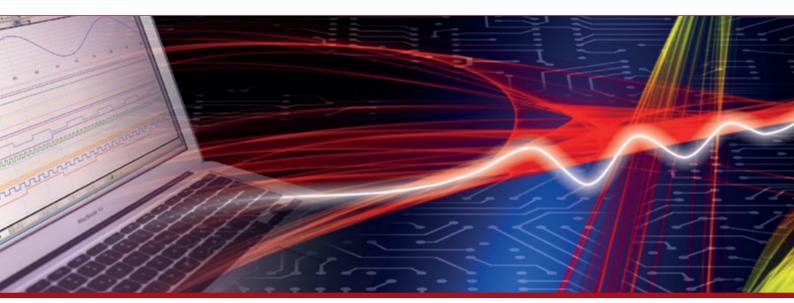


## **Product Datasheet - Technical Specifications**



More information in our Web-Shop at ▶ www.meilhaus.com

#### Your contact

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FAX: +49 - (0)81 41 - 52 71-129

E-Mail: sales@meilhaus.com



# 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



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.

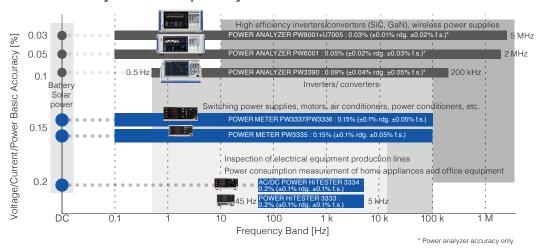
Designed for power consumption testing, the 3334 and 3333 are guaranteed for accuracy for up to 3 years.



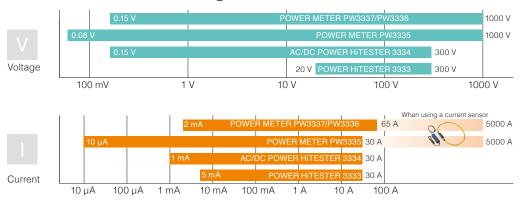




## Basic Accuracy and Frequency Bands



## Effective Measurement Range



## Comparison Chart

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

## **Features**

## POWER METER PW3337/PW3336

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





PW3337-03 Front Panel

PW3337-03 Rear Panel



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

- Voltage/current/power basic accuracy of ±0.1% \*
- Direct input up to 1000 V AC/DC / 65 A
- Harmonic measurement as standard feature, IEC61000-4-7 compliant
- Little instrument loss, even with large currents. DCCT input with an input resistance of 1 m $\Omega$  or less.



- Measurement of multiple connections in the optimal range for each due to independent ranges for each channel
- Measure up to 5000 A AC with optional current sensor

## POWER METER PW3335

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







PW3335-04 Rear Panel



PW3336-03

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® server power evaluation test

## **POWER HITESTER 3333**

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





- Compact model for saving space, even when added to a system
- Accuracy guaranteed up to 3 years

# **Dimensional Drawings**

Units: mm 32.5 M6×12L ÔÔ PW3337 127.75 PW3336 27.75 245 M6×12I 0 6 6 0 0: PW3335 M6×12L = O = O 3334 95.5 54 25 3333

## **Applications**

## Inspection of Electrical Equipment Production Lines



## Best-in-class Accuracy ±0.1% \* PW333 7 PW333 6 PW333 5

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





Basic accuracy, AC

±0.1%

# 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.



## Extensive Interfaces



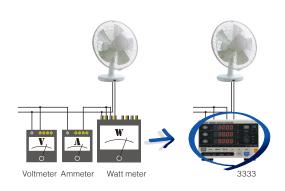
The built-in interfaces are convenient for transferring data to a PC and equipping the unit on automated machines. PC communication software can be downloaded free of charge from the HIOKI website. For details about the built-in interfaces, refer to the specifications for each model.



## Replacement for Analog Meters



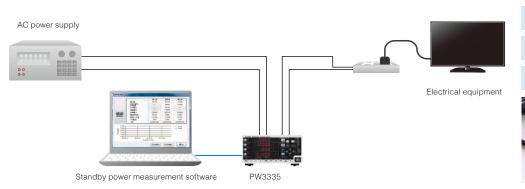
These models can be used as replacements for analog voltmeters, ammeters, and watt meters. Up to 4 parameters such as voltage, current, and power can be displayed at the same time, allowing 3 measuring devices to be covered with a single unit. The digital display avoids issues such as parallax due to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



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

## Standby Power Measurement





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

Key features

Compliant with standby

power standards
Wide dynamic range

Standby power measurement software

## Compliant with IEC62301 and EN50564 Standards

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

#### Requirements for Measurement Instruments for Standby Power Measurements (excerpt)

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

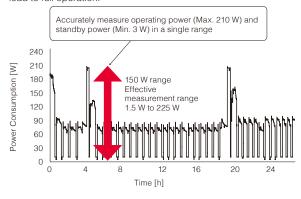
THD (Total Harmonic Distortion): Indicates to what extent harmonic components are present in an AC waveform

CF (Crest Factor): Ratio of the peak value to the effective (RMS) value of an AC waveform

MCR (Maximum Current Ratio): Current evaluation index, calculated from the crest factor and power factor

## Wide Range of Effective Measurement

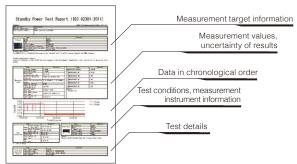
The PW3335 has an effective measurement range of 1% to 150%. Due to this wide range of effective measurement, even equipment with large load fluctuations, such as refrigerators, heaters, and pumps, can be measured accurately under all conditions from noload to full operation.



Long-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.

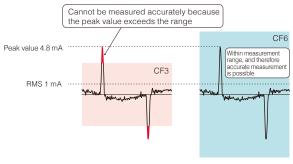


Example of Report Output

## Support for CF6 (Crest Factor 6)

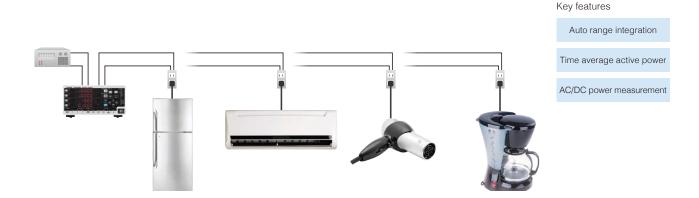
When an AC adapter or switching power supply operates with no load, the crest factor of the current waveform increases. The PW3335 can measure waveforms that exceed the range of watt meters that support crest factor 3.

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 (CF = Peak Value, RMS = 4.8)

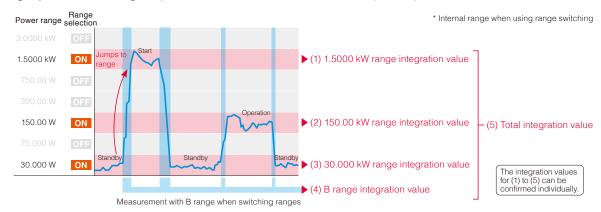
## Measurement of Fluctuating Loads and Power Supply Control



## 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.

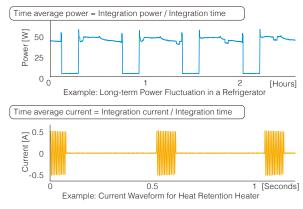


## Intermittent Power Supply



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

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

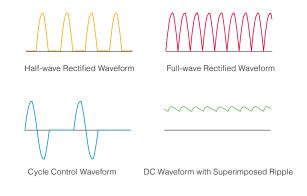


## AC/DC Measurement



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

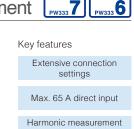
- Half-wave rectified waveforms used for dryers and fans
- Full-wave rectified waveforms used for AC adapters
- Cycle control waveforms used for voltage and temperature adjustment heaters
- DC waveforms with superimposed ripple components



## Research, Development, and Inspection of Three-Phase Equipment [PW333 7] [PW333 6]

Transformer

Motor



Current sensor input

# Compliant with IEC61000-4-7 Harmonic Measurement Standards

Three-phase

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

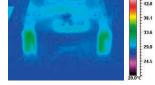
The PW3337 supports not only 3V3A, but also a variety of three-phase connections such as 3P4W, 3P3W2M, and 3P3W3M.

## Accuracy Guaranteed for Currents Up to 65 A

Air conditioner

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.



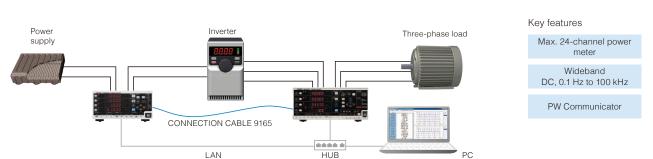


PW333 7 PW333 6 PW333

DCCT current sensor (in the PW3337)

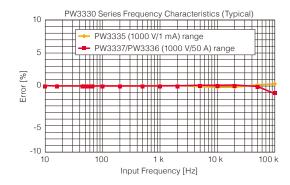
Temperature distribution image at 30 A DC/10-minute input

## **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

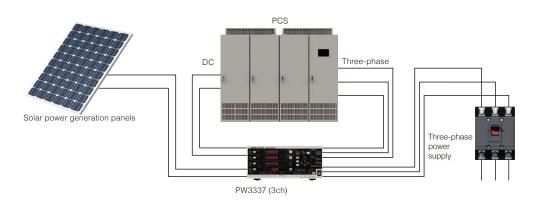
Connect 8 units for synchronous measurement of up to 24 channels. The calculation and control timing for PW3337, PW3336, and PW3335 units that are set as secondaries are synchronized with the primary unit. Use this feature to measure the I/O efficiency of power supply devices, compare multiple pieces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



\* This software can be downloaded from the HIOKI website.

## PV Power Conditioner (PCS) Efficiency Measurements

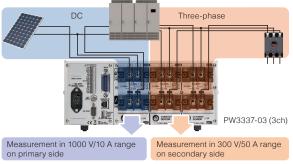




# Key features Independent range per channel Extensive calculation functions Harmonic measurement function

# Independent Ranges Per Channel for Highly Accurate Measurements

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

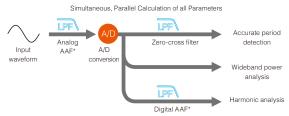


Setting Optimal Range According to Target to be Measured

# Simultaneous Measurement of Power Data and Harmonics

In addition to standard measurement items such as voltage, current, and power, all items related to harmonics, such as distortion and content percentage, are calculated internally in parallel at the same time. Items such as RMS value, MEAN value, DC components, AC components, and fundamental wave components can all be confirmed simply by switching the display. Even for DC waveforms with superimposed ripple components, the AC/DC components can be measured separately.

In addition, when using PC software, more than 180 measurement items can be acquired at the same time.



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

## I/O Efficiency Calculation with a Single Unit

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

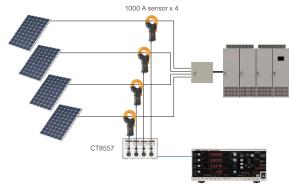
#### 1000 V Range for Evaluation of Large Power Conditioners

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



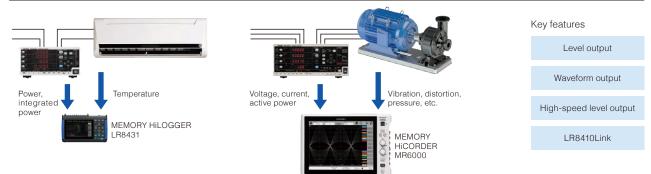
# Aggregation of Output from DC Current Sensors (Up to 4000 A)

SENSOR UNIT CT9557 is a power supply for highly accurate current sensors that have a waveform output function. In addition to using it as a 4-channel power supply, it is also equipped with a sum feature for aggregating the input waveforms into a single waveform to be output.



Aggregating the Output from 4 Sensors into One Unit

## Output Function Linked with Recorder

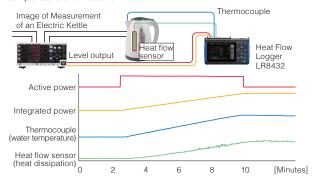


	PW3337-02 PW3337-03	PW3336-02 PW3336-03	PW3335-02 PW3335-04	3334 3334-01	3333 3333-01
Level output (Analog output)	Yes		Yes	Yes	Yes
Waveform output	Yes		Yes	Yes	-
High-speed level output	Active power only		Voltage, current, active power	-	-

# Display Trends with a Data Logger



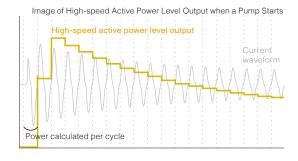
The level output (analog output) function delivers measured values that are displayed on the power meter with an analog voltage that is updated every 200 ms. Connect the unit to a data logger to check trends through synchronization with data such as temperature and heat flow\*.



\* 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 PW333 PW333 PW333 PW333

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



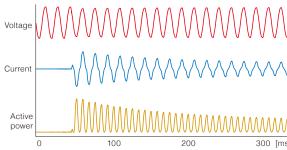
\* With the PW3335, high-speed level output is also possible for 45 Hz to 66 Hz

# 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.





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



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

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

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



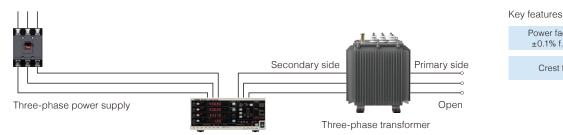
\* Connection requires the serial - Bluetooth® wireless technology conversion adapter recommended by Hioki. Please inquire with your Hioki distributor.

## No-load Loss Measurements for Transformers



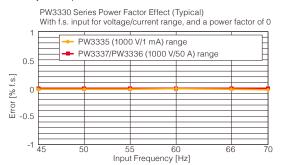
Power factor effect ±0.1% f.s. or less

Crest factor 6



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

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



## Support for Crest Factor 6

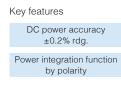
The crest factor of a current waveform increases during no-load operation. The PW3337, PW3336, and PW3335 support a crest factor 6. Therefore, even if the waveform peak value is large relative to the range, accurate measurements are possible without exceeding the range.



Example of Transformer Current Waveform during No-load Operation

## DC Power Measurement for Batteries and Power Supplies





## 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.



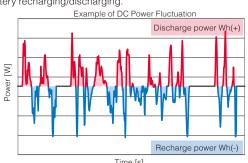


DC power accuracy

## 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.



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

# **Options**

## TYPE 1 Current Sensor (General Current Measurements)



Connect this unit to the current sensor input terminal (BNC) on the PW3337/PW3336. 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	ф 15 mm (0.59 in)	±0.3% rdg. ±0.02% f.s. Within ±1°		
	31	CLAMP ON SENSOR 9661	500 A	40 Hz to 5 kHz	φ 46 mm (1.81 in)	±0.3% rdg. ±0.01% f.s. Within ±0.5°		Not used
Clamp		CLAMP ON SENSOR 9669	1000 A	40 Hz to 5 kHz	φ 55 mm (2.17 in), 80 mm (3.15 in) × 20 mm (0.79 in) BUS BAR	±1.0% rdg. ±0.01% f.s. Within ±1°	3 m (9.84 ft)	
metriou	80	FLEXIBLE CLAMP ON SENSOR CT9667-01			ф 100 mm (3.94 in)		(9.04 11)	AA (LR6) Alkaline Batteries x
	80	FLEXIBLE CLAMP ON SENSOR 500 A/ CT9667-02 5000 A		10 Hz to 20 kHz	ф 180 mm (7.09 in)	±2.0% rdg. ±0.3% f.s. Within ±1°		2 (approx. 7 days) or
		FLEXIBLE CLAMP ON SENSOR CT9667-03			ф 254 mm (10.00 in)			AC ADAPTER 9445-02 (optional)

Options for CT9667-01/-02/-03

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

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

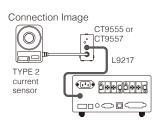
Connect this unit to the current sensor input terminal (BNC) on the PW3337/PW3336/PW3335. SENSOR UNIT CT9555 or CT9557 and CONNECTION CABLE L9217 are required.

7 DW222		
DW222	DW222	DW222
PW333 =	FW333 -	FW333

Wiring method	External appearance	Product name/ model no.	Cord lengths	Rated current	Frequency band	Diameter of measurable conductors	Basic accuracy (amplitude)	Power supply
		CT6862-05	3 m (9.84 ft)		DC to 1 MHz	ф 24 mm (0.94 in)	±0.05% rdg. ±0.01 % f.s.	
	NEW .	CT6872	3 m (9.84 ft)	50 A	DC to 10 MHz	ф 24 mm (0.94 in)	±0.03% rdg. ±0.007 %f.s.	
	NEW NEW	CT6872-01	10 m (32.81 ft)		DO 10 10 WI 12	Ψ 24 ΠΠΠ (0.54 ΠΙ)	±0.00% rug. ±0.007 %i.s.	
		CT6863-05	3 m (9.84 ft)		DC to 500 kHz	ф 24 mm (0.94 in)	±0.05% rdg. ±0.01 %f.s.	
	NEW .	CT6873	3 m (9.84 ft)	200 A	DC to 10 MHz	ф 24 mm (0.94 in)	±0.03% rdg. ±0.007 %f.s.	CT9555 or
Through		CT6873-01	10 m (32.81 ft)		DC to 10 Wil 12	Ψ 24 ΠΠΠ (0.54 Π)	±0.03% lug. ±0.007 %i.s.	
method	NEW S	CT6875A	3 m (9.84 ft)	500 A	DC to 2 MHz	φ 36 mm (1.42 in)	±0.04% rdg. ±0.008 %f.s.	
	NEW	CT6875A-1	10 m (32.81 ft)	300 A	DC to 1.5 MHz			
	NEW	CT6876A	3 m (9.84 ft)	1000 A	DC to 1.5 MHz	ф 36 mm (1.42 in)		
		CT6876A-1	10 m (32.81 ft)	1000 A	DC to 1.2 MHz			
	NEW	CT6877A	3 m (9.84 ft)	2000 A	DC to 1 MHz φ 80 mm (3.15 in)		CT9557	
		CT6877A-1	10 m (32.81 ft)					
	NEW 🦜	CT6841A	3 m (9.84 ft)	20 A	DC to 2 MHz	ф 20 mm (0.79 in)		
	NEW 🦄	CT6843A	3 m (9.84 ft)	200 A	DC to 700 kHz	ф 20 mm (0.79 in)		
Clamp	NEW 🦠	CT6844A	3 m (9.84 ft)	500 A	DC to 500 kHz	ф 20 mm (0.79 in)	±0.2% rdg. ±0.01% f.s.	
method	NEW 🔒	CT6845A	3 m (9.84 ft)	500 A	DC to 200 kHz	ф 50 mm (1.97 in)		
	NEW 🦠	CT6846A	3 m (9.84 ft)	1000 A	DC to 100 kHz	ф 50 mm (1.97 in)		
	9	9272-05	3 m (9.84 ft)	20 A/ 200 A	1 Hz to 100 kHz	ф 46 mm (1.81 in)	±0.3% rdg. ±0.01% f.s.	

Options for Current Sensor TYPE 2

External appearance	Product name/ model no.	Max. no. of sensors	Functions	Power supply	Cord lengths
17.00	SENSOR UNIT CT9555	1	For supplying power to the TYPE 2 current sensor	100 V to 240 V AC	-
2000	SENSOR UNIT CT9557	4	For supplying power to the TYPE 2 current sensor With addition output function	100 V to 240 V AC	-
//	CONNECTION CORD L9217	-	For connecting CT9555/CT9557 and PW3330 series units	-	1.6 m (5.25 ft)



#### Rack Mount Hardware

HIOKI can also manufacture rack mount hardware (EIA, JIS).

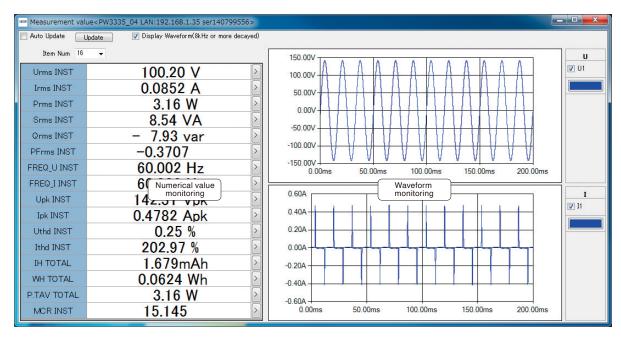
Please contact your Hioki distributor or subsidiary for more information.

## Software

## PW Communicator



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



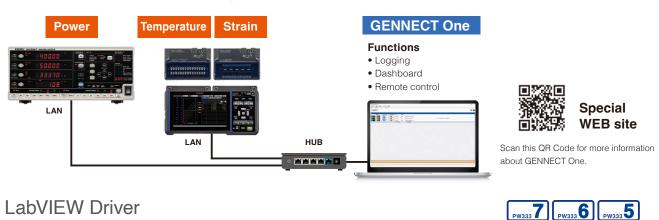




## **GENNECT One SF4000**



Simultaneous measurements in combination with different measuring instruments (e.g., Memory HiLOGGER LR8450 and Power Meter PW3337) are possible. A single PC can be connected to up to 30 measuring instruments via Ethernet, enabling real-time batch display and recording of measurement data, as well as centralized data management.



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.

## 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

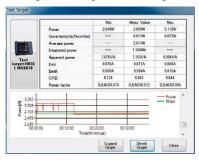
## 1. Connect to power meter

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



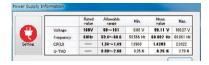
#### 2. Configure the test target

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



## 3. Configure the test power supply

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



#### 4. Configure the test conditions

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



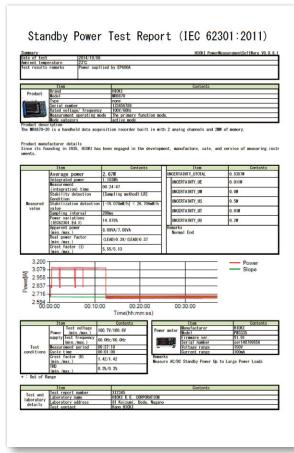
#### 5. Run test

The consumed power is measured according to the configured settings.



#### 6. Create report

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



Example of report output

Model	PW0005				
Serial Number	ser1 40799556				
Firmware Ver	V0.07				
Start Time	2014	7	28	14	32
Voltage Hange	150V				
Current Range	200mA				
Update Rate	200ms				
Algorithm	LR	CA	SP1	SP2	SAE
Stop Factor	Pass[Condition1 (	(R)]			
Valid Period	0	180			
Time(Sec)	Test voltage(V)	Test frequency(Hz)	U-THD(%)	Crest Factor U	Crest Factor I
14.8	99.49	60.002	0.26	1.4202	5.6212
15	99.49	60.002	0.27	1.4199	5.6585
15.2	99.49	60.002	0.25	1.4198	5.6696
15.4	99.49	60.002	0.26	1.4198	5.6834
15.6	99.49	60.002	0.26	1.4198	5.6652
15.8	99.49	60.002	0.26	1.4198	5.6668
16	99.49	60.002	0.26	1.4199	5.6484
16.2	99 49	60 002	0.26	1 4198	5 6675

CSV output example

## Pw333 **6**

# PW3337 and PW3336 Specifications

#### Input Specifications

Input Specificati	ons						
Measurement line	PW3336 series						
type	Single-phase 2-wire (1P2W), Single-phase 3-wire (1P3W),						
	Three-phase 3-wire (3P3W, 3P3W2M)						
	Wiring CH1 CH2						
	1P2W×2	1P2W	1P2W				
	1P3W		3W				
	3P3W		3W				
	3P3W2M	3P3\	N2M				
	PW3337 series						
	Single-phase 2-wire	(1P2W), S	Single-phas	se 3-wire (	1P3W).		
	Three-phase 3-wire						
	Three-phase 4-wire				,,		
	Wiring	CH1	CH2	CH3			
	1P2W×3	1P2W	1P2W	1P2W			
	1P3W&1P2W	1P	3W	1P2W			
	3P3W&1P2W	3P3W		1P2W			
	3P3W2M	3P3W2M					
	3V3A	3V3A					
	3P3W3M	3P3W3M					
	3P4W		3P4W				
Input methods	Voltage Isolated input						
	Current Isolated input, I						
Voltage measurement	AUTO/ 15.000 V/ 30.00				0 V/		
ranges	600.00 V/ 1000.0 V (se						
Current	AUTO/ 200.00 mA/ 500						
measurement	10.000 A/ 20.000 A/ 50						
ranges	For more information al			sensor inp	out, see the		
	external current sensor						
Power ranges	Depends on the combi						
	PW3336: from 3.00						
Input resistance	PW3337: from 3.00 Voltage input terminal		0.00kw (ai 9 MO	so applies	io va, var)		
(FO/GO U-)	Current direct input tor			0			

(50/60 Hz)	Current direct input ter					
Basic Measuren	nent Specifications	S				
	Simultaneous voltage		noling, zero-cross			
	simultaneous calculati		9,			
Sampling frequency	Approx. 700 kHz					
A/D converter	16-bit resolution					
Frequency bands	DC, 0.1 Hz to 100 kHz U1, U2, U3, I1, I2, I3, E					
Synchronization sources	Can be set separately					
Measurement items	· Voltage · Curr		ver · Apparent power			
	Reactive power Pow					
	- Efficiency	· Current int				
	<ul> <li>Active power integrat</li> <li>Voltage waveform pe</li> </ul>		time aveform peak value			
	Voltage crest factor	· Current cr				
	· Time average current	t · Time avera	age active power			
	· Voltage ripple factor	<ul> <li>Current rip</li> </ul>	pple factor			
	Harmonic parameters	:				
	Harmonic voltage RN		current RMS value			
	Harmonic active pow		onic voltage distortion			
		nt distortion · Voltage fu waveform · Active power				
	Apparent power fundament	ntal waveform · Reactive pov	ver fundamental waveform			
	<ul> <li>Power factor fundament</li> </ul>	ental waveform (displa	cement power factor)			
		e difference fundamen				
		fundamental wave pha fundamental wave pha				
	. Harmonic voltage co		current content %			
	· Harmonic active pow					
	The following paramet	ters can be downloade	d as data during PC			
	communication but no		a ao aata aamig i o			
	· Harmonic voltage ph	ase angle · Harmonic	current phase angle			
		rrent phase difference				
Rectifiers	AC+DC: AC+DC meas	surement	a and a was			
	AC+DC Umn: AC+DC	S values for both voltag	e and current			
	Display of average	value rectified RMS co	nverted values for			
		MS values for current				
	DC: DC measurement		a and account			
		verages for both voltag				
	Display of values calculated by (voltage DC value)x (current DC					
			c value)x (current DC			
	value) for active po AC: AC measurement	wer				
	value) for active po AC: AC measurement Display of values co	wer alculated by fo <u>r both vo</u>	oltage and current			
	value) for active po AC: AC measurement Display of values co Display of values co	wer	oltage and current			
	value) for active po AC: AC measurement Display of values co Display of values co for active power	wer alculated by fo <u>r both vo</u>	oltage and current			
	value) for active po AC: AC measurement Display of values co Display of values co for active power FND	wer alculated by fo <u>r both vo</u>	oltage and current value) <sup>2</sup> - (DC value) <sup>2</sup>			
	value) for active po AC: AC measurement Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea	wer alculated by fo <u>r both vo</u> alculated by $\sqrt{(AC+DC)}$ blay of the fundamental	oltage and current value) <sup>2</sup> - (DC value) <sup>2</sup>			
	value) for active po AC: AC measurement Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz	wer alculated by fo <u>r both vous tools</u> alculated by $\sqrt{(AC+DC)}$ blay of the fundamental asurement	oltage and current cvalue) <sup>2</sup> - (DC value) <sup>2</sup> wave component			
Filter	value) for active po AC: AC measurement Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz	wer alculated by fo <u>r both vo</u> alculated by $\sqrt{(AC+DC)}$ blay of the fundamental	oltage and current c value) <sup>2</sup> - (DC value) <sup>2</sup> wave component			
Filter Measurement accuracy	value) for active po AC: AC measurement Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz	wer alculated by fo <u>r both vous tools</u> alculated by $\sqrt{(AC+DC)}$ blay of the fundamental asurement	oltage and current c value) <sup>2</sup> - (DC value) <sup>2</sup> wave component			
Filter Measurement accuracy Voltage	value) for active po AC: AC measurement Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500	wer alculated by for <u>both vc</u> alculated by √(AC+DO blay of the fundamental issurement  Hz, 200 kHz: 0.1 Hz to	oltage and current value) <sup>2</sup> - (DC value) <sup>2</sup> wave component 200 kHz			
Filter Measurement accuracy Voltage Frequency (f)	value) for active po AC: AC measurement Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500	wer  alculated by for both verification alough the fundamental surement  Hz, 200 kHz: 0.1 Hz to  50%f.s.≤ Input < 100%f.s.	oltage and current calue)² - (DC value)² wave component 200 kHz			
Filter Measurement accuracy Voltage Frequency (f) DC	value) for active po AC: AC measurement Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 KHz 500 Hz: 0.1 Hz to 500 Input < 50% f.s. ±0.1%rdg, ±0.1%f.s.	wer  alculated by for both valculated by √(AC+DC)  blay of the fundamental sourement  Hz, 200 kHz: 0.1 Hz to  50%f.s. ≤ Input < 100%f.s. ±0.1%rdg. ±0.1%f.s.	oltage and current c value)² - (DC value)² wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg.			
Filter Measurement accuracy Voltage Frequency (f)	value) for active po AC: AC measurement Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500	wer  alculated by for both verification alough the fundamental surement  Hz, 200 kHz: 0.1 Hz to  50%f.s.≤ Input < 100%f.s.	oltage and current calue)² - (DC value)² wave component 200 kHz			
Filter Measurement accuracy Voltage Frequency (f) DC 0.1Hz ≤ f < 16Hz	value) for active po AC: AC measurement Display of values c: Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 KHz 500 Hz: 0.1 Hz to 500 Input < 50% f.s. ±0.1%rdg, ±0.1%f.s. ±0.1%rdg, ±0.2%f.s. ±0.1%rdg, ±0.2%f.s. ±0.1%rdg, ±0.05%f.s.	wer  alculated by for both volalculated by √(AC+DC)  blay of the fundamental issurement  Hz, 200 kHz: 0.1 Hz to  50%f.s. ≤ Input < 100%f.s. ±0.1%rdg. ±0.1%f.s. ±0.3%rdg.	oltage and current value)² - (DC value)² wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg.			
$\label{eq:filter} Filter \\ \mbox{Measurement accuracy} \\ \mbox{Voltage} \\ \mbox{Frequency (f)} \\ \mbox{DC} \\ \mbox{0.1Hz} \le f < 16 \mbox{Hz} \\ \mbox{16Hz} \le f < 45 \mbox{Hz} \\ \mbox{45Hz} \le f \le 66 \mbox{Hz} \\ \mbox{66Hz} < f \le 500 \mbox{Hz} \\$	value) for active po AC: AC measurement Display of values c: Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mee 500 Hz/200 KHz 500 Hz: 0.1 Hz to 500 Hz: 0.1 Hz to 500 Hz: 0.1 Wrdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s. ±0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.15%f.s. ±0.1%rdg. ±0.15%f.s. ±0.1%rdg. ±0.15%f.s. ±0.1%rdg. ±0.15%f.s.	wer alculated by for both volalculated by √AC+DC blay of the fundamental issurement  Hz, 200 kHz: 0.1 Hz to  50%f.s. ≤ Input < 100%f.s. ±0.1%rdg, ±0.1%f.s. ±0.2%rdg, ±0.2%rdg, ±0.2%rdg, ±0.2%rdg,	value)² - (DC value)²  wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.15%rdg. ±0.2%rdg.			
$Filter \\ \mbox{Measurement accuracy} \\ \mbox{Voltage} \\ \mbox{Frequency (f)} \\ \mbox{DC} \\ \mbox{0.1Hz} \leq f < 16 \mbox{Hz} \\ \mbox{16Hz} \leq f < 45 \mbox{Hz} \\ \mbox{45Hz} \leq f \leq 66 \mbox{Hz} \\ \mbox{500Hz} < f \leq 10 \mbox{Hz} \\ \mbox{500Hz} < f \leq 10 \mbox{Hz} \\ \mbox{500Hz} < f \leq 10 \mbox{Hz} \\ \mbox{600Hz} < f \leq 10 \mbox{MHz} \\ \$	value) for active po AC: AC measurement Display of values c: Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Hz	wer alculated by for both vc alculated by √(AC+DC blay of the fundamental surement  Hz, 200 kHz: 0.1 Hz to  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.	oltage and current value)² - (DC value)² wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.15%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg.			
Filter Measurement accuracy Voltage Frequency (f) DC 0.1Hz ≤ f < 16Hz 16Hz ≤ f < 45Hz 45Hz ≤ f ≤ 66Hz 66Hz < f ≤ 500Hz 500Hz < f ≤ 10kHz 10kHz < f ≤ 50kHz	value) for active po AC: AC measurement Display of values c: Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Input < 50% 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, ±0.1%f.s. ±0.1%rdg, ±0.2%f.s. ±0.5%rdg, ±0.3%f.s.	wer  alculated by for both vc alculated by √(AC+DC  blay of the fundamental surement  Hz, 200 kHz: 0.1 Hz to  50%f.s. ≤ Input < 100%f.s. ±0.1%rdg, ±0.1%f.s. ±0.2%rdg, ±0.25%rdg, ±0.28%rdg, ±0.28%rdg, ±0.38%rdg, ±0.88%rdg,	oltage and current c value)² - (DC value)²  wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg, ±0.3%rdg, ±0.2%rdg, ±0.2%rdg, ±0.2%rdg, ±0.3%rdg, ±0.3%rdg, ±0.8%rdg, ±0.8%rdg, ±0.8%rdg,			
$Filter \\ \mbox{Measurement accuracy} \\ \mbox{Voltage} \\ \hline \mbox{Frequency (f)} \\ \mbox{DC} \\ \mbox{0.1Hz} \le f < 16Hz \\ \mbox{16Hz} \le f < 45Hz \\ \mbox{45Hz} \le f \le 66Hz \\ \mbox{66Hz} < f \le 500Hz \\ \mbox{500Hz} < f \le 10kHz \\ \mbox{50kHz} < f \le 50kHz \\ \mbox{50kHz} < f \le 100kHz \\ \mb$	value) for active po AC: AC measurement Display of values c: Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 KHz 500 Hz: 0.1 Hz to 500 Hz: 0.1 Hz to 500 Hz: 0.1 Hz to 500 Hz: 0.1 Wrdg. ±0.1%f.s. ±0.1%rdg. ±0.2%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. ±0.5%rdg. ±0.3%f.s. ±2.1%rdg. ±0.3%f.s. ±2.1%rdg. ±0.3%f.s.	wer alculated by for both vc alculated by √(AC+DC blay of the fundamental surement  Hz, 200 kHz: 0.1 Hz to  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.	oltage and current value)² - (DC value)² wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.15%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg.			
Filter  Measurement accuracy  Voltage  Frequency (f)  DC  0.1Hz ≤ f < 16Hz 16Hz ≤ f < 45Hz 45Hz ≤ f ≤ 66Hz 66Hz < f ≤ 500Hz 500Hz < f ≤ 10kHz 10kHz < f ≤ 50kHz 20kHz < f ≤ 10kHz	value) for active po AC: AC measurement Display of values c: Display of values c: of active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Hz: 0.1 Hz to 500 Hz: 0.1%rdg. ±0.1%f.s. ±0.1%rdg. ±0.2%f.s. ±0.1%rdg. ±0.05%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. ±0.3%f.s. ±0.1%rdg. ±0.3%f.s. ±2.1%rdg. ±0.3%f.s.	wer alculated by for both valculated by √(AC+DC) alculated by √(AC+DC) blay of the fundamental issurement  Hz, 200 kHz: 0.1 Hz to  50%f.s. ≤ input < 100%f.s. ±0.1%rdg. ±0.1%f.s. ±0.3%rdg. ±0.2%rdg. ±0.25%rdg. ±0.29%rdg. ±0.33%rdg. ±0.38%rdg. ±2.4%rdg.	bitage and current value)² - (DC value)² wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.15%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±2.4%rdg.			
Filter  Measurement accuracy  Voltage  Frequency (f)  DC  0.1Hz ≤ f < 16Hz 16Hz ≤ f < 45Hz 45Hz ≤ f ≤ 66Hz 66Hz < f ≤ 500Hz 500Hz < f ≤ 10kHz 10kHz < f ≤ 50kHz 50kHz < f ≤ 10kHz Current (direct input) Frequency (f)	value) for active po AC: AC measurement Display of values c: Display of values c: Display of values c: of active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Hz: 0.1 Hz t	wer alculated by for both valculated by √(AC+DC alculated by √(AC+DC blay of the fundamental surement  Hz, 200 kHz: 0.1 Hz to  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, ±0.3%rdg, ±0.3%rdg, 50.4%rdg, 50%f.s. ≤ Input < 100%f.s.	value)² - (DC value)²  wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg.			
Filter Measurement accuracy Voltage	value) for active po AC: AC measurement Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Input < 50% f.s. ±0.1%rdg, ±0.1%f.s. ±0.1%rdg, ±0.2%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, ±0.3%f.s. ±2.1%rdg, ±0.3%f.s. ±2.1%rdg, ±0.3%f.s. ±0.1%rdg, ±0.3%f.s. ±0.1%rdg, ±0.3%f.s. ±0.1%rdg, ±0.3%f.s.	wer  alculated by for both verification in the fundamental interpretation	value)² - (DC value)²  wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg, ±0.3%rdg, ±0.2%rdg, ±0.2%rdg, ±0.2%rdg, ±0.2%rdg, ±0.8%rdg, ±0.8%rdg, ±0.4%rdg, ±0.4%rdg, ±0.4%rdg, ±0.4%rdg,			
Filter Measurement accuracy Voltage	value) for active po AC: AC measurement Display of values c: Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Hz: 0.1 Hz	wer  alculated by for <u>both vc</u> alculated by √AC+DO  blay of the fundamental issurement  Hz, 200 kHz: 0.1 Hz to  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, ±0.8%rdg, ±0.8%rdg, ±2.4%rdg,  50%f.s. ≤ input < 100%f.s. ±0.1%rdg, ±0.1%f.s. ±0.1%rdg, ±0.1%f.s. ±0.1%rdg, ±0.1%f.s. ±0.3%rdg,	bitage and current value)² - (DC value)²  wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.15%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±0.4%rdg. ±0.8%rdg. ±0.8%rdg. ±0.8%rdg. ±0.8%rdg. ±0.4%rdg. ±0.4%rdg.			
Filter Measurement accuracy Voltage	value) for active po AC: AC measurement Display of values c: Display of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Input < 50% f.s. ±0.1%rdg, ±0.1%f.s. ±0.1%rdg, ±0.2%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, ±0.3%f.s. ±2.1%rdg, ±0.3%f.s. ±2.1%rdg, ±0.3%f.s. ±0.1%rdg, ±0.3%f.s. ±0.1%rdg, ±0.3%f.s. ±0.1%rdg, ±0.3%f.s.	wer  alculated by for <u>both vc</u> alculated by √(AC+DC  blay of the fundamental surement  Hz, 200 kHz: 0.1 Hz to  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, ±0.8%rdg, ±2.4%rdg.  50%f.s. ≤ Input < 100%f.s. ±0.1%rdg, ±0.1%f.s. ±0.3%rdg, ±2.4%rdg.	value)² - (DC value)²  wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg, ±0.3%rdg, ±0.2%rdg, ±0.2%rdg, ±0.2%rdg, ±0.2%rdg, ±0.8%rdg, ±0.8%rdg, ±0.4%rdg, ±0.4%rdg, ±0.4%rdg, ±0.4%rdg,			
Filter  Measurement accuracy  Voltage  Frequency (f)  DC  0.1Hz ≤ f < 16Hz 16Hz ≤ f < 45Hz 45Hz ≤ f ≤ 66Hz 66Hz < f ≤ 500Hz 500Hz < f ≤ 10kHz 10kHz < f ≤ 50kHz 10kHz < f ≤ 50kHz 0kHz < f ≤ 10kHz 0current (direct input) Frequency (f)  DC 0.1Hz ≤ f < 16Hz 16Hz ≤ f < 45Hz	value) for active po AC: AC measurement Display of values c: Display C: Dis	wer alculated by for <u>both vc</u> alculated by √AC+DC blay of the fundamental issurement Hz, 200 kHz: 0.1 Hz to  50%f.s. ≤ Input < 100%f.s. ±0.1%rdg. ±0.1%f.s. ±0.3%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±2.4%rdg.  50%f.s. ≤ Input < 100%f.s. ±0.1%rdg. ±0.8%rdg. ±0.8%rdg. ±0.8%rdg. ±0.8%rdg. ±0.8%rdg. ±0.8%rdg.	value)² - (DC value)²  wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.3%rdg. ±0.3%rdg. ±0.2%rdg. ±0.4%rdg. ±0.2%rdg. ±0.3%rdg. ±0.8%rdg. ±0.4%rdg.			
Filter  Measurement accuracy  Voltage  Frequency (f)  DC  0.1Hz ≤ f < 16Hz 16Hz ≤ f < 45Hz 45Hz ≤ f ≤ 56Hz 66Hz < f ≤ 500Hz 500Hz < f ≤ 10kHz 10kHz < f ≤ 50kHz 10kHz < f ≤ 50kHz 10kHz < f ≤ 50kHz 50kHz < f ≤ 10kHz 45Hz ≤ f ≤ 66Hz 6Hz ≤ f ≤ 66Hz 6Hz ≤ f ≤ 66Hz 6Hz ≤ f < 45Hz 45Hz ≤ f ≤ 66Hz 66Hz < f ≤ 500Hz 500Hz < f ≤ 10kHz	value) for active po AC: AC measurement Display of values c: Display of values c: Display of values c: Display of values c: Oisplay of values c: Oisplay of values c: FND Extraction and disp. from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Hz: 0.5 Hz to 500 Hz: 0.1 Hz to 1.0 Hz	wer alculated by for <u>both vc</u> alculated by √(AC+DC alculated by √(AC+DC blay of the fundamental surement  Hz, 200 kHz: 0.1 Hz to  50%fs. ≤ Input < 100%fs. ±0.1%rdg. ±0.1%fs. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±2.4%rdg.  50%fs. ≤ Input < 100%fs. ±0.1%rdg. ±0.1%fs. ±0.1%rdg. ±0.1%fs. ±0.1%rdg. ±0.1%fs. ±0.3%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg.	bitage and current value)² - (DC value)²  wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.15%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±0.8%rdg. ±0.3%rdg. ±0.2%rdg. ±0.15%rdg. ±0.3%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg.			
Frequency (f) DC 0.1Hz ≤ f < 16Hz 16Hz ≤ f < 45Hz 45Hz ≤ f ≤ 66Hz 66Hz < f ≤ 500Hz 500Hz < f ≤ 10kHz 10kHz < f ≤ 50kHz 50kHz < f ≤ 10kHz 50kHz < f ≤ 10kHz 0.1 + 10kHz 10kHz 10kHz < f ≤ 64Hz 45Hz ≤ f < 16Hz 16Hz ≤ f < 45Hz 45Hz ≤ f ≤ 66Hz 66Hz < f ≤ 500Hz	value) for active po AC: AC measurement Display of values c: Display of values c: Display of values c: Display of values c: Oisplay of values c: for active power FND Extraction and disp from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Hz	wer alculated by for <u>both vc</u> alculated by √AC+DC blay of the fundamental issurement  Hz, 200 kHz: 0.1 Hz to  50%f.s. ≤ Input < 100%f.s. ±0.1%rdg, ±0.1%f.s. ±0.2%rdg, ±0.2%rdg, ±0.2%rdg, ±0.3%rdg, ±0.8%rdg, ±0.8%rdg, ±0.8%rdg, ±0.8%rdg, ±0.1%rdg, ±0.1%rdg, ±0.1%rdg, ±0.1%rdg, ±0.1%rdg, ±0.1%rdg, ±0.1%rdg, ±0.1%rdg, ±0.15%rdg, ±0.15%rdg, ±0.15%rdg, ±0.2%rdg, ±0.2%rdg,	bitage and current value) <sup>2</sup> - (DC value) <sup>2</sup> wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%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. ±0.15%rdg. ±0.15%rdg. ±0.15%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg.			
Filter  Measurement accuracy  Voltage  Frequency (f)  DC  0.1Hz ≤ f < 16Hz 16Hz ≤ f < 45Hz 45Hz ≤ f ≤ 56Hz 66Hz < f ≤ 500Hz 500Hz < f ≤ 10kHz 10kHz < f ≤ 50kHz 10kHz < f ≤ 50kHz 10kHz < f ≤ 50kHz 45Hz ≤ f ≤ 66Hz 6Hz < f ≤ 50kHz 50kHz < f ≤ 10kHz 10kHz < f ≤ 50kHz 10kHz < f ≤ 50kHz 10kHz < f ≤ 60kHz 10kHz < f ≤ 60kHz 10kHz < f ≤ 60kHz 10kHz < f ≤ 66Hz 10kHz ≤ f < 45Hz 10kHz ≤ f < 45Hz 10kHz ≤ f ≤ 66Hz 10kHz ≤ f ≤ 66Hz 10kHz ≤ f ≤ 500Hz	value) for active po AC: AC measurement Display of values c: Display of values c: Display of values c: Display of values c: Oisplay of values c: Oisplay of values c: FND Extraction and disp. from harmonic mea 500 Hz/200 kHz 500 Hz: 0.1 Hz to 500 Hz: 0.5 Hz to 500 Hz: 0.1 Hz to 1.0 Hz	wer alculated by for <u>both vc</u> alculated by √(AC+DC alculated by √(AC+DC blay of the fundamental surement  Hz, 200 kHz: 0.1 Hz to  50%fs. ≤ Input < 100%fs. ±0.1%rdg. ±0.1%fs. ±0.2%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±2.4%rdg.  50%fs. ≤ Input < 100%fs. ±0.1%rdg. ±0.1%fs. ±0.1%rdg. ±0.1%fs. ±0.1%rdg. ±0.1%fs. ±0.3%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg.	bitage and current value)² - (DC value)²  wave component  200 kHz  100%f.s. ≤ Input ±0.2%rdg. ±0.3%rdg. ±0.15%rdg. ±0.3%rdg. ±0.3%rdg. ±0.8%rdg. ±0.3%rdg. ±0.8%rdg. ±0.3%rdg. ±0.2%rdg. ±0.2%rdg. ±0.15%rdg. ±0.2%rdg. ±0.2%rdg. ±0.3%rdg. ±0.2%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg. ±0.3%rdg.			

Active power	I					
Frequency (f)	Input < 50% f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. ≤ Input			
DC	±0.1%rdg. ±0.1%f.s.	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.			
0.1Hz ≤ f < 16Hz	±0.1%rdg. ±0.2%f.s.	±0.3%rdg.	±0.3%rdg.			
16Hz ≤ f < 45Hz	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.	±0.2%rdg.			
45Hz ≤ f ≤ 66Hz	±0.1%rdg. ±0.05%f.s.	±0.15%rdg.	±0.15%rdg.			
66Hz < f ≤ 500Hz	±0.1%rdg. ±0.1%f.s.	±0.2%rdg.	±0.2%rdg.			
500Hz < f ≤ 1kHz	±0.1%rdg. ±0.2%f.s.	±0.3%rdg.	±0.3%rdg.			
1kHz < f ≤ 10kHz	±(0.03+0.07×F)%rdg.	±(0.23+0.07×F)%rdg.	±(0.23+0.07×F)%rdg.			
	±0.2%f.s.					
10kHz < f ≤ 50kHz	±(0.07×F)%rdg. ±0.3%f.s.	±(0.3+0.07×F)%rdg.	±(0.3+0.07×F)%rdg.			
50kHz < f ≤ 100kHz		±(0.9+0.07×F)%rdg.	±(0.9+0.07×F)%rdg.			
	<ul> <li>Values for f.s. depend on measurement ranges.</li> <li>"F" in the tables refers to the frequency in kHz.</li> <li>Add ±1mA to DC measurement accuracy for current.</li> <li>Add (±1mA) x (voltage read value) to DC measurement accuracy for active power.</li> <li>When using the 200mA or 500mA range, add ±0.1% rdg. to current and active power for which 1kHz &lt; f ≤ 10kHz.</li> <li>Values for voltage, current, and active power for which 0.1Hz ≤ f &lt; 10Hz are for reference only.</li> <li>Values for voltage, current, and active power in excess of 220V or 20A for which 10Hz ≤ f &lt; 16Hz are for reference only.</li> <li>Values for current and active power in excess of 20A for which 500Hz &lt; f ≤ 50kHz are for reference only.</li> <li>Values for current and active power in excess of 15A for which 50kHz &lt; f ≤ 100kHz are for reference only.</li> <li>Values for voltage and active power in excess of 750V for which 30kHz &lt; f ≤ 100kHz are for reference only.</li> </ul>					
Guaranteed accuracy period	1 year					
Maximum effective peak voltage	±600% of each voltag	e range 00 V, and 1000 V range	s +1500 Vneak			
Maximum effective	±600% of each curren		3, ±1000 vpcar			
peak current		ge and 50 A range, ±10	0 Apeak			
Conditions of	Temperature and hum	idity: 23°C ±5°C, 80%	RH or less			
guaranteed	Warm-up time: 30 min					
accuracy	voltage of 0V, af fundamental wa	, power factor of 1, term ter zero adjustment; wit ve satisfies synchroniza	hin range in which the			
Temperature characteristic	±0.03% f.s. per °C or l		0)			
Power factor effects	Internal circuitry voltage	o 66 Hz, at power facto ge/current phase differe				
Effect of common	±0.02% f.s. or less	P. 11. 4				
mode voltage		lied between input term	ninais and enclosure)			
Effect of external	400 A/m, DC and 50/6					
magnetic field interference	Voltage :±1.5% f.s. or less  Current :±1.5% f.s. or ±10 mA, whichever is greater, or less  Active power :±3.0% f.s. or (voltage influence quantity) × (±10 mA),  whichever is greater, or less					
Magnetization effect	±10 mA equivalent or (after inputting 100 A I	less DC to the current direct	input terminals)			
Adjacent channel	±10 mA equivalent or		<del></del>			
input effect	(when inputting 50 A to	o adjacent channel)				

Voltage/ Current/ Active Power Measurement Specifications

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

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

Wiring		X: U(Voltage) or I(Current)	P (Active power)
All channels	1P2W	X(i)	P(i)
	1P3W 3P3W	$X_{sum} = \frac{1}{2}(X_{(1)} + X_{(2)})$	$Psum = (P_{(1)} + P_{(2)})$
Sum	3P3W2M		
values 3	3V3A	$Xsum = \frac{1}{3} (X_{(1)} + X_{(2)} + X_{(3)})$	Psum = (P(1) + P(2) + P(3))
	3P3W3M		7 Sum = (1 (1) 1 1 (2) 1 1 (3))
	3P4W		

( i ): Measurement channel

Voltage Waveform Pe	ak Value / Current Waveform Peak Value Measurement Specifications
Measurement	Measures the waveform's peak value (for both positive and

Micasurcincin		wicasures the waveloring peak value (for both positive and									
method	negative polarity) based on sampled instantaneous voltage values.										
Sampling frequency	Approx. 700 kHz										
Voltage peak range											
Voltage range	15V	30V	60'	V	15	0V	3	00V		600V	1000V
Voltage peak range	90.000V	180.00	V 360.0	)OV	900	.00V	1.8	000kV	3.	6000kV	6.0000kV
Current peak range											
Current range		500mA	1A		2A	5 <i>A</i>		10A		20A	50A
Current peak range	1.2000A	3.0000A	6.0000A	12.0	A000	30.00	)0A	60.000	AC	120.00A	A00.00A
Measurement	Same as	the volta	age or c	urre	nt me	easur	eme	ent ac	cu	racy at	DC and
accuracy	when 10	$Hz \le f \le$	1 kHz (f	.s.: ۱	voltag	ge pe	ak ı	range	or	current	peak
	range). P	rovided	as refer	enc	e vali	ie wł	nen	0.1 Hz	2 ≤	f < 10 F	iz and
	when in e	excess c	of 1 kHz.								
Effective	±5% to ±	100% of	f voltage	pea	ak rai	nge (	up t	o ±150	00	V) or	
measuring range	±5% to ±	100% of	f current	pea	ak rar	nge (i	up to	o ±100	A C	()	
Display range	±0.3% to	±102%	of voltage	ge p	eak i	range	e or	currer	nt p	oeak rai	nge
	(values le	ss than	±0.3%	are:	subje	ct to	zer	o-sup	pre	ession)	-

#### Voltage Crest Factor/ Current Crest Factor Measurement Specifications

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

Measurement method		Calculates the A	AC com	ponent	(peak t	rement Specification o peak [peak width]) as C component	
Effective		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					
measuring Display ra		0.00[%] to 500.		value e	errective	e measurement ranges	
Polarity		None					
			wer Fac	tor/ Pha	ise Ang	le Measurement Specifi	cations
Measurer types	nent			Power/ F	ower Fac	tor : AC+DC, AC, FND, AC+E	OC Umn
Effective measuring range Display range			urrent, a			effective measurement ra	
		Apparent Power/ Reactive Power   : 0% to 196% of the range (no zero-suppression)   : ±0.0000 to ±1.0000   Phase Angle   : ±180.00 to -180.00					
Polarity		voltagé wavefo	gned a	ccording	to the and the	Angle lead/lag relationship of the current waveform rising polarity display)	
		- : When cu	urrent le	eads vo	Itage	polarity display)	
	nannel an ring	d sum value ca			nulas	Q: Reactive power	
All channels		$S_{(i)} = U_{(i)} \times$		WCI		$Q(i) = si(i)\sqrt{S(i)^2 - P(i)^2}$	
	1P3W	$S_{sum} = S_{(1)} +$	S <sub>(2)</sub>			,, <b>\</b>	
Sum	3P3W	$S_{sum} = \frac{\sqrt{3}}{2} (S_{(1)})$		)		$Q_{sum} = Q_{(1)} + Q_{(2)}$	
values	3P3W2M 3V3A	$S_{sum} = \frac{\sqrt{3}}{3} (S_{(1)})$				Sum (1) (2)	
	3P3W3M 3P4W	$S_{sum} = S_{(1)} +$				$Q_{\text{sum}} = Q_{(1)} + Q_{(2)} + Q_{(3)}$	)
i): Meas	urement ch					. , (-) (0)	
Wir	ring	<b>λ</b> : Pov	wer fact	or		$\phi$ : Phase angle	
All channels			$Si(i) \frac{P(i)}{S(i)}$		$\top$	$\phi(i) = si(i) \cos^{-1}l \lambda(i)l$	,
	1P3W		<b>O</b> (i)	1	W	nen Psum≥0	
Sum	3P3W 3P3W2M	λ sum -	Sisum Psu	ım		$\Phi_{\text{sum}} = \text{Sisum } \cos^{-1}  \lambda_{\text{sum}} $ $(0^{\circ} \text{ to})$	±90°)
values	3V3A 3P3W3M	7.50011 — 5	Ssu Ssu	m		nen P <sub>sum ≥ 0</sub> Ф <sub>sum = Sisum</sub>   180 - cos <sup>-1</sup>	λsuml
i ): Measu	3P4W	nnel; The polarity	symhol	sisum is			±180°)
		surement Sp	•				
Number of n	neasurement						
channels Measureme	nt source	Select from U (\	/Hz) or	I (AHz)	by cha	nnel	
Measureme	nt method	Calculated from input waveform period (reciprocal method)					
Measureme					m perio	d (reciprocal method)	
		500 Hz/ 200 kH	z (linke	d to zer	m perio o-cross	d (reciprocal method)	
Measureme Effective r		500 Hz/ 200 kH ±0.1% rdg. ±1 c 0.1 Hz to 100 kH	z (linke lgt. (0°0 lz	d to zer C to 40°	m perio o-cross C)	d (reciprocal method)	
Measureme Effective r	nt accuracy	500 Hz/ 200 kH ±0.1% rdg. ±1 c 0.1 Hz to 100 kH For sine wave in	z (linke lgt. (0°0 lz nput tha	d to zer C to 40° at is at le	m perio o-cross C)	d (reciprocal method)	
Measureme Effective r range	nt accuracy measuring	500 Hz/ 200 kH ±0.1% rdg. ±1 c 0.1 Hz to 100 kH For sine wave ir source's measu Measurement lo	z (linke dgt. (0°0 Hz nput tha rement wer limi	cd to zer C to 40° at is at le range. it freque	m perio o-cross C) east 209	d (reciprocal method) if filter) % of the measurement ting: 0.1 sec. / 10	
Measureme Effective r range	nt accuracy measuring	500 Hz/ 200 kH ±0.1% rdg. ±1 c 0.1 Hz to 100 kH For sine wave ir source's measu Measurement lo 0.1000 Hz to 9.999	z (linke dgt. (0°0 Hz nput tha rement wer limi 99 Hz, 9.	to to zer to 40° at is at le range. it freque	m perio o-cross C) east 209 ency set	d (reciprocal method) filter) % of the measurement	,
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Scaling	Applies user-defined VT and CT ratio set	
(VT, CT)	These settings can be configured separa VT ratio setting range : OFF (1.0), 0.1	to 1000 (setting: 0000)
		01 to 1000 (setting: 0000)
HOLD	· Stops display updates for all measured	
(HOLD)	display values at that point in time.  · Measurement data acquired by community.	niantiana ia alaa fiyad at
	that point in time.	ilications is also lixed at
	· Internal calculations (including integration	on and integration elapsed
	time) will continue.	not hold
Maximum value/	<ul> <li>Analog output and waveform output are</li> <li>Detects maximum and minimum measure</li> </ul>	
minimum value	maximum and minimum values for the v	
hold	waveform peak and holds them on the d	
(MAX/MIN HOLD)	<ul> <li>For data with polarity, display of the max value for the data's absolute values is he</li> </ul>	
	and negative polarity values are shown)	
	· Internal calculations (including integration	on and integration elapsed
	time) will continue.  · Analog output and waveform output are	not held
Zero Adjustment	Degausses the current input unit DCCT a	
(0 ADJ)	current input offset.	
Key-lock (KEY LOCK)	Disables key input in the measurement st key and KEY LOCK key.	ate, except for the SHIFT
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. Communicat	
	(communications speed, address, and LAN-rela	ted settings) are not initialized.
Integration Mea	surement Specifications	
Measurement items	Simultaneous integration of the following 6 pa	rameters for each channel
	(total of 18 parameters):	and Alexander and Albertan
	Sum of current integrated values (displayed Positive current integrated value (displayed	
	Negative current integrated value (displayed	
	Sum of active power integrated values (displ	ayed as Wh on panel display)
	Positive active power integrated value (displaye	
Measurement types	Negative active power integrated value (displementations) Rectifiers: AC+DC, AC+DC Umn	ayou as wiir on parter display)
wicasurement types	Current:	
	Displays the result of integrating co	
	(display values) once every display 200 ms) as an integrated value.	update interval (approx.
	Active power:	
	Displays the result of integrating ac	ctive power values
	by polarity calculated once every	
	synchronization source as integrat Rectifier: DC	ed values.
	Displays the result of integrating instan	taneous data obtained by
	sampling both current and active power	er by polarity as integrated
	values (When the active power contain DC component will not be integrated)	
Integration time	1 min. to 10000 hr., settable in 1 min. blo	
Integration time accuracy	±100 ppm ±1 dgt. (0°C to 40°C)	
Integration	(Current or active power measurement accu	racy) + (±0.01% rdg. ±1 dgt.)
measurement accuracy Effective measuring range	Until PEAK OVER U or PEAK OVER I occ	ure
Display resolution	999999 (6 digits + decimal point)	
Functions	· Stopping integration based on integration	
	Displaying the integration elapsed time (displaying the integration by repeatedly starting by repeated by rep	
	<ul> <li>Additional integration by repeatedly star</li> <li>Backing up integrated values and the integration el</li> </ul>	
	· Stopping integration when power return	S
External control	Stopping/starting integration and resetting integrated	
Measuring range	Corresponds to the range set for START	
Harmonic Meas	urement Specifications (built-in f	
Measurement	· Zero-cross simultaneous calculation me	
method	by channel according to the wiring mode. Uniform thinning between zero-cross ev	
	a digital antialiasing filter	onto artor processing with
	· Interpolation calculations (Lagrange inte	
	<ul> <li>When the synchronization frequency falls wit</li> <li>IEC 61000-4-7:2002 compliant</li> </ul>	nin the 45 Hz to 66 Hz range
	Gaps and overlaps may occur if the measurement	
		nt frequency is not 50 Hz or 60 Hz
	When the synchronization frequency falls out	nt frequency is not 50 Hz or 60 Hz
Synchronization course	» No gaps or overlap will occur	nt frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range
Synchronization source Measurement channels		nt frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range
Measurement channels	<ul> <li>No gaps or overlap will occur</li> <li>Conforms to synchronization source (SYNC) for the base</li> <li>Harmonic voltage RMS value</li> </ul> Harmonic voltage RMS value	at frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range vasic measurement specifications nic voltage content %
Measurement channels	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to a Harmonic voltage RMS value Harmonic voltage phase angle Harmonic voltage phase angle	nt frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range pasic measurement specifications nic voltage content % nic current RMS value
Measurement channels	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3 - Harmonic voltage RMS value - Harmonic voltage phase angle - Harmonic current content % - Harmonic voltage hase angle - Harmonic voltage phase angle - Harmonic voltage phase angle - Harmonic voltage phase angle	nt frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range wasic measurement specifications nic voltage content % nic current RMS value nic current phase angle
Measurement channels	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3 - Harmonic voltage RMS value - Harmonic voltage phase angle - Harmonic current content % - Harmonic voltage hase angle - Harmonic voltage phase angle - Harmonic voltage phase angle - Harmonic voltage phase angle	nt frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range vasic measurement specifications nic voltage content % nic current RMS value nic current phase angle nic active power content %
Measurement channels	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3  - Harmonic voltage RMS value Harmonic voltage phase angle Harmonic Harmonic current content % - Harmonic active power Harmonic voltage current phase difference - Total harmonic voltage current distortion - Voltagy	nt frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range hasic measurement specifications nic voltage content % nic current RMS value nic current phase angle nic active power content % armonic voltage distortion e fundamental waveform
Measurement channels	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3  - Harmonic voltage RMS value - Harmonic voltage phase angle - Harmonic current content % - Harmonic active power - Harmonic voltage current phase difference - Total harmonic current distortion - Current fundamental waveform - Active	nt frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range easic measurement specifications nic voltage content % nic current RMS value nic current phase angle nic active power content % armonic voltage distortion e fundamental waveform power fundamental waveform
Measurement channels	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3  - Harmonic voltage RMS value Harmonic voltage phase angle Harmonic Harmonic current content % - Harmonic active power Harmonic voltage current phase difference - Total harmonic voltage current distortion - Voltagy	nt frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range easic measurement specifications nic voltage content % nic current RMS value nic current phase angle nic active power content % armonic voltage distortion e fundamental waveform power fundamental waveform
Measurement channels	No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3  Harmonic voltage RMS value Harmonic voltage phase angle Harmonic current content % Harmonic voltage current phase difference Harmonic voltage current distortion Hortal harmonic current distortion  Voltage Current fundamental waveform Apparent power fundamental waveform Power factor fundamental waveform Voltage current phase difference fundamental  Voltage  Voltage  Active  Apparent power fundamental waveform  Power factor fundamental waveform  Voltage current phase difference fundamental  Voltage fundamental  V	and frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range easic measurement specifications nic voltage content % nic current RMS value nic current phase angle nic active power content % armonic voltage distortion e fundamental waveform power fundamental waveform expower fundamental waveform expertage of the state of the
Measurement channels	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the transcription to the transcription transcription to the transcription tran	nt frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range basic measurement specifications inic voltage content % nic current RMS value nic current phase angle nic active power content % armonic voltage distortion e fundamental waveform power fundamental waveform e power fundamental waveform hase difference
Measurement channels	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the transcription of transcription of the transcription of transcription of the transcription of tran	at frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range basic measurement specifications.  Inic voltage content % nic current RMS value nic current phase angle nic active power content % armonic voltage distortion to the fundamental waveform power fundamental waveform the power fundamental waveform whase difference thase difference thase difference thase difference.
Measurement channels	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3  - Harmonic voltage RMS value - Harmonic Harmonic voltage phase angle - Harmonic current content % - Harmonic voltage current phase difference - Total harmonic voltage current distortion - Total harmonic outrent current distortion - Active - Apparent power fundamental waveform - Power factor fundamental waveform - Voltage current phase difference fundam - Interchannel voltage fundamental wave pinterchannel current fundamental wave pinterchannel current fundamental wave pinterchannel current fundamental wave pommunication but not displayed:	at frequency is not 50 Hz or 60 Hz or 60 Hz or 60 Hz range basic measurement specifications inic voltage content % nic current RMS value nic active power content % armonic voltage distortion voltage volta
Measurement channels	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the transport of transpo	and trequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range basic measurement specifications.  Inic voltage content % notic current RMS value nic current phase angle nic active power content % armonic voltage distortion to the fundamental waveform power fundamental waveform to power fundamental waveform whase difference whase difference ded as data during PC onic current phase angle
Measurement channels Measurement items	No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3  Harmonic voltage RMS value Harmonic voltage phase angle Harmonic current content % Harmonic outlage current phase difference Harmonic outlage current distortion Total harmonic current distortion Voltage Current fundamental waveform Apparent power fundamental waveform Voltage current phase difference fundam Interchannel voltage fundamental wave p Interchannel current fundamental wave p The following parameters can be downloacommunication but not displayed: Harmonic voltage phase angle Harmonic voltage phase angle Harmonic voltage current phase difference Harmonic voltage current phase difference	and trequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range basic measurement specifications.  Inic voltage content % notic current RMS value nic current phase angle nic active power content % armonic voltage distortion to the fundamental waveform power fundamental waveform to power fundamental waveform whase difference whase difference ded as data during PC onic current phase angle
Measurement channels Measurement items	No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3  Harmonic voltage RMS value Harmonic voltage phase angle Harmonic current content % Harmonic voltage current phase difference Harmonic voltage current phase difference Harmonic voltage current distortion Current fundamental waveform Apparent power fundamental waveform Voltage current phase difference fundam Interchannel voltage fundamental wave p The following parameters can be downloacommunication but not displayed: Harmonic voltage phase angle Harmonic voltage current phase difference Harmonic voltage phase angle Harmonic voltage current phase difference Harmonic voltage current phase difference Harmonic voltage phase angle Harmonic voltage current phase difference Harmonic voltage current phase difference	and trequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range basic measurement specifications.  Inic voltage content % notic current RMS value nic current phase angle nic active power content % armonic voltage distortion to the fundamental waveform power fundamental waveform to power fundamental waveform shase difference whase difference ded as data during PC onic current phase angle
Measurement channels Measurement items	No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3  Harmonic voltage RMS value Harmonic voltage phase angle Harmonic current content % Harmonic outlage current phase difference Harmonic outlage current distortion Total harmonic current distortion Active Apparent power fundamental waveform Active Apparent power fundamental waveform Voltage current phase difference fundam Interchannel voltage fundamental wave p The following parameters can be downloacommunication but not displayed: Harmonic voltage phase angle Harmonic voltage current phase differen 32 bits 4096 Rectangular	and the frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range basic measurement specifications.  Inic voltage content % nic current RMS value nic current phase angle nic active power content % armonic voltage distortion e fundamental waveform power fundamental waveform power fundamental waveform sental waveform on the fundamental waveform base difference hase difference and as data during PC onic current phase angle ce
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Measurement channels Measurement items  FFT processing word length Number of FFT points Window function	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the transport of transport o	and trequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range static measurement specifications.  In the static measurement specifications are static measurement specifications.  In the static measurement specifications are static measurement shall be static measurement. The static measurement is a static measurement of the static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the st
Measurement channels Measurement items  FFT processing word length Number of FFT points Window function Analysis window width	No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3      Harmonic voltage RMS value Harmonic voltage phase angle Harmonic current content %     Harmonic current content % Harmonic active power Harmonic voltage current phase difference Total harmonic voltage current distortion      Current fundamental waveform Apparent power fundamental waveform Power factor fundamental waveform Voltage current phase difference fundam Interchannel voltage fundamental wave p Interchannel current fundamental wave p The following parameters can be downloacommunication but not displayed: Harmonic voltage phase angle Harmonic voltage current phase difference 12 bits 12 bits 13 bits 14 c ≤ 6 < 6 Hz: 178.57 ms to 222.22 m Frequencies other than the above: 185.92 m	and trequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range static measurement specifications.  In the static measurement specifications are static measurement specifications.  In the static measurement specifications are static measurement shall be static measurement. The static measurement is a static measurement of the static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the st
Measurement channels Measurement items  FFT processing word length Number of FFT points Window function Analysis window	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the transport of transport o	and trequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range static measurement specifications.  Inic voltage content % nic current RMS value nic active power content % armonic voltage distortion of fundamental waveform power fundamental waveform some fundamental waveform shase difference thase difference dided as data during PC onic current phase angle ce
Measurement channels Measurement items  FFT processing word length Number of FFT points Window function Analysis window width  Data update rate	» No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3  - Harmonic voltage RMS value - Harmo - Harmonic voltage phase angle - Harmo - Harmonic current content % - Harmonic active power - Total harmonic outrent phase difference - Total harmonic ourrent distortion - Voltage - Total harmonic ourrent distortion - Active - Apparent power fundamental waveform - Active - Power factor fundamental waveform - Reactive - Power factor fundamental waveform - Harmonic - Total harmonic outrent phase difference fundamental wave properties of the pr	and trequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range static measurement specifications.  In the static measurement specifications are static measurement specifications.  In the static measurement specifications are static measurement shall be static measurement. The static measurement is a static measurement of the static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the static measurement is static measurement. The static measurement is static measurement in the st
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FFT processing word length Number of FFT points Window function Analysis window width Data update rate Synchronization frequency range	No gaps or overlap will occur Conforms to synchronization source (SYNC) for the the synchronization frequency (SYNC) for th	and trequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range static measurement specifications assic measurement specifications on the courrent RMS value on the courrent RMS value of the courrent phase angle of the courrent phase difference of the courrent phase difference of the courrent phase difference of the courrent phase angle of the course of the cours
FFT processing word length Number of FFT points Window function Analysis window width Data update rate Synchronization frequency range Maximum	No gaps or overlap will occur Conforms to synchronization source (SYNC) for the to 3      Harmonic voltage RMS value Harmonic voltage phase angle Harmonic current content % Harmonic current content % Harmonic outree power Harmonic outree power Harmonic voltage current phase difference Total harmonic current distortion Voltage Current fundamental waveform Apparent power fundamental waveform Woltage current phase difference fundam Interchannel voltage fundamental wave p Interchannel current fundamental wave p Harmonic voltage current phase difference fundam Current fundamental wave p Harmonic voltage fundamental wave p The following parameters can be downloacommunication but not displayed: Harmonic voltage phase angle Harmonic voltage current phase difference Harmonic voltage current phase difference Harmonic voltage current phase difference Harmonic voltage base angle Harmonic voltage current phase difference Harmonic voltage phase angle Ha	and frequency is not 50 Hz or 60 Hz or 60 Hz or 60 Hz or 60 Hz range static measurement specifications inc voltage content % on current RMS value or current phase angle or cative power content % armonic voltage distortion or fundamental waveform power fundamental waveform the power fundamental waveform or content waveform or
FFT processing word length Number of FFT points Window function Analysis window width Data update rate Synchronization frequency range Maximum	» No gaps or overlap will occur  Conforms to synchronization source (SYNC) for the to 3  - Harmonic voltage RMS value Harmonic voltage phase angle Harmonic voltage phase angle Harmonic voltage phase angle Harmonic voltage current content %  - Harmonic voltage current ghase difference Total harmonic voltage current stortion Voltage.  - Total harmonic current distortion Voltage.  - Current fundamental waveform Apparent power fundamental waveform  - Voltage current phase difference fundam Interchannel voltage fundamental wave promount of the properties of the proper	asic measurement specifications  nic voltage content % nic current RMS value nic current RMS value nic active power content % armonic voltage distortion e fundamental waveform power fundamental waveform shase difference thase difference ded as data during PC unic current phase angle ce  Analysis order 50th 50th 50th 50th
FFT processing word length Number of FFT points Window function Analysis window width Data update rate Synchronization frequency range Maximum	<ul> <li>No gaps or overlap will occur</li> <li>Conforms to synchronization source (SYNC) for the total synchronization synchronization source (SYNC) for the total synchronization synch</li></ul>	and trequency is not 50 Hz or 60 Hz or 60 Hz or 60 Hz or 60 Hz range static the 45 Hz to 66 Hz range static measurement specifications in courtent PMS value nic current PMS value nic current phase angle nic active power content % armonic voltage distortion of fundamental waveform owner fundamental waveform the power fundamental waveform th
FFT processing word length Number of FFT points Window function Analysis window width Data update rate Synchronization frequency range Maximum	<ul> <li>No gaps or overlap will occur</li> <li>Conforms to synchronization source (SYNC) for the the synchronization harmonic outrent content %</li> <li>Harmonic current content %</li> <li>Harmonic behavior of the synchronization of the synchronization over the synchronization out the synchronization but not displayed:</li> <li>Harmonic voltage phase angle of the synchronization out not displayed:</li> <li>Harmonic voltage phase angle of the synchronization out not displayed:</li> <li>Harmonic voltage phase angle of the synchronization out the synchronization frequency (f) range to the synchronization frequency (f) range to the synchronization frequency (f) range to the synchronization frequency (f) range for the s</li></ul>	nt frequency is not 50 Hz or 60 Hz side the 45 Hz to 66 Hz range static measurement specifications.  Inic voltage content % nic current RMS value nic current phase angle nic active power content % armonic voltage distortion e fundamental waveform power fundamental waveform the power fundamental waveform shase difference dided as data during PC short current phase angle ce.  In (10 cycles) as (12 cycles) as (12 cycles) as to 214.08 ms.  Analysis order  50th 50th 50th 50th 50th 50th 25th
FFT processing word length Number of FFT points Window function Analysis window width Data update rate Synchronization frequency range Maximum	<ul> <li>No gaps or overlap will occur</li> <li>Conforms to synchronization source (SYNC) for the total synchronization synchronization source (SYNC) for the total synchronization synch</li></ul>	and trequency is not 50 Hz or 60 Hz or 60 Hz or 60 Hz or 60 Hz range static the 45 Hz to 66 Hz range static measurement specifications in courtent PMS value nic current PMS value nic current phase angle nic active power content % armonic voltage distortion of fundamental waveform owner fundamental waveform the power fundamental waveform th



PW333 PW333	6	
Analysis order	2nd to 50th	
upper limit setting		
Measurement	f.s.: Measurement range	
accuracy	Frequency (f)	Voltage, Current, Active power
	DC	±0.4%rdg.±0.2%f.s.
	10 Hz ≤ f < 30 Hz	±0.4%rdg.±0.2%f.s.
	30 Hz ≤ f ≤ 400 Hz	±0.3%rdg.±0.1%f.s.
	400 Hz < f ≤ 1 kHz	±0.4%rdg.±0.2%f.s.
	1 kHz < f ≤ 5 kHz	±1.0%rdg.±0.5%f.s.
	5 kHz < f ≤ 8 kHz	±4.0%rdg.±1.0%f.s.
	For DC, add ±1 mA to current and (±1 mA	(voltage read value) to active power.
Display Specific	ations	
Display	7-segment LED	
Number of display parameters	4	
Display resolution	Other than integrated values: 999	999 count
	Integrated values: 999999 count	
Display update rate	200 ms to 20 s (varies with numb	er of averaging iterations setting)
Synchronized C	ontrol	
Functions	Timing of calculations, display updates, data	a updates, integration start/stop/reset

events, display hold operation, key lock operation, and zero-adjustment operation for the secondary PW3336/PW3337 are synchronized with the primary PW3336/PW3337. Terminal BNC terminal × 1 (non-isolated) Terminal name **EXT SYNC** EXT SYNC

Off: Synchronized control function off
In: The EXT SYNC terminal is set to input, and a dedicated synchronization signal can be input (secondary).

Out: The EXT SYNC terminal is set to output, and a dedicated synchronization signal can be output (primary).

1 primary unit and 7 secondary units (total 8 units) I/O settings Number of units for which synchronized control can be performed

External Current Sensor Input Specifications (built-in feature)

Terminal	Isolated BNC terminals	s, 1 for each channel			
Current sensor	Off / Type 1 / Type 2				
type switching	When set to off, input from	the external current sensor	r input terminal is ignored.		
Current sensor	TYPE1 (100 A to 5000 A senso	rs)			
options		9669, CT9667-01/-02/-03			
	TYPE2 (20 A to 2000 A sensor	s, Power supply is required to u	se)		
	CT6862-05,	CT6863-05, CT6872, CT6872-0	01, CT6873, CT6873-01,		
	CT6875A, CT6875A-1, CT6876A, CT6876A-1, CT6877A, CT6877A-1,				
	9272-05, CT6841A, CT6843A, CT6844A, CT6845A, CT6846A				
Current		A (range noted on pane			
measurement	User-selectable for ea	ch wiring mode. Can be	e read directly by		
range	manually setting the CT ratio.				
Power range		ination of voltage and o			
configuration	60.000W to 15.000MW (also applies to VA, var)				
Measurement accuracy					
Current, Active power					
Frequency	Input < 50%f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. < Input		

Power factor effects

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

- f.s.: Each measurement range
  •To obtain the current or active power accuracy, add the current sensor's accuracy to the above current and active power accuracy figures.

  •The effective measurement range and frequency characteristics conform to the current sensor's specifications.

Values for current, and active power for which

0.1 Hz ≤ f < 10 Hz are for reference only.

•Values for voltage in excess of 220 V active power for which

10 Hz ≤ f < 16 Hz are for reference only.

Current, active power:

±0.08% f.s./°C (instrument temperature coefficient;

f s : instrument measurement rance)

Temperature characteristics

f.s.: instrument measurement range)
Add current sensor temperature coefficient to above.

Instrument: ±0.15% f.s. or less (45 Hz to 66 Hz with power factor = 0)
Internal circuit voltage/current phase difference: ±0.086°

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

(External current sensor input instrument accuracy) + (±2.0% f.s.) (f.s.:current peak range) Current peak value measurement Add the current sensor accuracy to the above. accuracy

 $\begin{array}{llll} \text{Add the current sensor accuracy to the above.} \\ \hline \text{Frequency} & \text{Voltage} & \text{Current, Active power} \\ \hline \text{DC} & \pm 0.4 \text{wrdg}, \pm 0.2 \text{wf.s.} & \pm 0.6 \text{wrdg}, \pm 0.8 \text{wf.s.} \\ \hline 10 \text{Hzc} \neq \text{c} & 30 \text{Hz} & \pm 0.4 \text{wrdg}, \pm 0.2 \text{wf.s.} & \pm 0.6 \text{wrdg}, \pm 0.4 \text{wf.s.} \\ \hline 30 \text{Hzc} \leq \text{f} & 400 \text{Hz} & \pm 0.3 \text{wrdg}, \pm 0.18 \text{f.s.} & \pm 0.5 \text{wrdg}, \pm 0.3 \text{wf.s.} \\ \hline 400 \text{Hz} & \text{f} & \text{c} & \text{fkHz} & \pm 0.4 \text{wrdg}, \pm 0.2 \text{wf.s.} & \pm 0.6 \text{wrdg}, \pm 0.5 \text{wf.s.} \\ \hline 1 \text{kHz} & \text{c} & \text{f} & \text{s} & \text{kHz} & \pm 1.0 \text{wrdg}, \pm 0.5 \text{wf.s.} \\ \hline 2 \text{kHz} & \text{c} & \text{f} & \text{s} & \text{kHz} & \pm 4.0 \text{wrdg}, \pm 0.5 \text{wf.s.} \\ \hline 2 \text{kHz} & \text{c} & \text{f} & \text{s} & \text{kHz} & \pm 4.0 \text{wrdg}, \pm 1.0 \text{wf.s.} & \pm 2.0 \text{wrdg}, \pm 6.0 \text{wf.s.} \\ \hline \end{array}$ Harmonic measurement accuracy f.s.: Each measurement range
•To obtain the current or active power accuracy, add the current sensor's

accuracy to the above current and active power accuracy figures

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

Number of	16
output channels	
Configuration	16-bit D/A converter (polarity + 15 bits)
Output parameters	U1 to U3 (voltage level) or u1 to u3 (instantaneous voltage waveform) (switchable) I1 to 13 (current level) or i1 to i3 (instantaneous current waveform) (switchable) P1 to P3 (active power level) or p1 to p3 (instantaneous power waveform) (switchable) Psum (active power level) or Hi-Psum (high-speed active power level) (switchable) Psum and Hi-Psum output is not available (0 V) when using the 1P2W wiring mode.P12 is output when using 1P3W, 3P3W, or 3P3W2M, and P123 is output when using 3V3A, 3P3W3M, or 3P4W. D/A1 to D/A3  : Select any 3 from channel or sum value for Voltage, Current, Active power, Apparent power, Reactive power, Power factor, Phase angle, Total harmonic voltage/current fistortion, Inter-channel voltage/current fundamental wave phase difference, Voltage/current rest factor, Time average current/factive power, Voltage/current ripple rate, Frequency, Efficiency, Current integration, Active power integration (Harmonic output is not available for individual orders). Hi-P1 to Hi-P3 and Hi-Psum (high-speed active power level): Fixed to AC+DC HC or other level output, select AC+DC, AC+DC Umn, DC, AC, or fnd.

Output accuracy	f.s.: Relative to the output voltage rated value for each output parameter
	Level output
	: (Output parameter measurement accuracy) + (±0.2% f.s.)
	High-speed active power level output
	: (Output parameter measurement accuracy) + (±0.2% f.s.)
	Instantaneous waveform output
	: (Output parameter measurement accuracy) + (±1.0% f.s.)
	Instantaneous voltage, instantaneous current: RMS value level
	Instantaneous power: Average value level
Output frequency	Instantaneous waveform output, high-speed active power level output
band	At DC or 10 Hz to 5 kHz, accuracy is as defined above.
Output voltage	Level output
Catpat voltage	Voltage, Current, Active power, Apparent power,
	Reactive power, Time average current/active power
	: ±2 V DC for ±100% of range
	Power factor
	: ±2 V DC at ±0.0000, 0 V DC at ±1.0000
	Phase angle
	: 0 V DC at 0.00°, ±2 V DC at ±180.00°
	Voltage/current ripple rate, total harmonic voltage/current distortion
	: + 2 V DC at 100.00%
	Voltage/current crest factor
	: +2 V DC at 10.000
	Frequency
	: Varies with measured value.
	+2 V DC per 100 Hz from 0.1000 Hz to 300.00 Hz
	+2 V DC per 100 Hz from 300.01 Hz to 300.00 Hz
	+2 V DC per 100 kHz from 30.001 kHz to 220.00 kHz
	Efficiency
	: +2 V DC at 200.00%
	Current integration, active power integration
	: ±5 V DC at (range) × (integration set time)
	Waveform output
	: 1 V f.s. relative to 100% of range
Maximum output voltage	Approx. ±12 V DC
Output update rate	Level output
Output update rate	: Fixed at 200 ms ±50 ms (approx. 5 times per sec.)
	Update rate is unrelated to number of averaging iterations
	setting and display hold operation. Waveform output
	: Approx. 11.4 µs (approx. 87.5 kHz)
	High-speed P level
D tim.	: Updated once every cycle for the input waveform set as the synchronization source.
Response time	Level output
	: 0.6 sec. or less (when the input changes abruptly from 0% to 90%, or from
	100% to 10%, the time required in order to satisfy the accuracy range)
	Waveform output
	: 0.2 ms or less
	High-speed active power level output
Towns and the short of the	: 1 cycle
Temperature characteristic	±0.05% f.s./°C or less
Output resistance	100 Ω ±5 Ω
	a man a second

#### External control (built-in feature)

External control	(Dulit-III le	eature)							
Functions	Integration st	Integration start/stop, integration reset and hold via external control							
External control	Input signal le	Input signal level: 0 to 5 V (high-speed CMOS level or shorted [Lo]/open [Hi])							
	Functions	nctions External control signal External control terminal							
	Start	START/STOP							
	Stop Lo → Hi								
	Reset	Reset Lo interval of at least 200 ms RESET							
	Hold on	Hold on Hi → Lo HOLD							
	Hold off	Lo → Hi	HOLD						

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

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

#### RS-232C interface (built-in feature)

Connector	D-sub 9-pin connector × 1
Communication	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 × 1			
	IEEE802.3 compliant			
Transmission Method	10BASE-T/100BASE-TX (automatic detection)			
Protocol	TCP/IP			
Functions	HTTP server (remote operation, firmware updates)			
	Dedicated ports (command control, data transfer)			
	Remote control by controller (REMOTE lamp will light up.)			

## General Specifications (product quaranteed for 3 year)

General Specific	cations (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	
	-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 (case, interface, and output terminals)
	Between voltage input terminals and current direct input terminals
Maximum rated	Voltage input terminal, Current direct input terminal
voltage to earth	Measurement category III 600 V (anticipated transient overvoltage 6000 V)
	Measurement category II 1000 V (anticipated transient overvoltage 6000 V)
Maximum input voltage	Between voltage input terminals U: 1000 V, ±1500 Vpeak
Maximum input current	Between +/- current direct input terminals I: ±70 A, ±100 Apeak
Applicable Standards	Safety: EN61010, EMC: EN61326 Class A/ EN61000-3-2/ EN61000-3-3
Rated supply voltage	100 VAC to 240 VAC, Rated power supply frequency: 50/60 Hz
Maximum rated power	40 VA or less
Dimensions	Approx. 305W(12.01") × 132H(5.20") × 256D(10.08") mm
	(excluding protrusions)
Mass	PW3336 series Approx. 5.2 kg (183.4 oz.)
	PW3337 series Approx. 5.6 kg (197.5 oz.)
Accessories	Instruction manual x 1, Measurement guide x 1, Power cord x 1

## wass 5 PW3335 Specifications

ı	Input	Sn	ecifi	icati	ions	2

input opcomout	0110						
Measurement line type	Single-phase 2-wire(1P2W)						
Input methods	Voltage Isolated input, resistive voltage divider method						
	Current Iso	Current Isolated input, shunt input method					
Voltage measurement	AUTO/ 6 .0000 V	AUTO/ 6 .0000 V/ 15.000 V/ 30.000 V/ 60.000 V/ 150.00 V/					
ranges	300.00 V/ 600.0	00 V/ 1.000	00 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 ter	minal:	2 ΜΩ				
	Current input ter	minal:	1 mA to 100 mA range 520 mΩ or less				
	· ·		200 mA to 20 A range 15 mΩ or less				

Rasic	Measuren	ent Sne	cifications

Power ranges	Depends on the combination of voltage and current ranges;  From 6.0000 mW to 20.000 kW (also applies to VA, yar)						
	From 6.0000 mW to 20.000 kW (also applies to VA, var) The details are as below.						
Input resistance	Voltage input terminal:						
	Current input terminal:		nge 520 mΩ or less				
	200 mA to 20 A range 15 mΩ or less						
Decis Masses							
	nent Specification						
Measurement		and current digital san	npling, zero-cross				
method	simultaneous calculati	on					
Sampling frequency	Approx. 700 kHz						
A/D converter resolution	DC, 0.1 Hz to 100 kHz (Va	Jugo within 0.1Hz < f < 10.1	Ja ara far rafaranga anlul				
Synchronization sources			12 are for reference only)				
Measurement items	Voltage	Current	Active power				
	Apparent power	Reactive power	Power factor				
	Phase angle	Frequency	Current integration				
	Active power integra						
	Voltage waveform pe Voltage crest factor	eak value Current wa Current cre	veform peak value				
	Maximum current ra		age current				
	Time average active		ago ourrone				
	Voltage ripple rate	Current rip	ple rate				
	Harmonic parameters						
	Harmonic voltage R		current RMS value				
	Harmonic active pov	ver rotal narm t distortion Funda,mei	onic voltage distortion				
	Fundamental wave of		ital wave active power				
		parent power Fundament					
	Fundamental wave p	ower factor (Displace)	ment power factor)				
		oltage current phase of	difference				
	Harmonic voltage co						
	Harmonic current co		2				
		wer content percentage					
		can be downloaded as da	ita via PC communication)				
	Harmonic voltage pl Harmonic current pr						
		urrent phase difference	)				
Rectifiers	AC+DC : AC+DC mea	surement					
		Display of true RMS values for both voltage and current					
	AC+DC Umn : AC+DC measurement						
	Display of average value rectified RMS converted values for voltage and true RMS values for current						
	DC : DC measurement						
	Display of simple averages for both voltage and current						
	Display of values calculated by (voltage DC value) x (current DC value) for active power						
	AC : AC measurement						
	Display of values calculated by						
		$\sqrt{(AC+DC \text{ value})^2}$ - (DC value) <sup>2</sup> for both voltage and current Display of values calculated by					
		C value) for active pow	er				
			ent from harmonic measurement				
Zero-cross Filter		Hz 500 Hz: 0.1 Hz to 5					
	5 kHz: 0.1 Hz to 5 kHz	100 kHz: 0.1 Hz to	100 kHz				
Measurement accuracy							
Voltage		Foots 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1000//				
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 16Hz≤f<45Hz	±0.1%rdg.±0.2%f.s.	±0.3%rdg. ±0.2%rdg.	±0.3%rdg. ±0.2%rdg.				
45Hz≤f≤66Hz	±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.05%f.s.	±0.2%rag. ±0.15%rdg.	±0.2%rag. ±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≤10khz< td=""><td>±0.1%rdg.±0.2%f.s.</td><td>±0.3%rdg.</td><td>±0.3%rdg. ±0.8%rdg.</td></f≤10khz<>	±0.1%rdg.±0.2%f.s.	±0.3%rdg.	±0.3%rdg. ±0.8%rdg.				
10kHz <f≤50khz 50kHz<f≤100khz< td=""><td>±0.5%rdg.±0.3%f.s. ±2.1%rdg.±0.3%f.s.</td><td>±0.8%rdg. ±2.4%rdg.</td><td>±0.8%rdg. ±2.4%rdg.</td></f≤100khz<></f≤50khz 	±0.5%rdg.±0.3%f.s. ±2.1%rdg.±0.3%f.s.	±0.8%rdg. ±2.4%rdg.	±0.8%rdg. ±2.4%rdg.				
JONI 12 NI TOURHZ	±2.1701ag.±0.0701.8.	±2.7 /01 uy.	±2.7/01ug.				
Current							
Frequency (f)	Input < 50%f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. ≤ Input				
DC	±0.1%rdg.±0.1%f.s.	±0.1%rdg.±0.1%f.s.	±0.2%rdg.				
0.1Hz≤f<16Hz	±0.1%rdg.±0.2%f.s.	±0.3%rdg.	±0.3%rdg.				
16Hz≤f<45Hz	±0.1%rdg.±0.1%f.s.	±0.2%rdg.	±0.2%rdg.				
45Hz≤f≤66Hz 66Hz <f≤500hz< td=""><td>±0.1%rdg.±0.05%f.s.</td><td>±0.15%rdg.</td><td>±0.15%rdg.</td></f≤500hz<>	±0.1%rdg.±0.05%f.s.	±0.15%rdg.	±0.15%rdg.				
500Hz <f≤1khz< td=""><td>±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.2%f.s.</td><td>±0.2%rdg. ±0.3%rdg.</td><td>±0.2%rdg. ±0.3%rdg.</td></f≤1khz<>	±0.1%rdg.±0.1%f.s. ±0.1%rdg.±0.2%f.s.	±0.2%rdg. ±0.3%rdg.	±0.2%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.				
INCIESIS IONIZ	±0.2%f.s.	_(3.2010.01 A1 )/01dy.					
10kHz <f≤100khz< td=""><td>±(0.3+0.04×F)%rdg.</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.	±(0.6+0.04×F)%rdg.	±(0.6+0.04×F)%rdg.				
	±0.3%f.s.	, , ,	\				
_							

Active power				
	Frequency (f)	Input < 50%f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. ≤ Input
	DC	±0.1%rdg.±0.1%f.s.	±0.1%rdg.±0.1%f.s.	±0.2%rdg.
	0.1Hz≤f<16Hz	±0.1%rdg.±0.2%f.s.	±0.3%rdg.	±0.3%rdg.
	16Hz≤f<45Hz	±0.1%rdg.±0.1%f.s.	±0.2%rdg.	±0.2%rdg.
	45Hz≤f≤66Hz	±0.1%rdg.±0.05%f.s.	±0.15%rdg.	±0.15%rdg.
	66Hz <f≤500hz< 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="" ±(0.03+0.07×f)%rdg.<=""><td>±(0.23+0.07×F)%rdg.</td><td>±(0.23+0.07×F)%rdg.</td></f≤10khz>		±(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.</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+0.07×F)%rdg.	±(0.3+0.07×F)%rdg.
		±0.3%f.s.		
	50kHz <f≤100khz< td=""><td>±(0.6+0.07×F)%rdg.</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.	±(0.9+0.07×F)%rdg.	±(0.9+0.07×F)%rdg.
		±0.3%f.s.		

Values for f.s. depend on measurement ranges "F" in the tables refers to the frequency in kHz.

 When using the 1 mA/ 2 mA range:
 Add ±1 μA to 0.1 Hz to 100 kHz measurement accuracy for current.

Add (±1 µA) × (voltage read value) to 0.1 Hz to 100 kHz

measurement accuracy for active power.

•When using the 200 mA/ 500 mA/ 1 A/ 2 A/ 5 A/ 10 A/ 20 A range: Add  $\pm 1$  mA to DC measurement accuracy for current. Add ( $\pm 1$  mA) x (voltage read value) to DC measurement accuracy for active power When using the 1 mA/2 mA/5 mA/10 mA/20 mA/50 mA/100 mA range Add ±10 µA to DC measurement accuracy for current.

Add ( $\pm$ 10 µÅ) × (voltage read value) to DC measurement accuracy for active power. •When using the 200 mA/ 500 mA/ 1 A/ 2 A/ 5 A/ 10 A/ 20 A range: Add  $\pm$ (0.02×F)% rdg, to the measurement accuracy for current and active power for which (10 kHz < f  $\le$  100 kHz).

•The measurement results for following input are considered reference values: Values for voltage, current, and active power for which 0.1 Hz  $\le$  f < 10 Hz.

Values for voltage, current, and active power in excess of 220 V or 20 A for which 10 Hz  $\le$  f  $\le$  16 Hz. Values for current and active power in excess of 20 A for which 500 Hz < f  $\le$  50 kHz. Values for current and active power in excess of 10 A for which 50 kHz < f  $\le$  100 kHz.

Effective measuring range

 
 Values for voltage and active power in excess of 750 V for which 30 ktz < f ≤ 100 ktdz.</th>

 Voltage
 1% to 150% of the range (1000 V range, up to 1000 V)

 Current
 1% to 150% of the range (when using 1000 V range, up to 150%)
 However, valid when the voltage and current fall within the effective measurement range

±600% of each voltage range

However, for 300 V, 600 V, and 1000 V ranges, ±1500 V peak

±600% of each current range Maximum effective peak voltage Maximum effective However, for 20 A range, ±60 A peak peak current

Guaranteed accuracy

period Conditions of guaranteed accuracy

Temperature and humidity range: 23°C±5°C (73°F±9°F), 80% RH or less Warm-up time: 30 minutes Sine wave input, power factor of 1, voltage to earth of 0 V, after zero-adjustment; within range in which Input:

the fundamental wave satisfies synchronization source conditions ±0.03%f.s. per °C or less.

Temperature ±0.03%f.s. per °C or less.

±0.19%f.s. or less (45 to 66 Hz, at power factor = 0)

Internal circuitry voltage/current phase difference: ±0.0573°
±0.01%f.s. or less (600 V, 50 Hz/60 Hz, applied between input coefficient Effect of power

Effect of common mode voltage Effect of magnetic terminals and enclosure)
400 A/m, DC and 50 Hz/60 Hz magnetic field field

Voltage ±1.5%f.s. or less

Current ±1.5%f.s. or less than or equal to the following value, whichever is greater 200 mA/ 500 mA/ 1 A/ 2 A/ 5 A/ 10 A/ 20 A range: ±20 mA 1 mA/ 2 mA/ 5 mA/ 10 mA/ 20 mA/ 50 mA/ 100 mA range: ±200 μA ±3.0%f.s. or less than or equal to the following value, whichever is greater

200 mA/500 mA/1 A/2 A/5 A/10 A/20 A range: (Voltage influence quantity)x(±20 mA) 1 mA/2 mA/5 mA/10 mA/20 mA/50 mA/100 mA range: (Voltage influence quantity)x(±20 μΔ) With input of at least 15 A to current input terminals

Effect of selfheating Current

AC input signal

±(0.025+0.005×(I-15))%rdg. or less

200 mA/500 mA/1 A/2 A/5 A/10 A/20 A range ±((0.025+0.005×(1-15))% rdg.+(0.5+0.1×(1-15))mA) or less 1 mA/ 2 mA/ 5 mA/ 10 mA/ 20 mA/ 50 mA/ 100 mA range ±((0.025+0.005×(I-15))% rdg.+(5+1×(I-15))µA) or less I: Current read value (A)

Active power

(above current influence quantity) × (voltage read value) or less The effects of self-heating will continue to manifest themselves until the input resistance temperature falls, even if the current value is low.

## Range table (Power ranges)

5								
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



#### Voltage/ Current/ Active Power Measurement Specifications

Measurement types	Rectifiers: AC+DC, DC, AC, FND, AC+DC Umn
Effective measuring range	Voltage ±1% to ±150% of the range. However, up to ±1500 V peak value and 1000 V RMS value
	Current ±1% to ±150% of the range
	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 $\pm 152\%$ 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		
Measurement		n's peak value (for both positive and
method	negative polarity) based on sai	mpled instantaneous voltage values.
Range	Voltage	
configuration	Voltage range	Voltage peak range
	6.0000 V	36.000 V
	15.000 V	90.000 V
	30.000 V	180.00 V
	60.000 V	360.00 V
	150.00 V	900.00 V
	300.00 V	1.8000 kV
	600.00 V	3.6000 kV
	1.0000 kV	6.0000 kV
	1:0000 KV	8.0000 KV
	Current	
	Current range	Current peak range
	1.0000 mA	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	6.0000 A
	2.0000 A	12.000 A
	5.0000 A	30.000 A
	10.000 A	60.000 A
	20.000 A	120.00 A
Measurement	+2.0%f.s. at DC and when 10 Hz <	f ≤ 1 kHz (f.s.: current peak range).
accuracy		0.1 Hz ≤ f < 10 Hz and when 1 kHz < f.
,	The above measurement accuracy	is multiplied by 2 for the 1 mA range.
Effective	±5% to ±100% of current peak	range, however, up to ±60 A
measuring range	· ·	
Display range	Up to ±102% of current peak ra	ange, however, the value 0 will be
, , ,		alue triggers the instrument's zero
	suppression function.	

## Voltage Crest Factor/Current Crest Factor Measurement Specifications

	Calculates the ratio of the voltage waveform peak value to the voltage RMS value.
	As per voltage and voltage waveform peak value, or current and current waveform peak value effective measurement ranges.
Display range	1.0000 to 612.00 (no polarity)

## Voltage Ripple Rate/ Current Ripple Rate Measurement Specifications

Measurement	Calculates the AC component (peak to peak [peak width]) as a
method	proportion of the voltage or current DC component.
Effective	As per voltage and voltage waveform peak value, or current and
measuring range	current waveform peak value effective measurement ranges.
Display range	0.00 to 500.00 (No polarity)

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

Measurement 5	pecilications
Measurement	Rectifiers
types	Apparent Power/ Reactive Power/ Power Factor AC+DC, AC, FND, AC+DC Umn
	Phase Angle AC, FND
Effective	As per voltage, current, and active power effective measurement
measuring range	ranges
Display range	Apparent Power/ Reactive Power 0% to 231.04% of the range (no zero-suppression)
	Power Factor ±0.0000 to ±1.0000
	Phase Angle +180 00 to -180 00

Polarity	Reactive Power/ Power Factor/ Phase Angle
,	Polarity is assigned according to the lead/lag relationship of the
	voltage waveform rising edge and the current waveform rising edge.
	+: When current lags voltage (no polarity display)
	-: When current leads voltage

#### Power Calculation Formulas

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	$\phi = si \cos^{-1}  \lambda $ $\phi = si  180 - \cos^{-1}  \lambda  $	(±90° to ±180°) ( 0° to ±90°)

U: Voltage, I: Current, P: Active Power, si: Polarity 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	period (reciprocal method)
Measurement ranges	100 Hz/ 500 Hz/ 5 kHz/ 100 kHz	(linked to zero-cross filter)
Measurement accuracy	±0.1% rdg. ±1 dgt. However, for	1 mA range, ±0.2% rdg. ±1 dgt.
Effective	0.1 Hz to 100 kHz	
measuring range	For sine wave input that is at lea	st 20% of the measurement
	source's measurement range	
	Measurement lower limit frequer	ncy setting: 0.1 sec. / 1 sec. / 10
	sec. (linked to synchronization t	imeout setting)
Display format	0.1000 Hz to 9.9999 Hz,	9.900 Hz to 99.999 Hz,
	99.00 Hz to 999.99 Hz,	0.9900 kHz to 9.9999 kHz,
	9 900 kHz to 99 999 kHz	99 00 kHz to 100 00 kHz

#### Maximum Current Ratio Measurement Specifications (MCR)

Measurement	Calculates the ratio of the current crest factor to the power factor.
method	(MCR) = (Current Crest Factor) / (Power Factor)
Effective	As per power factor (voltage, current, active power) and current crest factor
measuring range	(current, current waveform peak value) effective measurement ranges.
Display range	1.0000 to 6.1200 M (no polarity)

#### Time Average Current/ Time Average Active Power Measurement Specifications

	Calculates the average by dividing the current or active power integrated value by the integration time.
Measurement accuracy	(Current or Active power measurement accuracy) + (±0.01% rdg. ±1 dgt.)
Effective measuring range	As per the current or active power integration effective measurement range.
Display range	Time Average Current ±0% to ±612% of the range (Has polarity when using the DC rectifier.)
	Time Average Active Power

Range select

Averaging

Hold

	Time Average Active Power ±0% to ±3745.4% of the range (Has polarity)
Functional Spec	sifications
Auto-range (AUTO)	Automatically changes the voltage and current range according to the input.
	Range up: The range is increased when input exceeds 150% of the range or when the peak is exceeded.
	Range down:

However, the range is not decreased when the peak is exceeded at the lower range.

The input level is monitored, and the range is switched over multiple ranges. Range select can be used to disable ranges so that they are not selected Selects whether to enable (turn on) or disable (turn off) individual voltage and current ranges. Enabled (use):
Ranges can be selected with the range keys.

Range switching occurs using auto-range operation. Range switching occurs during auto-range integration.

Disabled (do not use):
Ranges cannot be selected with the range keys.
Range switching does not occur using auto-range operation.
Range switching does not occur during auto-range integration.

Sets the zero-cross filter's threshold level for voltage and current ranges. Set from 1% to 15% (in 1% intervals). Synchronization occurs when the Zero-cross filter's threshold level percentage level set for each measurement range is exceeded.

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

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) Applies user-defined VT and CT ratio settings to measured values. VT ratio setting range OFF (1.0), 0.001 to 1000 CT ratio setting range OFF (1.0), 0.001 to 1000

Stops display updates for all measured values and fixes the display values at that point in time.

Measurement data acquired by communications is also fixed at

that point in time. Internal calculations (including integration and integration elapsed time) will continue.

Analog output and waveform output are not held

Maximum value/	Detects maximum and minimum measured values (except
minimum value	current integration, active power integration, integration elapsed
hold (MAX/MIN HOLD)	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.
	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 or the current
	waveform peak value.  Internal calculations (including integration and integration
	elapsed time) will continue.
	The maximum and minimum values during integration are detected (maximum/minimum value measurement during the
	integration interval).
Zoro Adjustment	Analog output and waveform output are not held.  Zeroes out the voltage and current input offset.
Zero Adjustment Key-lock	Zeroes out the voltage and current input offset.  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.
ntegration Mea	surement Specifications
ntegration	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.
	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	Simultaneous integration of the following 6 parameters:
and display	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-)
Measurement	Sum of active power integrated values (Wh)  Rectifiers: AC+DC, AC+DC Umn
ypes	Current:
	Displays the result of integrating current RMS value data (display values) once every display update interval as an integrated value.
	values) once every display update interval as all 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)
ntegration time	1 min. to 10000 hr., settable in 1 min. blocks
ntegration time	±0.01% rdg. ±1 dgt.
accuracy	
ntegration neasurement accuracy	(Current or active power measurement accuracy) + (±0.01% rdg. ±1 dgt.)
Effective	Until PEAK OVER U lamp or PEAK OVER I lamp lights up.
neasuring range	
Display resolution Functions	999999 (6 digits + decimal point)     Stopping integration based on integration time setting (timer)
di lottorio	Stopping/starting integration and resetting integrated values
	based on external control
	Displaying the integration elapsed time (displayed as TIME on panel display)
	Additional integration by repeatedly starting/stopping integration
	Backing up integrated values and the integration elapsed time during power outages.
	during power outages  Stopping integration when power returns
armonic Mess	urement Specifications
armonic ivieas leasurement	Zero-cross simultaneous calculation method
nethod	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
	Gaps and overlaps may occur if the measurement frequency is not 50 Hz or 60 Hz.
	Gaps and overlaps may occur if the measurement frequency is
	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.  Conforms to synchronization source (SYNC) for the basic
ource	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.
source	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.
source	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.  Harmonic voltage RMS value Harmonic voltage content percentage Harmonic current RMS value Harmonic current content percentage Harmonic current phase angle
source	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.  Harmonic voltage RMS value Harmonic voltage phase angle Harmonic current RMS value Harmonic current content percentage Harmonic active power
Synchronization source Measurement items	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.  Harmonic voltage RMS value Harmonic voltage content percentage Harmonic current content percentage Harmonic current content percentage Harmonic active power Harmonic active power content percentage
source	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.  Harmonic voltage RMS value Harmonic voltage phase angle Harmonic current RMS value Harmonic active power Harmonic active power content percentage Harmonic active power content percentage Harmonic voltage during the process of th
ource	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.  Harmonic voltage RMS value Harmonic voltage content percentage 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 current
ource	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.  Harmonic voltage RMS value Harmonic voltage phase angle Harmonic current RMS value Harmonic active power Harmonic active power Larmonic active power content percentage Harmonic voltage current phase difference Total harmonic voltage distortion Total harmonic current distortion
ource	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.  Harmonic voltage RMS value Harmonic voltage content percentage Harmonic ourrent content percentage Harmonic current content percentage Harmonic active power Harmonic active power Harmonic active power ontent percentage Harmonic voltage current phase difference Total harmonic voltage distortion Total harmonic current distortion Fundamental wave voltage Fundamental wave current Fundamental wave active power Fundamental wave apparent power
ource	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.  Harmonic voltage RMS value Harmonic voltage content percentage Harmonic current content percentage Harmonic current content percentage 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 current Fundamental wave active power Fundamental wave apparent power Fundamental wave voltage current phase difference
ource	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.  Conforms to synchronization source (SYNC) for the basic measurement specifications.  Harmonic voltage RMS value Harmonic voltage phase angle Harmonic current RMS value Harmonic current content percentage Harmonic active power Harmonic active power Fundamental wave voltage distortion Total harmonic current distortion Fundamental wave voltage Fundamental wave current power Fundamental wave reactive power Fundamental wave power factor

FFT processing	FFT processing word length: 32 h Number of FFT points: 4096 point		
Window function	Rectangular		
Analysis window width	45 Hz ≤ f < 56 Hz : 178.57 ms to 222.22 ms (10 cycles) 56 Hz ≤ f < 66 Hz : 181.82 ms to 214.29 ms (12 cycles) Frequencies other than the above : 185.92 ms to 214.08 ms		
Data update rate	Depends on window width.		
Maximum analysis order	Synchronization frequency (f) ra		
	10 Hz ≤ f < 45 Hz 45 Hz ≤ f < 56 Hz	50th 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 500 Hz < f ≤ 640 Hz	15th 11th	
Analysis order	2nd to 50th	1101	
upper limit setting Measurement	f.s.: Measurement range	V 15 0 1 1 1 1 1	
accuracy	Frequency (f)	Voltage, Current, Active power ±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.	
	When using the 1 mA/ 2 mA ran Add ±1 μA to 10 Hz to 8 kHz mea Add (±1 μA) × (voltage read valu measurement accuracy for active	asurement accuracy for current. e) to 10 Hz to 8 kHz	
	When using the 200 mA/500 mA/1 A/2 A/5 A/10 A/20 A range:     Add ±1 mA to DC measurement accuracy for current.     Add (±1 mA) × (voltage read value) to DC measurement accuracy		
	for active power.  • When using the 1 mA/ 2 mA/ 5 mA/ 10 mA/ 20 mA/ 50 mA/ 100 mA range: Add ±10 μA to DC measurement accuracy for current. Add (±10 μA) × (voltage read value) to DC measurement accuracy for active power.		
Display Specific Display Number of display	cations  7-segment LED 4 (display area a, b, c, and d)		
parameters Display resolution	Other than integrated values: 999 Integrated values: 999999 count		
Display update rate	200 ms ±50 ms (approx. 5 updates per sec.) to 20 s (varies with number of averaging iterations setting)		
Synchronized c	ontrol		
Functions	The timing of calculations; display u integration start, stop, and reset eve lock operation; and zero-adjustmen PW3335 series is synchronized with Synchronization with the PW3336 s	ents; display hold operation; key it operation for the secondary in the primary PW3335 series.	
Terminal	supported.  BNC terminal × 1 (non-isolated)		
Terminal name	External synchronization terminal	(EXT.SYNC)	
I/O settings	Off Synchronized control function off (signals input to the external synchronization terminal (EXT.SYNC) are ignored)		
	In The external synchronization terminal (EXT.SYNC) is set to input, and a dedicated synchronization signal can be input (secondary).		
	Out The external synchronization termi and a dedicated synchronization s		
Number of units for which synchronized control can be performed	Up to 7 secondaries per primary (total of 8 units including the PW3	336/PW3337 series)	
External Currer (PW3335-03 ar Terminal	nt Sensor Input Specification of PW3335-04)	ns	
Current sensor	Off / TYPE.1 / TYPE.2 When set to off, input from the ext terminal is ignored.	ernal current sensor input	
		TYPE1 (100 A to 5000 A sensors) 9660, 9661, 9669, CT9667-01/-02/-03	
type switching Current sensor options	9660, 9661, 9669, CT9667-01,		
Switching  Current sensor options	9660, 9661, 9669, CT9667-01,  TYPE2 (20 A to 2000 A sensors, F CT6862-05, CT6872, CT6872- CT6873-01, CT6875A, CT6875 CT6877A, CT6877A-1, CT6841 CT6846A,9272-05	Power supply is required to use) 01, CT6863-05, CT6873, 6A-1, CT6876A, CT6876A-1, A, CT6843A, CT6844A, CT6845,	
switching  Current sensor options  Current measurement	9660, 9661, 9669, CT9667-01,  TYPE2 (20 A to 2000 A sensors, F CT6862-05, CT6872, CT6872- CT6873-01, CT6875-A, CT6876- CT6877-A, CT6877-A, CT6874- CT6846A,9272-05  Auto/ 1 A/ 2 A/ 5 A (range noted of	Power supply is required to use) 01, CT6863-05, CT6873, 5A-1, CT6876A, CT6876A-1, A, CT6843A, CT6844A, CT6845, In panel)	
Switching  Current sensor options	9660, 9661, 9669, CT9667-01,  TYPE2 (20 A to 2000 A sensors, F CT6862-05, CT6872, CT6872- CT6873-01, CT6875A, CT6875 CT6877A, CT6877A-1, CT6841 CT6846A,9272-05	Power supply is required to use) 01, CT6863-05, CT6873, SA-1, CT6876A, CT6876A-1, A, CT6843A, CT6844A, CT6845, on panel) setting the CT ratio.	



Measurement

accuracy
Current/ Active Power

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≤10kh< td=""><td>Z</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≤10kh<>	Z	±(0.03+0.07×F)%rdg.	±(0.23+0.07×F)%rdg.	±(0.23+0.07×F)%rdg.
		±0.2%f.s.		
10kHz <f≤100kh< td=""><td>Hz</td><td>±(0.3+0.04×F)%rdg.</td><td>±(0.6+0.04×F)%rdg.</td><td>±(0.6+0.04×F)%rdg.</td></f≤100kh<>	Hz	±(0.3+0.04×F)%rdg.	±(0.6+0.04×F)%rdg.	±(0.6+0.04×F)%rdg.
		±0.3%f.s.		

Active Power

Frequency (f)	Input < 50%f.s.	50%f.s. ≤ Input < 100%f.s.	100%f.s. ≤ Input
1kHz <f≤10khz< td=""><td></td><td>±(0.23+0.07×F)%rdg.</td><td>±(0.23+0.07×F)%rdg.</td></f≤10khz<>		±(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.</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+0.07×F)%rdg.	±(0.3+0.07×F)%rdg.
	±0.3%f.s.		
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.

- 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 for which 0.1 Hz ≤ f < 10 Hz.
  Values for voltage and active power in excess of 220 V for which 10 Hz ≤ f < 16 Hz.
  Values for voltage and active power in excess of 750 V for which 30 kHz < f ≤ 100 kHz.
   When using the CT684xA series, add ±2 mV to the CT684xA series accuracy after performing CT684xA 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 instrument 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.	
	Values for f.s. depend on meas To obtain the current or active psensor's accuracy to the above accuracy figures. When using the CT684xA series accuracy after performing the company of the series accuracy after performing the series accuracy after performance accuracy after performance accuracy after performance accuracy accuracy after performance accuracy acc	power accuracy, add the current current and active power s, add ±2 mV to the CT684A	

adjustment using the 1 A range noted on the panel.

# D/A Output Specifications (PW3335-02 and PW3335-04)

Number of output channels	7 channels		
Configuration	16-bit D/A converter (polarity + 15 bits)		
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 High-speed level output 2 Vf.s. or 5 Vf.s., linked to synchronization interval Waveform output		
Output	1 Vf.s., linked to sampling Output parameters for all channels		
parameters	Available selections vary with the output parameter.		
	Level output/ High-speed level output/ Waveform output Voltage, current, active power Only Level output		
	Apparent power, reactive power, power factor, phase angle, total harmonic voltage distortion, total harmonic current distortion, voltage ripple rate, current ripple rate, voltage crest factor, current crest factor, time average current, time average active power, maximum current ratio Only Level output 5 Vf.s. Frequency, current integration, active power integration		
	The rectifier can be selected.		
	Harmonic-order output is not supported.		

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	Waveform output, high-speed level output
band	At DC or 10 Hz to 30 kHz, accuracy is as defined above.
Maximum output voltage	Approx. ±12 V DC
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 th 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
<del>-</del> .	0.2 ms or less
Temperature coefficient	±0.05%f.s./°C or less
Output resistance	Approx. 100 Ω
External control	
Functions	Integration start/stop, integration reset and hold via external control
Input signal level	0 to 5 V (high-speed CMOS level) or shorted [Lo]/ open [Hi]
GP-IB interface	
(PW3335-01 an	,
Method	Compliant with IEEE488.1 1987, in reference to IEEE488.2 1987
	Interface functions

(1 WOODS 01 dha 1 WOODS 04)	
Method	Compliant with IEEE488.1 1987, in reference to IEEE488.2 1987
	Interface functions
	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0
Address	00 to 30

Address 00 to 30		
RS-232C interface (PW3335, PW3335-02, PW3335-03, and PW3335-04)		
Connector	D-sub 9-pin connector x 1	

Communication method	Full duplex, Start-stop synchronization Stop bits: 1 (fixed) Data length: 8 (fixed) Parity: None
Communication speed	9600 bps/ 38400 bps

## LAN interface

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

General Specifications		
Product warranty period	3 year	
Operating environment	Indoors, altitude up to 2000 m (6562 ft.), pollution degree 2	
Operating temperature and humidity	0°C to 40°C (32°F to 104°F), 80% RH or less (no condensation)	
Storage temperature and humidity	-10°C to 50°C (14°F to 122°F), 80% RH or less (no condensation)	
Dielectric strength	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 Between the voltage input terminals and current input terminals	
Maximum rated voltage to earth	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)	
Maximum input voltage	Between the voltage input terminals U and ± 1000 V, ±1500 V peak	
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	
Applicable Standards	Safety EN61010 EMC EN61326 Class A EN61000-3-2 EN61000-3-3	
Rated supply voltage	100 V AC to 240 V AC 50 Hz/60 Hz	
Maximum rated power	30 VA or less	
Dimensions	Approx. 210W $\times$ 100H $\times$ 245D mm (8.27"W $\times$ 3.94"H $\times$ 9.65"D) (excluding protrusions)	
Mass	Approx. 3 kg (105.8 oz.)	
Accessories	Instruction manual ×1 Power cord ×1	

Voltage and current input terminal safety cover ×2

## 3334 Specifications

## **Basic Specifications**

		1					
Measurable lines		Single-phase, 2-wire (AC/DC)					
Measurement		Voltage, current, active power, apparent power, power factor,					
parameters		frequency, integrated current and active power, waveform peak					
		(voltage an	id current)				
Measurement method Sampling Frequency		Simultaneous digital sampling of voltage and current, True RMS					
		Approx. 74	Approx. 74.4kHz				
Measurement 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	15.000 W	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	9.000 kW
For any and the second of all the		DO 4511					

#### Frequency bandwidth DC, 45Hz to 5kHz

#### Measurement accuracy

	Warm-up time	3 minutes	
	Period of guaranteed accuracy	3 years (better accuracy specifications available for 1-year period)	
	Effective measurement	Voltage, current:1% to 100% (Power: 0% to 100%)	
	range	Measurements below 0.5% of the voltage or current range will be zero suppresse	
	Effect of power factor (at pf=0.5)	Maximum ±0.4%±rdg. (45 to 66Hz)	
Temperature Coefficient   Maximum ±0.03%f.s./°C			

Frequency	Guaranteed	Voltage, current and active power	
rrequericy	Period	(at less than 50% of input range)	(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.
45 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.
00 HZ < 1 \ 1 KHZ	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.
I KMZ < I S D KMZ	3 years	±4.5 %f.s.	±4.5 %rdg.

<sup>\*</sup>Add ±50µA to the accuracy when measuring DC current Add (±50µA x voltage value) to the accuracy when measuring DC active power \*\* Accuracy not defined for current input exceeding 20A

## Input Specifications

Input impedance	2.4 M $\Omega$ for voltage, 10 m $\Omega$ 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 each voltage range, Within ±425 Vpeak
Maximum effective peak current	±300% of each current range, Within ±54.0 Apeak *1
Max. rated voltage to earth	300 V (DC, 50/60 Hz)

## **Display Specifications**

	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 Spec	cifications	
Integration	No.of displayed digits:	Six digits
measurement	Current Integration:	From 0.00000mAh, Polarity-independent
	_	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 of active power ±1dgt.
Wave peak		tive and negative waveform of voltage/
measurement	current (up to 300% of	
		/: ±1.2%f.s. ("f.s." is 300% of each range)
		rue RMS), DC(simple average display) and AC(True RMS)
Analog output	Parameter output repre	
(D/A output)		ctive power (3 simultaneous channels)
		Current integration, Active power integration,
	Apparent power, power	
	Voltage output: ±2 V	
\M		6% f.s. + individual measurement accuracy
Waveform output	Parameter output repre	Active power (3 simultaneous channels)
	Voltage output: 1 VE	
		% f.s. + individual measurement accuracy
Average function		ed 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,
	80, 100, 200, 3	300, 500, 1000, 2000, 3000, 5000, 10000
External Interfaces	RS-232C interface: Inc	luded as standard
	Asynchronous comm	nunication method:
		rate: 9600 bps (fixed)
	GP-IB interface (Model	
		npliant, IEEE-488.2 1987 reference
Miscellaneous		value hold, Peak value hold, Key lock,
	Backup function (prese	erves settings, integration data)

## General Specifications

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

	•						
Measu	rable lines	Single-pha	se, 2-wire (	AC)			
Measure	ment parameters	Voltage, Cu	urrent, Activ	e power, Ap	parent pov	ver, Power f	actor
Measure	ement method	Simultaneo	us digital s	ampling of v	oltage and	current, Tru	ue RMS
Sampli	ng frequency	Approx. 48	kHz				
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
Frequency bandwidth		45Hz to 5k	Hz				

#### Measurement accuracy

(Guaranteed at 23°C±5, max. 80%th, sine wave input, power factor=1, in-phase voltage =0V, accuracy specifications differ depending on usage period of 1 or 3 years)				
Warm-up time	10 minutes			
Period of guaranteed accuracy	3 years (better accuracy specifications available for 1-year period)			
Effective measurement range	Voltage, current, power: 1 Measurements below 1% of the	0% to 150% voltage or current range will be zero suppressed.		
Effect of power factor (at pf=0.5) Maximum ±0.4%±rdg. (45 to 66Hz)		5 to 66Hz)		
Temperature Coefficient	Maximum ±0.03%f.s./°C			
Frequency	Guaranteed Period	Voltage, current and active power		
45 Hz ≤ f ≤ 66 Hz	1 year	±0.1 %rdg. ±0.1 %f.s.		
	3 years	±0.1 %rdg. ±0.2 %f.s.		
66 Hz < f < 1 kHz *	1 year	±0.1 %rdg. ±0.2 %f.s.		

<ul> <li>* Accuracy not defin</li> </ul>	ned for curren	it input exceeding	20A

±0.1 %rdg. ±0.35 %f.s

±3.0 %f.s.

±4.5 %f.s.

3 years

1 year

3 years

#### Input specifications

 $66 \text{ Hz} < \text{f} \leq 1 \text{ kHz}^*$ 

 $1 \text{ kHz} < f \le 5 \text{ kHz}$ 

Input impedance	2.4 MΩ for voltage, 7 mΩ or better (50/60 Hz) for current
Maximum input voltage	300 Vrms, 425 Vpeak
Maximum input current	30 Arms, 42.5 Apeak
Maximum effective peak voltage	Within 425Vpeak
Maximum effective peak current	±300% of each current range, Within ±42.5Apeak
Max. rated voltage to earth	300V (50/60Hz)

#### Display specifications

Display indication	voltage and current: 1% to 152% of range
range	active power: 0% to 231.04% 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 rangel)

## **Functional Specifications**

Rectification method	AC(True RMS)
Analog output (D/A output)	Parameter output representation: voltage, current and active power (3 simultaneous channels) Voltage output: +2 VDC f.s. for each range Output accuracy: ±0.5% f.s. + individual measurement accuracy
Average function	Simple averaging of specified number of samples: 1, 2, 5, 10, 25, 50 or 100
VT or CT ratio	VT ratios: 1, 2, 4, 10, 20, 30, 60, 100 CT ratios: 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 24, 25, 30, 40, 50, 60, 75, 80, 100
External Interfaces	RS-232C interface: Included as standard Asynchronous communication method: full-duplex; Baud rate: 9600 bps (fixed) GP-IB interface (Model 3333-01 only) IEEE-488.1 1987 compliant, IEEE-488.2 1987 reference
Miscellaneous	Display hold, Key lock, Settings backup (preserves settings)

## General Specifications

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	160 mm (6.30 in)W × 100 mm (3.94 in)H × 227 mm (8.94 in)D (excluding feet and projections), 1.9 kg (67.0 oz)

## Calculation formulas (3333 & 3334)

Measurement Parameters	Formula
Apparent Power (S)	$S = U \times I$
Power Factor (λ)	$\lambda = IP/SI$
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 *	

<sup>\*</sup> Current and active power integration available only on Model 3334.

## **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	~	•	~	×	×	~	~
POWER METER PW3337	PW3337-01	3	AC/ DC	~	~	~	<b>~</b>	×	~	~
	PW3337-02	3	AC/ DC	~	<b>✓</b>	•	×	~	•	~
	PW3337-03	3	AC/ DC	~	<b>✓</b>	•	<b>~</b>	~	•	~
	PW3336	2	AC/ DC	~	<b>~</b>	~	×	×	•	~
POWER METER PW3336	PW3336-01	2	AC/ DC	~	~	~	<b>~</b>	×	~	~
35190 B 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PW3336-02	2	AC/ DC	~	~	<b>v</b>	×	~	•	~
	PW3336-03	2	AC/ DC	~	<b>~</b>	~	~	~	<b>v</b>	~

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

## **Single-phase Power Meter**

Model & Appearance	Model No. (Order Code)	Number of Channels	AC/ DC	Harmonic Measurement	LAN	RS-232C	GP-IB	D/A output	Current Sensor Input	Synchronized Control
POWER METER PW3335 -	PW3335	1	AC/ DC	<b>✓</b>	<b>~</b>	~	×	×	×	~
	PW3335-01	1	AC/ DC	~	~	×	<b>✓</b>	×	×	~
	PW3335-02	1	AC/ DC	~	~	~	×	~	×	~
	PW3335-03	1	AC/ DC	~	~	~	×	×	~	<b>✓</b>
	PW3335-04	1	AC/ DC	~	~	~	<b>~</b>	~	~	~
AC/ DC POWER HITESTER 3334	3334	1	AC/ DC	×	×	~	×	~	×	×
12000   3000 22000   40   50 3500   40   50	3334-01	1	AC/ DC	×	×	~	~	~	×	×
POWER HITESTER 3333	3333	1	AC	×	×	<b>✓</b>	×	~	×	×
9800	3333-01	1	AC	×	×	~	~	<b>✓</b>	×	×

Accessories : Instruction manual ×1, Power cord ×1

## Communications and control options



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



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



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



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

 $Note: Company\ names\ and\ product\ names\ appearing\ in\ this\ brochure\ are\ trademarks\ or\ registered\ trademarks\ of\ various\ companies.$ 

