±1500 V peak         Between the current input terminals I and ± 200 mA to 20 A range 30 A, ±100 A peak         1 mA to 100 mA range 20 A, ±30 A peak         Safety       EN61010         EMC       EN61326 Class A EN61000-3-2         EN61000-3-2         EN61000-3-3         100 V AC to 240 V AC 50 Hz
Maximum input voltage Maximum input current Applicable Standards Rated supply voltage Maximum rated power	Between the voltage input terminals and current input terminals         Voltage input terminal, Current input terminal         Measurement category III 600 V (anticipated transient overvoltage: 6000 V)         Measurement category II 1000 V (anticipated transient overvoltage: 6000 V)         Between the voltage input terminals U and ± 1000 V, ±1500 V peak         Between the voltage input terminals I and ± 200 mA to 20 A range 30 A, ±100 A peak         Safety       EN61010         EMC       EN61326 Class A EN61000-3-2         EN61000-3-2         EN61000-3-3         100 V Ac to 240 V AC 50 Hz/60 Hz         30 VA or less         Approx. 210W × 100H × 245D mm (8.27"W × 3.94"H × 9.65"D)

# **3334 Specifications**

#### **Basic Specifications**

Measu	rable lines	Single-phase, 2-wire (AC/DC)							
Measu	irement	Voltage, current, active power, apparent power, power factor,							
param	eters	frequency, integrated current and active power, waveform peak							
		(voltage ar	id current)						
Measure	ement method	Simultaneo	ous digital s	ampling of v	oltage and	current, Tru	le RMS		
Samplin	g Frequency	Approx. 74	.4kHz						
Measur	ement Ranges								
	Currnet Voltage	100.00 mA	300.0 mA	1.0000 A	3.000 A	10.000 A	30.00 A		
	15.000 V	1.5000 W	4.500 W	15.000 W	45.00 W	150.00 W	450.0 W		
	30.00 V	3.000 W	9.000 W	30.00 W	90.00 W	300.0 W	900.0 W		
	150.00 V		45.00 W	150.00 W	450.0 W	1.5000 kW	4.500 kW		
	300.0 V 30.00 W 90.00 W 300.0 W 900.0 W 3.000 kW 9.0								
Freque	ncy bandwidth	DC, 45Hz to 5kHz							

#### Measurement accuracy

Warm-up time	3 minutes									
Period of guaranteed accuracy	3 years (bet	ter accuracy specifications a	available for 1-year period)							
Post-adjustment accuracy guarantee	1 year (accu	racy specifications available	e for 1-year period)							
Effective measurement		rent:1% to 100% (Power: 0%								
range		below 0.5% of the voltage or current	nt range will be zero suppressed.							
Effect of power factor (at pf=0.5)		0.4%±rdg. (45 to 66Hz)								
Temperature Coefficient	Maximum ±	laximum ±0.03%f.s./°C								
Frequency	Guaranteed Period	Voltage, current and active power (at less than 50% of input range)	Current and active power (at 50% to 100% of input range)							
DC *	1 year	±0.1 %rdg.	±0.2 %f.s.							
DC	3 years	±0.1 %rdg.	±0.35 %f.s.							
45 Hz < f < 66 Hz	1 year	±0.1 %rdg. ±0.1 %f.s.	±0.2 %rdg.							
40 HZ S I S 00 HZ	3 years	±0.1 %rdg. ±0.2 %f.s.	±0.3 %rdg.							
66 Hz < f < 1 kHz **	1 year	±0.1 %rdg. ±0.2 %f.s.	±0.3 %rdg.							
	3 years	±0.1 %rdg. ±0.35 %f.s.	±0.45 %rdg.							
1 kHz < f < 5 kHz **	1 year	±3.0 %f.s.	±3.0 %rdg.							
	3 years	±4.5 %f.s.	±4.5 %rdg.							
Input Specificat	Add (±50 ** Accur	0μA to the accuracy when m μA x voltage value) to the accuracy acy not defined for current in	when measuring DC active power							
Input impedance	2.4 MΩ for v	oltage, 10 mΩ or better (50/	60 Hz) for current							
Maximum input voltage	300 V, ±425	Vpeak								
Maximum input current	30 A, ±54.0	Apeak								
Maximum effective peak voltage	±300% of e	ach voltage range, Within ±4	25 Vpeak							
Maximum effective peak current	±300% of e	ach current range, Within ±5	4.0 Apeak *1							
Max. rated voltage to earth	300 V (DC,	50/ 60 Hz)								
Display Specific	ations									
Display indication Voltage and current: 0.5% to 105% of range Active power: 0% to 110.25% of range										
Diaplacement power factor	0.000 to 1.000 (no polority display)									

Display indication	Voltage and current: 0.5% to 105% of range
range	Active power: 0% to 110.25% of range
Displacement power factor	0.000 to 1.000 (no polarity display)
Display refresh rate	approx. 5 times per second
Response time	within 0.5 s (Time to rated accuracy after abrupt change in input [0 to 90% or 100 to 10% of range])

#### **Functional Specifications**

Integration	No.of displayed digits:	Six digits					
measurement	Current Integration:	From 0.00000mAh, Polarity-independent					
meddarennent	ourient integration.	integration and Sum value					
	Active power Integration:	From 0.00000mWh, Polarity-independent					
		integration and Sum value					
	Integration time:	1 min to 10000 h					
	Measurement accuracy:	Measurement accuracy of active power ±1dgt.					
Wave peak		tive and negative waveform of voltage/					
measurement	current (up to 300% of						
D 100 11 11 1		y: ±1.2%f.s. ("f.s." is 300% of each range)					
Analog output	Parameter output repre						
(D/A output)	Voltage, Current and Active power (3 simultaneous channels)						
	D/A select an item from Current integration, Active power integration, Apparent power, power factor						
	Voltage output: ±2 VDC f.s. for each range						
		5% f.s. + individual measurement accuracy					
Waveform output	Parameter output repre						
	Voltage, Current and	Active power (3 simultaneous channels)					
		DC f.s. for each range					
	Output accuracy: ±1.0	% f.s. + individual measurement accuracy					
Average function	Simple averaging of specif	ied number of samples: 1, 2, 5, 10, 25, 50 or 100					
VT or CT ratio	VT ratios: 1, 2, 4, 10, 20	0, 30, 60, 100					
		8, 10, 12, 15, 16, 20, 24, 25, 30, 40, 50, 60, 75, 300, 500, 1000, 2000, 3000, 5000, 10000					
External Interfaces	RS-232C interface: Inc						
	Asynchronous comn						
		rate: 9600 bps (fixed)					
	GP-IB interface (Model 3334-01 only) IEEE-488.1 1987 compliant, IEEE-488.2 1987 reference						
Miscellaneous		value hold, Peak value hold, Key lock,					
wiscenarieous		erves settings, integration data)					
General Specifi	cations						
	1						

Safety	EN61010 Pollution Factor 2,
	Measurement Category III (4000 V anticipated overvoltage)
EMC	EN61326, EN61000-3-2, EN61000-3-3
Operating environment	0 to 40 °C, 80% RH or less, non-condensating
Storage environment	-10 to 50 °C, 80% RH or less, non-condensating
Rated supply voltage	100 to 240 VAC, 50/60 Hz
Maximum rated power	20 VA
Dimensions and mass	210 mm (8.27 in)W × 100 mm (3.94 in)H × 245 mm (9.65 in)D (excluding feet and projections), 2.5 kg (88.2 oz)

# **3333 Specifications**

#### Basic specifications

Measurable lines		Single-phase, 2-wire (AC)								
Measurement parameters		Voltage, Current, Active power, Apparent power, Power factor								
	ement method	Simultaneous digital sampling of voltage and current, True RMS								
	ng frequency	Approx. 48kHz								
Measur	rement ranges									
	Currnet Voltage	50.00 mA	200.0 mA	500.0 mA	2.000 A	5.000 A	20.00 A			
	200.0 V	10.000 W	40.00 W	100.00 W	400.0 W	1.0000 kW	4.000 kW			
	icy bandwidth	45Hz to 5kHz								
(Guaranteed	urement a at 23°C±5, max. 80%rh, s	CCURACY ine wave input, power	factor=1, in-phase vo	ltage =0V, accuracy s	pecifications differ de	pending on usage per	iod of 1 or 3 years)			
	up time	10 minutes								
	guaranteed accuracy					or 1-year per				
	Post-adjustment accuracy guarantee 1 year (accuracy specifications available for 1-year period)									
	Effective measurement Voltage, current, power: 10% to 150% Measurements below 1% of the voltage or current range will be zero suppressed.									
Effect of power factor (at pi=0.5) Maximum $\pm 0.4\% \pm rdg$ . (45 to 66Hz)										
	ature Coefficient		±0.03%f.s./		<i>L</i> )					
				1		t and a still				
Fr	equency		eed Period	VOIt		t and active				
45 Hz	z ≤ f ≤ 66 Hz		year			g. ±0.1 %f.s				
			years			g. ±0.2 %f.s				
66 Hz	< f $\leq$ 1 kHz *		year			g. ±0.2 %f.s				
			years			g. ±0.35 %f. 0 %f.s.	5.			
1 kHz	< f $\leq$ 5 kHz *		year years			0 %1.s. 5 %f.s.				
				(						
Input	specification		not defined	for current i	nput excee	aing 20A				
Input i	mpedance	2.4 M $\Omega$ for voltage, 7 m $\Omega$ or better (50/60 Hz) for current								
Maximu	m input voltage	300 Vrms, 425 Vpeak								
	m input current	30 Arms, 4								
	effective peak voltage									
Maximum e	effective peak current	±300% of e	each curren	it range, Wit	hin ±42.5A	peak				
Max. rate	d voltage to earth	300V (50/6	i0Hz)							
Displa	ay specific	ations								
Display range	y indication			% to 152% o 31.04% of ra						
Displacer	ment power factor			arity display	/)					
	y refresh rate		imes per se							
Respo	nse time		(Time to ra		cy after abr	upt change	in input [0			
Funct	tional Spec	cifications	;							
Rectific	ation method	AC(True RI	MS)							
Analog (D/A o	g output utput)	voltage, ci				neous chan	nels)			
		Output accuracy: ±0.5% f.s. + individual measurement accuracy Simple averaging of specified number of samples: 1, 2, 5, 10, 25,								
	ge function	Simple ave 50 or 100	raging of sp	pecified nur	nber of sam	ples: 1, 2, 5	5, 10, 25,			
VT or (	CT ratio			0, 30, 60, 1 8, 10, 12, 15, 1		30, 40, 50, 60,	75, 80, 100			
Extern	al Interfaces	Asynchr	onous comi	cluded as st munication rate: 9600	method:					
		GP-IB inter	face (Mode	el 3333-01 c	only)	987 referenc				
Miscel	laneous		IEEE-488.1 1987 compliant, IEEE-488.2 1987 reference Display hold, Key lock, Settings backup (preserves settings)							
	ral Specific		,	, e e ta						
Safety		r	ollution Fac	tor 2						
		Measurem	ent Categor	y III (4000 \		d overvolta	ge)			
EMC				-2, EN6100						
	ng environment environment			less, non-c						
	upply voltage		VAC, 50/60	or less, nor	-condensa	ung				
	m rated power	20 VA	·A0, 30/00	112						
	ons and mass		.30 in)W × 1	100 mm (3.9	94 in)H × 22	?7 mm (8.94	in)D			
				ojections), 1			·			

#### Calculation formulas (3333 & 3334)

e al e al al al e l e l e								
Measurement	Formula							
Parameters								
Apparent Power (S)	$S = U \times I$							
Power Factor (🛛)	$\lambda = I P / S I$							
Integrated Current*	(Sum of I from start of integration)/ (Number of 1 hour data)							
Integrated Active	(Sum of P from start of integration)/ (Number of 1 hour data)							
Power *								

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# **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
	PW3337	3	AC/ DC	~	~	~	×	×	~	V
POWER METER PW3337	PW3337-01	3	AC/ DC	<b>v</b>	~	~	~	×	~	~
5 SUDIO 3 SUDI	PW3337-02	3	AC/ DC	~	~	•	×	~	~	~
	PW3337-03	3	AC/ DC	~	~	~	~	~	~	~
	PW3336	2	AC/ DC	~	~	~	×	×	~	V
POWER METER PW3336	PW3336-01	2	AC/ DC	~	~	~	~	×	~	V
50000 22370	PW3336-02	2	AC/ DC	<b>v</b>	~	<b>v</b>	×	~	~	~
	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
	PW3335	1	AC/ DC	~	~	~	×	×	×	~
POWER METER	PW3335-01	1	AC/ DC	✓	~	×	~	×	~	~
PW3335	PW3335-02	1	AC/ DC	✓	~	~	х	~	×	~
	PW3335-03	1	AC/ DC	✓	~	~	×	×	V	~
	PW3335-04	1	AC/ DC	~	~	V	~	~	V	~
AC/ DC POWER HITESTER 3334	3334	1	AC/ DC	×	×	~	×	~	×	×
9005 9000 90005 90005 90005	3334-01	1	AC/ DC	×	×	~	~	~	×	×
POWER HITESTER 3333	3333	1	AC	×	×	~	×	~	×	×
3000 - 3000 - 3000 -	3333-01	1	AC	×	×	~	~	~	×	×

#### 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

Accessories : Instruction manual ×1, Power cord ×1



CONNECTION CORD 9165 For synchronized control Cable length: 1.5 m (4.92 ft), metal BNC to metal BNC Note: Company names and Product names appearing in this catalog are trademarks or registered trademarks of various companies.



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