HIOKI

PW3337 e PW3336

Wattmetri a 2 e 3 canali CA/CC, 1000V-65/5000A, banda di frequenza da DC a 100kHz

PW3336 e **PW3337** sono wattmetri digitali di precisione a 2 e 3 canali di ingresso, totalmente isolati tra loro, in grado di misurare e integrare il consumo di potenza in corrente continua e/o alternata di motori elettrici, inverter, convertitori di potenza, caricabatterie, alimentatori ed altri dispositivi industriali quali macchinari elettrici complessi, impianti automatici...
PW3336 (2 canali) e PW3337 (3 canali) sono in grado di misurare segnali elettrici in corrente continua DC ed in corrente alternata AC fino a 100kHz, su circuiti di misura da monofase a 2 fili fino a trifase a 4 fili.

Caratteristiche avanzate

• Elevatissima accuratezza di misura (±0.15%) per Tensione, Corrente e Potenza Attiva

• Campo di Frequenza dei segnali in misura: continua DC e da 0.1Hz a 100kHz

• Misura di corrente in inserzione diretta fino a 65A e tramite sensori amperometrici fino a 5000A

• Misura ed analisi delle componenti armoniche fino al 50° ordine, secondo la norma CEI EN 61000-4-7

• Elevata stabilità di misura, anche in condizioni di basso Fattore di Potenza, per test a vuoto di trasformatori e motori elettrici

• Per ogni modello, 4 versioni disponibili in funzione delle diverse interfacce esterne

Principali campi di applicazione

• Produzione, Ricerca & Sviluppo e Collaudo di dispositivi trifase quali trasformatori, motori, condizionatori industriali, macchine automatiche industriali

• Misura dell'efficienza elettrica di convertitori di potenza (inverter) dedicati al settore fotovoltaico

• Valutazione del rendimento elettrico di inverter di potenza ad uso industriale

• Analisi delle capacità di conversione di dispositivi di soccorso quali UPS e gruppi di continuità e di caricabatterie di accumulo

• Osservazione del contenuto armonico prodotto dai dispositivi elettronici di potenza, in conformità alle richieste normative della CEI EN 61000-4-7

1 Accuratezza di misura fissa (±0.15%) per qualsiasi valore di corrente in ingresso

Fino a 65A la misura di corrente può essere svolta in connessione diretta mentre per valori superiori si possono abbinare sensori di corrente fino a 5000A.
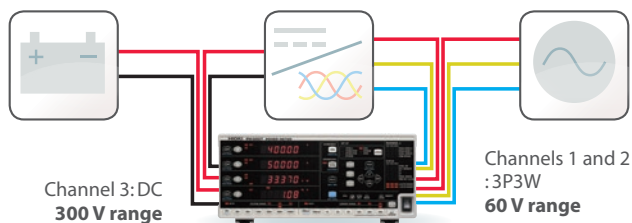Gli ingressi diretti di PW3336 e PW3337 sono costituiti da TA interni con tecnologia Hioki DCCT che offrono prestazioni totalmente fuori dal comune.
Tali sensori DCCT eliminano le problematiche di surriscaldamento e di deriva termica delle prestazioni presenti su tutti i wattmetri con ingresso diretto a shunt, garantendo una accuratezza stabile e ripetibile.

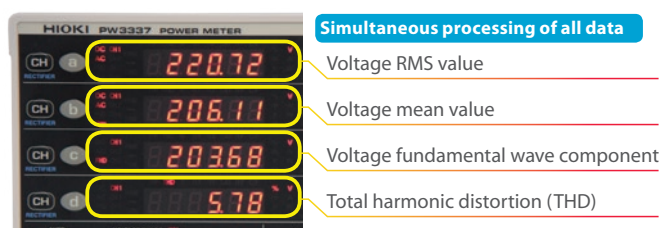## 2 PW3337: 3 canali totalmente indipendenti tra loro

La versatilità avanzata di PW3337 permette di misurare in contemporanea sia il lato primario di alimentazione di un inverter DC sia il lato secondario d'uscita trifase.
Questa efficace prestazione offre un valido aiuto in quelle applicazioni ove è richiesta la misura di efficienza input/output di inverter, gruppi di continuità caricabatterie e altre apparecchiature di alimentazione.

CONFIGURE MULTIPLE RANGES WITH A SINGLE INSTRUMENT

Channel 3:DC
300 V range

Channels 1 and 2 : 3P3W
60 V range

2ch

PW3336
2 canali:
1P2W, 1P3W,
3P3W

3ch

PW3337
3 canali:
1P2W, 1P3W,
3P3W, 3P4W

3 Elaborazione simultanea di parametri armonici e di potenza

Tutti i valori RMS, i valori medi, le componenti in DC, le componenti AC, i segnali fondamentali, l'analisi delle armoniche, i dati energetici, sono misurati, elaborati e visualizzabili simultaneamente.
Non è quindi necessario impostare la modalità di elaborazione in funzione delle misure da acquisire.
Ogni singolo valore a display può essere liberamente configurato; il software per PC in dotazione consente inoltre di acquisire tutti i dati in misura, anche in sincronizzazione tra più unità PW333x.

HIOKI PW3337 POWER METER

Simultaneous processing of all data

Voltage RMS value

Voltage mean value

Voltage fundamental wave component

Total harmonic distortion (THD)

4 Elevata stabilità di misura, anche in situazioni di basso Fattore di Potenza

PW3336 e PW3337 sono in grado di misurare la Potenza Attiva in condizioni di Fattore di Potenza molto basso, tipiche delle applicazioni senza carico nelle quali si valutano le prestazioni dei trasformatori "a vuoto", mantenendo un elevato livello di precisione nonostante l'elevato fattore di cresta che potrebbe presentarsi in questi casi.

5 Integrazione di energia per valori di potenza fluttuante

Il consumo energetico di apparecchiature con carico fluttuante quali ad esempio frigoriferi, stufe, e pompe varia considerevolmente tra funzionamento nominale e il funzionamento a vuoto.
Grazie alla ampia gamma dinamica delle portate di misura, PW3336 e PW3337 elaborano l'integrazione di energia con elevata precisione per tutta la scala di misura. Ogni portata accetta valori di picco fino al 600% del proprio valore nominale.

Rated operation

No-load operation
Integrated measurement using the same range
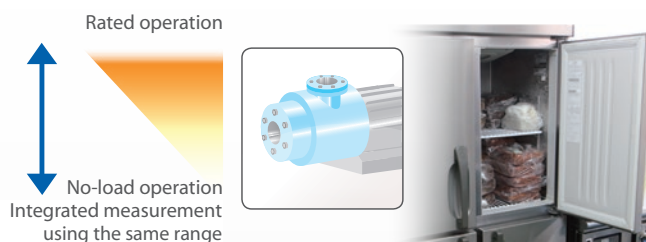
6 Analisi armonica secondo CEI EN 61000-4-7

PW3336 e PW3337 supportano la misura delle componenti armoniche in conformità ai requisiti tecnici di prova previsti dalla norma CEI EN 61000-4-7. Le misure svolte sono: la Distorsione Armonica Totale (THD%), l'ampiezza e l'angolo di fase delle singole componenti armoniche di tensione corrente e potenza fino al 50° ordine sia in valore assoluto sia in valore percentuale rispetto alla fondamentale di riferimento.

INFO SU CEI EN 61000-4-7

La norma CEI EN 61000-4-7 è uno standard internazionale che disciplina la misura delle componenti armoniche di tensione e corrente sui sistemi di alimentazione e per i dispositivi elettrici, definendone i limiti massimi di riferimento e le prestazioni di misura richieste agli strumenti misuratori.

7 Opzione D/A con 16 canali di uscita (versioni /02 e /03)

Le versioni /02 e /03 di PW3336 e PW3337 sono equipaggiate di uscita D/A con convertitore a 16 bit per la trasmissione in esterno di un massimo di 16 grandezze in misura.
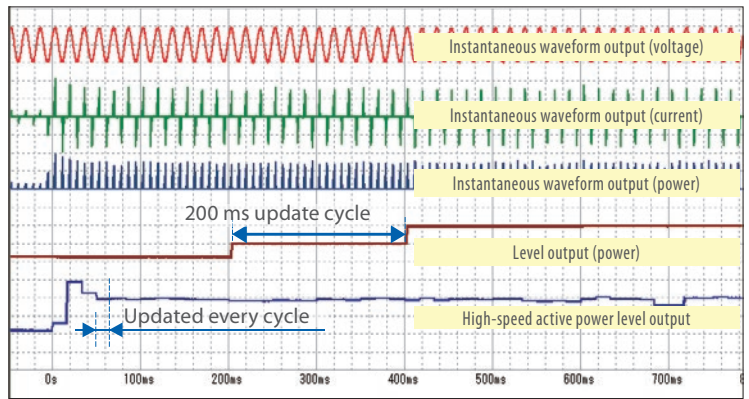
Ciò permette ad esempio di integrare su unica piattaforma i dati provenienti da più misuratori diversi, compresi misuratori di temperatura, pressione, velocità, vibrazione, ecc…

Configurazione delle uscita analogiche su 3 tipologie:

WAVEFORM: forma d'onda di tensione corrente e potenza, con campionamento 87.5kHz

LEVEL: ampiezza RMS di qualsiasi parametro in misura, con aggiornamento 200msec

ACTIVE POWER HIGH SPEED: ampiezza della Potenza Attiva per ogni ciclo della forma d'onda.

Instantaneous waveform output (voltage)
Instantaneous waveform output (current)
Instantaneous waveform output (power)
200 ms update cycle
Level output (power)
Updated every cycle
High-speed active power level output

D/A output waveforms when a fan motor is powered on

8 Sincronizzazione fino a 8 unità PW333x

La sincronizzazione consente di avere fino a 24 canali di misura perfettamente simultanei, organizzati e gestiti dall'unità configurata come "master".

La modalità master-slave consente inoltre di bloccare la tastiera di comando di tutti i dispositivi slave. L'applicativo software fornito in dotazione consente infine di elaborare calcoli di efficienza da valori provenienti da diverse unità PW333x.

Master instrument

Slave instruments

9 Ampia versatilità di modelli e soluzioni

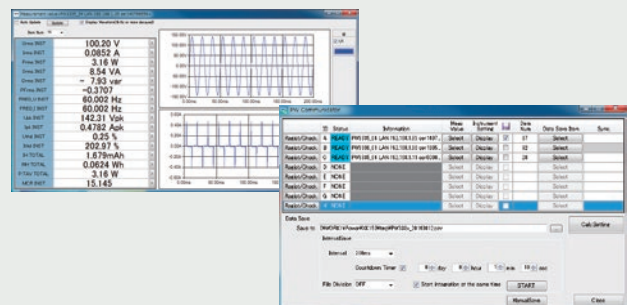PW3336 e PW3337 sono disponibili per un totale di 8 modelli in funzione delle interfacce incluse.

MODELLO	MISURA ARMONICHE	INGRESSO SENSORE DI CORRENTE	GESTIONE SINCRONIA	LAN	RS232	GP-IB	USCITE D/A
PW3336	•	•	•	•	•		
PW3336-01	•	•	•	•	•	•	
PW3336-02	•	•	•	•	•		•
PW3336-03	•	•	•	•	•	•	•
PW3337	•	•	•	•	•		
PW3337-01	•	•	•	•	•	•	
PW3337-02	•	•	•	•	•		•
PW3337-03	•	•	•	•	•	•	•

10 PW33 Communicator software (vedere sezione specifica)

Utilizzando il software applicativo per PC in dotazione, è possibile gestire il wattmetro da un computer remoto.
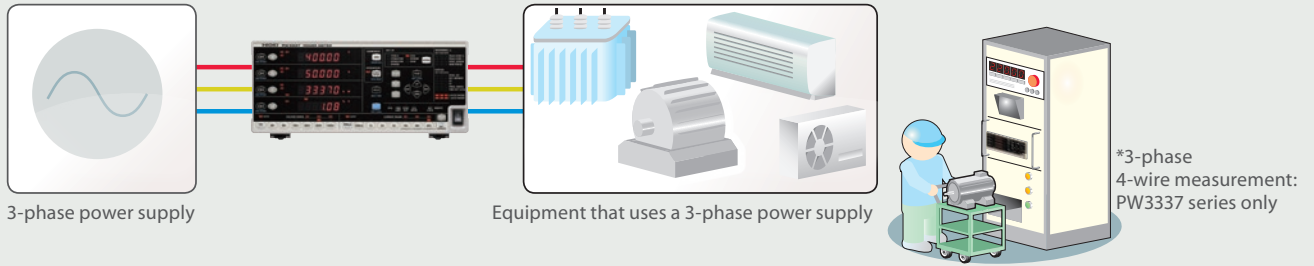
L'applicativo software consente di salvare i file dati su PC, visualizzare a monitor le forme d'onda ed eseguire calcoli di efficienza elettrica/energetica.

La connessione può essere fatta su interfaccia LAN, RS232 o GP-IB in funzione del modello in uso.
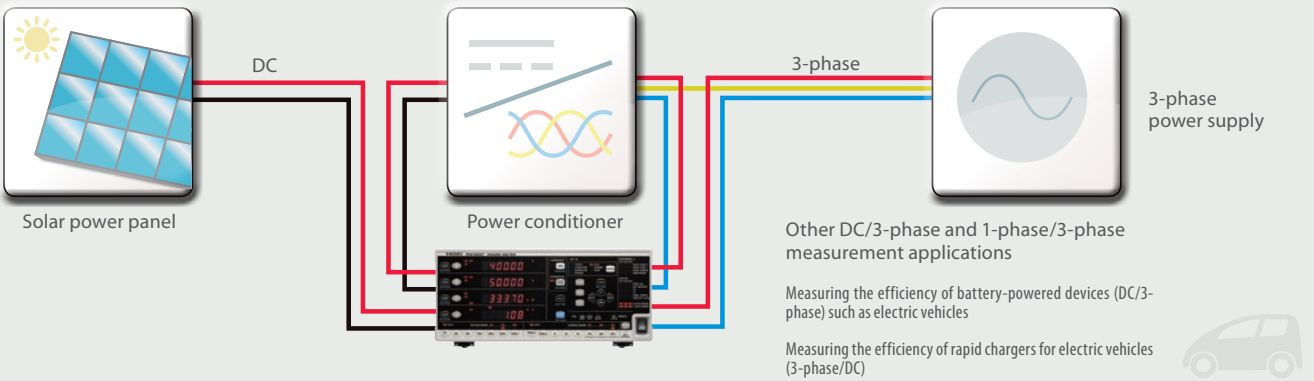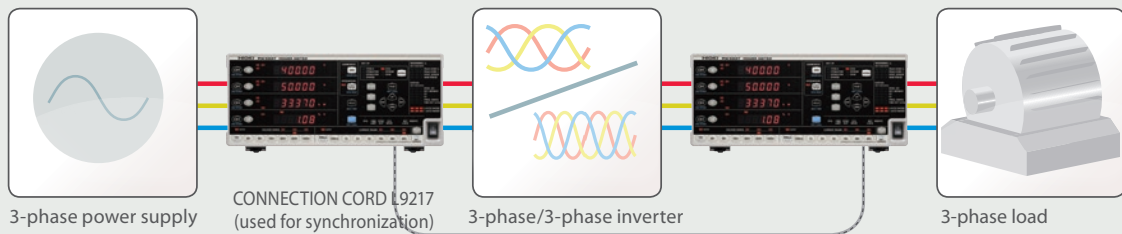
Applicazioni tipiche

Produzione, Ricerca & Sviluppo e Collaudo di dispositivi trifase quali trasformatori, motori, condizionatori industriali, macchine automatiche industriali

3-phase power supply

Equipment that uses a 3-phase power supply

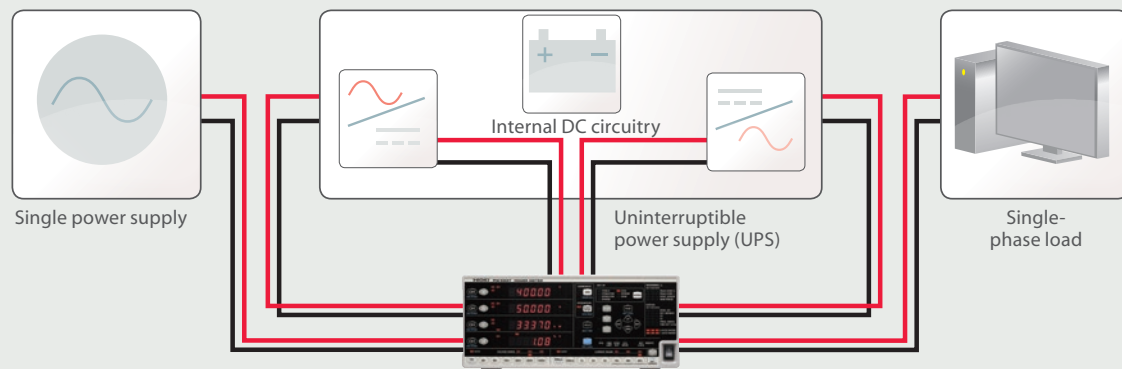*3-phase
4-wire measurement:
PW3337 series only

Misura dell'efficienza elettrica di convertitori di potenza (inverter) dedicati al settore fotovoltaico

DC

3-phase

3-phase
power supply

Solar power panel

Power conditioner

Other DC/3-phase and 1-phase/3-phase measurement applications

Measuring the efficiency of battery-powered devices (DC/3-phase) such as electric vehicles

Measuring the efficiency of rapid chargers for electric vehicles (3-phase/DC)

Valutazione del rendimento elettrico di inverter di potenza ad uso industriale

3-phase power supply

CONNECTION CORD L9217
(used for synchronization)

3-phase/3-phase inverter

3-phase load

Analisi delle capacità di conversione di dispositivi di soccorso quali UPS e gruppi di continuità e di caricabatterie di accumulo

Internal DC circuitry

Single power supply

Uninterruptible
power supply (UPS)
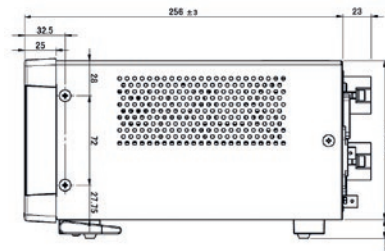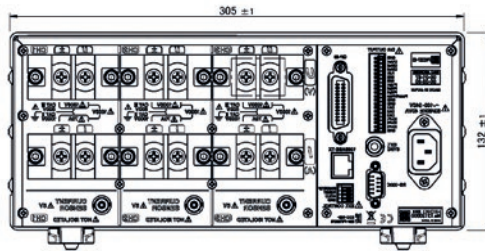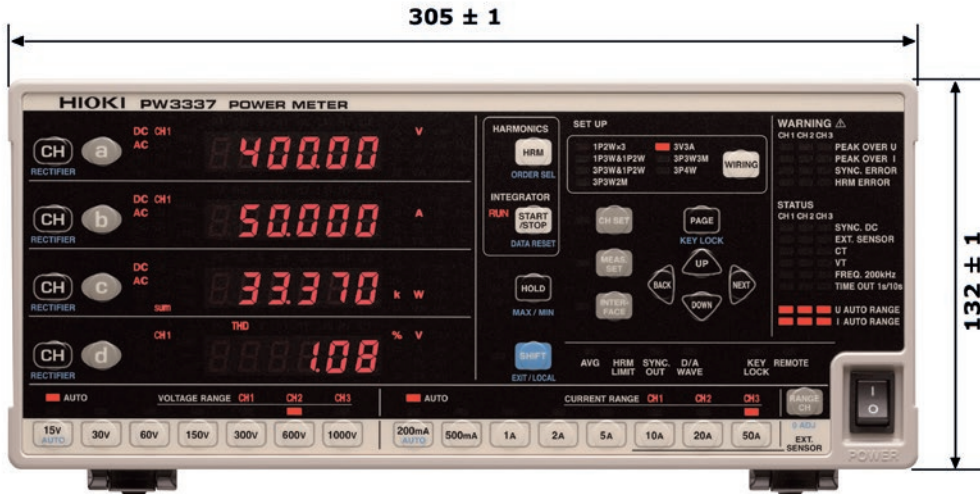
Single-
phase load

Specifications

Input Specifications

Measurement line type

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

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

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

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

Input methods
Voltage   Isolated input, resistance voltage division method
Current   Isolated input, DCCT method Isolated input from current sensors

Voltage measurement ranges
AUTO/ 15.000 V/ 30.000 V/ 60.000 V/ 150.00 V/ 300.00 V/ 600.00 V/ 1000.0 V (set for each wiring mode)

Current measurement ranges
AUTO/ 200.00 mA/ 500.00 mA/ 1.0000 A/ 2.0000 A/ 5.0000 A / 10.000 A/ 20.000 A/ 50.000 A (set for each wiring mode)
For more information about external current sensor input, see the external current sensor input specifications

Power ranges
Depends on the combination of voltage and current ranges;
PW3336: from 3.0000W to 100.00kW (also applies to VA, var)
PW3337: from 3.0000W to 150.00kW (also applies to VA, var)

Input resistance (50/60 Hz)
Voltage input terminal   : 2 MΩ±0.04 MΩ
Current direct input terminal   : 1 mΩ or less

Basic Measurement Specifications

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

Sampling frequency
Approx. 700 kHz

A/D converter resolution
16-bit

Frequency bands
DC, 0.1 Hz to 100 kHz

Synchronization sources
U1, U2, U3, I1, I2, I3, DC (fixed at 200 ms)
Can be set separately for each wiring mode.

Measurement items
· Voltage   · Current   · Active power   · Apparent power
· Reactive power   · Power factor   · Phase angle   · Frequency
· Efficiency   · Current   · Active power   · Integrated time
                     integration   integration
· Voltage waveform peak value   · Current waveform peak value
· Voltage crest factor   · Current crest factor
· Time average current   · Time average active power
· Voltage ripple factor   · Current ripple factor
Harmonic parameters:
· Harmonic voltage RMS value   · Harmonic current RMS value
· Harmonic active power   · Total harmonic voltage distortion
· Total harmonic current distortion   · Voltage fundamental waveform
· Current fundamental waveform   · Active power fundamental waveform
· Apparent power fundamental waveform · Reactive power fundamental waveform
· Power factor fundamental waveform (displacement power factor)
· Voltage current phase difference fundamental waveform
· Interchannel voltage fundamental wave phase difference
· Interchannel current fundamental wave phase difference
· Harmonic voltage content %   · Harmonic current content %
· Harmonic active power content %
The following parameters can be downloaded as data during PC communication but not displayed:
· Harmonic voltage phase angle   · Harmonic current phase angle
· Harmonic voltage current phase difference

Rectifiers
AC+DC   : AC+DC measurement
    Display of true RMS values for both voltage and current
AC+DC Umn   : AC+DC measurement
    Display of average value rectified RMS converted values for voltage
    and true RMS values for current
DC   : DC measurement
    Display of simple averages for both voltage and current
    Display of values calculated by (voltage DC value)× (current DC value)
    for active power
AC   : AC measurement
    Display of values calculated by for both voltage and current
    Display of values calculated by $\sqrt{(AC+DC\ value)^2 - (DC\ value)^2}$
    for active power
FND
    Extraction and display of the fundamental wave component from
    harmonic measurement

Zero-Crossing Filter
500 Hz/200 kHz
500 Hz: 0.1 Hz to 500 Hz, 200 kHz: 0.1 Hz to 200 kHz

Maximum effective peak voltage
±600% of each voltage range
However, for 300 V, 600 V, and 1000 V ranges, ±1500 Vpeak

Maximum effective peak current
±600% of each current range
However, for 20 A range and 50 A range, ±100 Apeak

Measurement accuracy

Voltage

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

Current (direct input)

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

Active power

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

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

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

Voltage/ Current/ Active Power Measurement Specifications

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

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

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

(i): Measurement channel

Power channel and sum value calculation formulas

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

(i): Measurement channel

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

(i): Measurement channel ; The polarity symbol $s i_{sum}$ is acquired from the Q_{sum} symbol.

Frequency Measurement Specifications

Number of measurement channels	3
Measurement source	Select from U (VHz) or I (AHz) by channel
Measurement method	Calculated from input waveform period (reciprocal method)
Measurement range	500 Hz/200 kHz (linked to zero-cross filter)
Measurement accuracy	±0.1% rdg. ±1 dgt. (0°C to 40°C)
Effective measuring range	0.1 Hz to 100 kHz For sine wave input that is at least 20% of the measurement source's measurement range. Measurement lower limit frequency setting: 0.1 sec. / 1 sec. / 10 sec.
Display format	0.1000 Hz to 9.9999 Hz, 9.900 Hz to 99.999 Hz, 99.00 Hz to 999.99 Hz, 9900 kHz to 9.9999 kHz, 9.900 kHz to 99.999 kHz, 99.00 kHz to 220.00 kHz

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

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

Voltage Waveform Peak Value / Current Waveform Peak Value Measurement Specifications

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

Range configuration
Voltage peak range

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

Current peak range

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

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

Voltage Crest Factor/ Current Crest Factor Measurement Specifications

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

Synchronized Control

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

Voltage Ripple Rate / Current Ripple Factor Measurement Specifications

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

Efficiency Measurement Specifications

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

PW3336 series

Wiring (WIRING)	CH1	CH2	Calculation formulas
1P2W × 2	1P2W	1P2W	$\eta1=100\times|P2| / |P1|$ $\eta2=100\times|P1| / |P2|$
1P3W	1P3W		
3P3W	3P3W		
3P3W2M	3P3W2M		

PW3337 series

Wiring (WIRING)	CH1	CH2	CH3	Calculation formulas
1P2W × 3	1P2W	1P2W	1P2W	$\eta1=100\times|P3| / |P1|$ $\eta2=100\times|P1| / |P3|$
1P3W & 1P2W	1P3W		1P2W	$\eta1=100\times|P3| / |Psum|$ $\eta2=100\times|Psum| / |P3|$
3P3W & 1P2W	3P3W		1P2W	
3P3W2M	3P3W2M			
3V3A	3V3A			
3P3W3M	3P3W3M			
3P4W	3P4W			

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

Functional Specifications

Auto-range (AUTO)	Automatically changes the voltage and current range for each wiring mode according to the input Range up : The range is increased when input exceeds 130% of the range or when the peak is exceeded. Range down : The range is decreased when input falls below 15% of the range. However, the range is not decreased when the peak is exceeded at the lower range.
Averaging (AVG)	· Averages the voltage, current, active power, apparent power, and reactive power. · The power factor and phase angle are calculated from averaged data. · Measured values other than peak values, power factor, frequency, integrated values, T.AV, crest factor, ripple rate, total harmonic distortion, and harmonics are averaged. Method : Simple averaging Number of averaging iterations and display update interval

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

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

Integration Measurement Specifications

Measurement types	Rectifiers: AC+DC, AC+DC Umn
	Current: Displays the result of integrating current RMS value data (display values) once every display update interval (approx. 200 ms) as an integrated value.
	Active power: Displays the result of integrating active power values by polarity calculated once every cycle for the selected synchronization source as integrated values.
	Rectifier: DC Displays the result of integrating instantaneous data obtained by sampling both current and active power by polarity as integrated values (When the active power contains both AC and DC, the DC component will not be integrated)

Integration Measurement Specifications

Measurement items	Simultaneous integration of the following 6 parameters for each channel (total of 18 parameters): Sum of current integrated values (displayed as Ah on panel display) Positive current integrated value (displayed as Ah+ on panel display) Negative current integrated value (displayed as Ah- on panel display) Sum of active power integrated values (displayed as Wh on panel display) Positive active power integrated value (displayed as Wh+ on panel display) Negative active power integrated value (displayed as Wh- on panel display)
Integration time	1 min. to 10000 hr., settable in 1 min. blocks
Integration time accuracy	±100 ppm ±1 dgt. (0°C to 40°C)
Integration measurement accuracy	(Current or active power measurement accuracy) + (±0.01% rdg. ±1 dgt.)
Effective measuring range	Until PEAK OVER U or PEAK OVER I occurs
Display resolution	999999 (6 digits + decimal point)
Functions	· Stopping integration based on integration time setting (timer) · Displaying the integration elapsed time (displayed as TIME on panel display) · Additional integration by repeatedly starting/stopping integration · Backing up integrated values and the integration elapsed time during power outages · Stopping integration when power returns
External control	Stopping/starting integration and resetting integrated values based on external control
Measuring range	Corresponds to the range set for START integretation

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

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

Harmonic Measurement Specifications (built-in function)

Measurement method	· Zero-cross simultaneous calculation method (separate windows by channel according to the wiring mode) · Uniform thinning between zero-cross events after processing with a digital antialiasing filter · Interpolation calculations (Lagrange interpolation) · When the synchronization frequency falls within the 45 Hz to 66 Hz range » IEC 61000-4-7:2002 compliant » Gaps and overlaps may occur if the measurement frequency is not 50 Hz or 60 Hz · When the synchronization frequency falls outside the 45 Hz to 66 Hz range » No gaps or overlap will occur
Synchronization source	Conforms to synchronization source (SYNC) for the basic measurement specifications
Measurement channels	3
Measurement items	· Harmonic voltage RMS value · Harmonic voltage content % · Harmonic voltage phase angle · Harmonic current RMS value · Harmonic current content % · Harmonic current phase angle · Harmonic active power · Harmonic active power content % · Harmonic voltage current phase difference · Total harmonic voltage distortion · Total harmonic current distortion · Voltage fundamental waveform · Current fundamental waveform · Active power fundamental waveform · Apparent power fundamental waveform · Reactive power fundamental waveform · Power factor fundamental waveform · Voltage current phase difference fundamental waveform · Interchannel voltage fundamental wave phase difference · Interchannel current fundamental wave phase difference The following parameters can be downloaded as data during PC communication but not displayed: · Harmonic voltage phase angle · Harmonic current phase angle · Harmonic voltage current phase difference
FFT processing word length	32 bits
Number of FFT points	4096
Window function	Rectangular
Analysis window width	45 Hz ≤ f < 56 Hz 178.57 ms to 222.22 ms (10 cycles) 56 Hz ≤ f < 66 Hz 181.82 ms to 214.29 ms (12 cycles) Frequencies other than the above 185.92 ms to 214.08 ms
Data update rate	Depends on window width
Synchronization frequency range	10 Hz to 640 Hz
Maximum analysis order	

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

Analysis order upper limit setting	2nd to 50th
Measurement accuracy	f.s.: Measurement range

Frequency (f)	Voltage, Current, Active power
DC	±0.4%rdg.±0.2%f.s.
10 Hz ≤ f < 30 Hz	±0.4%rdg.±0.2%f.s.
30 Hz ≤ f ≤ 400 Hz	±0.3%rdg.±0.1%f.s.
400 Hz < f ≤ 1 kHz	±0.4%rdg.±0.2%f.s.
1 kHz < f ≤ 5 kHz	±1.0%rdg.±0.5%f.s.
5 kHz < f ≤ 8 kHz	±4.0%rdg.±1.0%f.s.

For DC, add ±1 mA to current and (±1 mA) × (voltage read value) to active power.

Display Specifications

Display	7-segment LED
Number of display parameters	4
Display resolution	Other than integrated values: 99999 count Integrated values: 999999 count
Display update rate	200 ms ±50 ms (approx. 5 updates per sec.) to 20 s (varies with number of averaging iterations setting)

External Current Sensor Input Specifications (built-in feature)

Terminal	Isolated BNC terminals, 1 for each channel
Current sensor type switching	Off / Type 1 / Type 2 When set to off, input from the external current sensor input terminal is ignored.
Current sensor options	Type 1 　9661 (500 A AC)　　　　　9669 (1000 A AC) 　9660 (100 A AC)　　　　　CT9667 (500 A / 5000 A AC) Type 2 (9555-10　and L9217 is required; sold separately) 　9272-10 (20 A/200 A AC)　　9277 (20 A AC/DC) 　9278 (200 A AC/DC)　　　　9279* (500 A AC/DC) 　9709 (500 A AC/DC)　　　　CT6862 (50 A AC/DC) 　CT6863 (200 A AC/DC)　　　CT6865 (1000 A AC/DC) * 9279 is not CE marked
Current measurement range	Auto / 10 A / 20 A / 50 A (range noted on panel) User-selectable for each wiring mode. Can be read directly by manually setting the CT ratio.
Power range configuration	Depends on the combination of voltage and current ranges; from 60.000W to 15.000MW (also applies to VA, var)

Measurement accuracy

Current, Active power

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

f.s.: Each measurement range
- To obtain the current or active power accuracy, add the current sensor's accuracy to the above current and active power accuracy figures.
- The effective measurement range and frequency characteristics conform to the current sensor's specifications.
- Values for current, and active power for which 0.1 Hz ≤ f < 10 Hz are for reference only.
- Values for voltage in excess of 200 V active power for which 10 Hz ≤ f < 16 Hz are for reference only.

Temperature characteristics	Current, active power 　: ±0.08% f.s./°C (instrument temperature coefficient; 　　f.s.: instrument measurement range) Add current sensor temperature coefficient to above.
Power factor effects	・Instrument: ±0.15% f.s. or less (45 Hz to 66 Hz with power factor = 0) ・Internal circuit voltage/current phase difference: ±0.086° ・Add the current sensor phase accuracy to the internal circuit voltage/current phase difference noted above.
Current peak value measurement accuracy	・(External current sensor input instrument accuracy) + (±2.0% f.s.) (f.s.:current peak range) ・Add the current sensor accuracy to the above.

Harmonic measurement accuracy	Frequency	Voltage	Current, Active power
	DC	±0.4%rdg. ±0.2%f.s.	±0.6%rdg. ±0.8%f.s.
	10Hz≤ f < 30Hz	±0.4%rdg. ±0.2%f.s.	±0.6%rdg. ±0.4%f.s.
	30Hz≤ f ≤ 400Hz	±0.3%rdg. ±0.1%f.s.	±0.5%rdg. ±0.3%f.s.
	400Hz < f ≤ 1kHz	±0.4%rdg. ±0.2%f.s.	±0.6%rdg. ±0.5%f.s.
	1kHz < f ≤ 5kHz	±1.0%rdg. ±0.5%f.s.	±1.0%rdg. ±5.5%f.s.
	5kHz < f ≤ 8kHz	±4.0%rdg. ±1.0%f.s.	±2.0%rdg. ±6.0%f.s.

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

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

Number of output channels	16
Configuration	16-bit D/A converter (polarity + 15 bits)
Output parameters	U1 to U3 (voltage level) or u1 to u3 (instantaneous voltage waveform) (switchable) I1 to I3 (current level) or i1 to i3 (instantaneous current waveform) (switchable) P1 to P3 (active power level) or p1 to p3 (instantaneous power waveform) (switchable) Psum (active power level) or Hi-Psum (high-speed active power level) (switchable) 　Psum and Hi-Psum output is not available (0 V) when using the 1P2W wiring mode.P12 is output when using 1P3W, 3P3W, or 3P3W2M, and P123 is output when using 3V3A, 3P3W3M, or 3P4W. D/A1 to D/A3 　: Select any 3 from channel or sum value for voltage, current, active power, apparent power, reactive power, power factor, phase angle, total harmonic voltage/current distortion, inter-channel voltage/current fundamental wave phase difference, voltage/current crest factor, time average current/active power, voltage/current ripple rate, frequency, efficiency, current integration, active power integration (harmonic output is not available for individual orders). Hi-P1 to Hi-P3 and Hi-Psum (high-speed active power level): Fixed to AC+DC For other level output, select AC+DC, AC+DC Umn, DC, AC, or fnd.
Output accuracy	f.s.: Relative to the output voltage rated value for each output parameter Level output 　: (Output parameter measurement accuracy) + (±0.2% f.s.) High-speed active power level output 　: (Output parameter measurement accuracy) + (±0.2% f.s.) Instantaneous waveform output 　: (Output parameter measurement accuracy) + (±1.0% f.s.) 　Instantaneous voltage, instantaneous current: RMS value level 　Instantaneous power: Average value level
Output frequency band	Instantaneous waveform output, high-speed active power level output At DC or 10 Hz to 5 kHz, accuracy is as defined above.

Output voltage	Level output 　Voltage, current, active power, apparent power, reactive power, time average current/active power 　　: ±2 V DC for ±100% of range 　Power factor 　　: ±2 V DC at ±0.0000, 0 V DC at ±1.0000 　Phase angle 　　: 0 V DC at 0.00°, ±2 V DC at ±180.00° 　Voltage/current ripple rate, total harmonic voltage/current distortion 　　: + 2 V DC at 100.00% 　Voltage/current crest factor 　　: +2 V DC at 10.000 　Frequency 　　: Varies with measured value. 　　　+2 V DC per 100 Hz from 0.1000 Hz to 300.00 Hz 　　　+2 V DC per 10 kHz from 300.01 Hz to 30.000 kHz 　　　+2 V DC per 100 kHz from 30.001 kHz to 220.00 kHz 　Efficiency 　　: +2 V DC at 200.00% 　Current integration, active power integration 　　: ±5 V DC at (range) × (integration set time) 　Waveform output 　　: 1 V f.s. relative to 100% of range
Maximum output voltage	Approx. ±12 V DC
Output update rate	Level output 　: Fixed at 200 ms ±50 ms (approx. 5 times per sec.) 　　Update rate is unrelated to number of averaging iterations setting and display hold operation. Waveform output 　: Approx. 11.4 μs (approx. 87.5 kHz) High-speed P level 　: Updated once every cycle for the input waveform set as the synchronization source.
Response time	Level output 　: 0.6 sec. or less (when the input changes abruptly from 0% to 90%, or from 100% to 10%, the time required in order to satisfy the accuracy range) Waveform output 　: 0.2 ms or less High-speed active power level output 　: 1 cycle
Temperature characteristic	±0.05% f.s./°C or less
Output resistance	100 Ω ±5 Ω

External control (built-in feature)

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

External control	Input signal level: 0 to 5 V (high-speed CMOS level or shorted [Lo]/open [Hi])		
	Functions	External control signal	External control terminal
	Start	Hi → Lo	START/STOP
	Stop	Lo → Hi	
	Reset	Lo interval of at least 200 ms	RESET
	Hold on	Hi → Lo	HOLD
	Hold off	Lo → Hi	

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

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

RS-232C interface (built-in feature)

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

LAN interface (built-in feature)

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

General Specifications

Operating environment	Indoors, altitude up to 2000 m (6562-ft.), pollution degree 2
Operating temperature and humidity	0 to 40°C (32 to 104°F), 80% RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C (14 to 122°F) 80% RH or less (non-condensating)
Dielectric strength	4290 Vrms AC (sensed current: 1 mA) Between voltage input terminals and (case, interface, and output terminals) Between current direct input terminals and (case, interface, and output terminals) Between voltage input terminals and current direct input terminals
Maximum rated voltage to earth	Voltage input terminal, Current direct input terminal Measurement category III 600 V (anticipated transient overvoltage 6000 V) Measurement category II 1000 V (anticipated transient overvoltage 6000 V)
Maximum input voltage	Between voltage input terminals U: 1000 V, ±1500 Vpeak
Maximum input current	Between +/- current direct input terminals I: ±70 A, ±100 Apeak
Applicable Standards	Safety : EN61010, EMC : EN61326 Class A/ EN61000-3-2/ EN61000-3-3
Rated supply voltage	100 VAC to 240 VAC, Rated power supply frequency : 50/60 Hz
Maximum rated power	40 VA or less
Dimensions	Approx. 305W(12.01") × 132H(5.20") × 256D(10.08) mm (excluding protrusions)
Mass	PW3336 series Approx. 5 kg (176.4 oz.) PW3337 series Approx. 6 kg (211.6 oz.)
Accessories	Instruction manual × 1, Measurement guide × 1, Power cord × 1

Current Measurement Options [Type 1] Specifications (Can be connected to the current sensor input terminals on the PW3336/PW3337 series.)

Model	CLAMP ON SENSOR 9660	CLAMP ON SENSOR 9661	CLAMP ON SENSOR 9669	FLEXIBLE CLAMP ON SENSOR CT9667
Appearance				
Primary current rating	100A AC	500A AC	1000 A AC	500A AC, 5000A AC
Measurable conductor diameter	Max.φ15mm (0.59")	Max.φ46mm (1.81")	Max. φ55 mm(2.17"), 80 (3.15")×20(0.79") mm busbar	Max. φ254mm(10")
Amplitude accuracy *	±0.3%rdg.±0.02%f.s. *	±0.3%rdg.±0.01%f.s. *	±1.0%rdg.±0.01%f.s. *	±2.0%rdg.±0.3%f.s. *
Phase accuracy *	±1° or less *	±0.5° or less *	±1° or less *	±1° or less *
Frequency characteristics	±1.0% or less for 66Hz to 5kHz (deviation from specified accuracy)		Within ±2% at 40Hz to 5kHz (deviation from accuracy)	±3dB or less for 10 Hz to 20kHz (within ±3dB)
Operating Temperature & Humidity (non-condensating)	0 to 50°C (32-122°F), 80%RH or lower			0 to 40°C (32-104°F), 80%RH or lower, 40 to 50°C (104-122°F), 50%RH or lower
Effect of conductor position	Within ±0.5% (deviation from center)		Within ±1.5% (deviation from center)	Within ±3% (deviation from center)
Effect of external electromagnetic field	0.1A equivalent or lower (400A/m, 55Hz)		1A equivalent or lower (400A/m, 55Hz)	1.5% f.s. or lower (400A/m, 55Hz)
Maximum rated voltage to earth	CAT III 300Vrms		CATIII 600Vrms	CATIII 1000 Vrms, CATIV 600 Vrms
Dimensions, Mass	46W(1.81")×135H(5.31")×21D(0.83")mm, 230g(8.1oz.)	78W(3.07")×152H(5.98")×42D(1.65")mm, 380g(13.4oz.)	99.5W (3.92") × 188H (7.40") × 42D (1.65") mm, 590g (20.8 oz.)	Circuit box: 35W (1.38") × 120.5H (4.74") × 34D (1.34") mm, 140 g (4.9 oz.)
Power supply	—	—	—	LR6 alkaline battery x2, or AC Adapter (option)
Options (sold separately)	—	—	—	AC ADAPTER 9445-02 (universal 100 to 240VAC /for USA) AC ADAPTER 9445-03 (universal 100 to 240VAC /for Europe)

* : 45 to 66Hz

Current Measurement Options [Type 2] Specifications (Requires Sensor Unit 9555-10 and Connection Cable L9217.)

Model	CLAMP ON SENSOR 9272-10	UNIVERSAL CLAMP ON CT 6841	UNIVERSAL CLAMP ON CT 6843	UNIVERSAL CLAMP ON CT 9279/01
Appearance				
Primary current rating	20A/200A AC	AC/DC 20A	AC/DC 200A	AC/DC 500A
Measurable conductor diameter	Max.φ 46mm (1.81")	40A rms	400A rms	650A rms
Amplitude accuracy *	±0.3%rdg.±0.01%f.s. *	± 0.3%rdg. ±0.01%f.s. (DC < Freq < 100Hz)		±0.05%rdg. ±0.05%f.s., ±0.2°
Phase accuracy *	±0.2° or less			
Frequency characteristics** (typical)	1Hz to 5Hz: ±2%rdg.±0.1%f.s. 1kHz to 5kHz: ±1%rdg.±0.05%f.s. (±1.0°) 10kHz to 50kHz: ±5%rdg.±0.1%f.s.	DC to 1kHz: accuracy depending on frequency bandwidth	DC to 500kHz: accuracy depending on frequency bandwidth	DC to 20kHz: accuracy depending on frequency bandwidth
Operating Temperature & Humidity (non-condensating)	0°C to 50°C (-32°F to 122°F) 80%RH or lower	±0.1%rdg. or less		±1.5%rdg. or less
Effect of conductor position	Within ±0.2%rdg. (deviation from center)	50mA or less Scaled value, in a DC or 60 Hz magnetic field of 400A/m		2A or less in DC or 55Hz magnetic field of 400A/m
Effect of external electromagnetic field	0.1A equivalent or lower (400A/m, 55Hz)	-40° C to +85° C		0° to +40° C
Maximum rated voltage to earth	CAT III 600Vrms	Ø 20mm		Ø 40mm
Dimensions, Mass	78W(3.07")×188H(7.40")×35D(1.38")mm, 430g(15.2 oz.)	135x67x25mm		220x103x44mm, 470g
		350g	370g	
Power supply	Sensor Unit 9555-10			
Options (sold separately)	Sensor Unit 9555-10, Connection Cable L9217			

| Model	AC/DC CURRENT SENSOR CT6862	AC/DC CURRENT SENSOR CT6863	AC/DC CURRENT SENSOR 9709	AC/DC CURRENT SENSOR CT6865
Appearance				
Primary current rating	50A AC/DC	200A AC/DC	500A AC/DC	1000A AC/DC
Measurable conductor diameter	Max.φ 24mm (0.94")		Max.φ 36mm (1.42")	
Amplitude accuracy *	±0.05 %rdg.±0.01 % f.s. , ±0.2° (Right after power is turned on at DC and 16Hz to 400Hz)		±0.05 %rdg.±0.01 % f.s. , ±0.2° (10 minutes after power is turned on)	±0.05 %rdg.±0.01 % f.s. , ±0.2°
Phase accuracy *	±0.05 %rdg.±0.01 % f.s. , ±0.2° (Right after power is turned on at DC and 16Hz to 400Hz)		±0.05 %rdg.±0.01 % f.s. , ±0.2° (10 minutes after power is turned on)	±0.05 %rdg.±0.01 % f.s. , ±0.2°
Frequency characteristics** (typical)	DC to 16 Hz: ±0.1%rdg.±0.02%f.s.(±0.3°) 5kHz to 10kHz: ±1%rdg.±0.02%f.s. (±1.0°) 500kHz to 1M Hz: ±30%rdg.±0.05%f.s. ***	DC to 16 Hz: ±0.1%rdg.±0.02%f.s.(±0.3°) 5kHz to 10kHz: ±1%rdg.±0.02%f.s. (±1.0°) 300kHz to 500k Hz: ±30%rdg.±0.05%f.s.***	DC to 45Hz: ±0.2%rdg.±0.02%f.s.(±0.3°) 5kHz to 10kHz: ±2%rdg.±0.1%f.s. (±2.0°) 20kHz to 100kHz: ±30%rdg.±0.1%f.s. (±30°)	DC to 16Hz: ±0.1%rdg.±0.02%f.s.(±0.3°) 500Hz to 10kHz: ±5%rdg.±0.05%f.s. 10kHz to 20kHz: ±30%rdg.±0.1%f.s.
Operating Temperature & Humidity (non-condensating)	-30°C to 85°C (-22°F to 185°F) 80%RH or less		9709: 0°C to 50°C (-32°F to 122°F) 80%RH or less	-30°C to 85°C (-22°F to 185°F), 80%RH or less
Effect of conductor position	Within ±0.01%rdg. (deviation from center)	Within ±0.01%rdg. (deviation from center)	Within ±0.05%rdg. (deviation from center)	Within ±0.05%rdg. (deviation from center)
Effect of external electromagnetic field	10mA equivalent or lower (400A/m, 60Hz and DC)	50mA equivalent or lower (400A/m, 60Hz and DC)	50mA equivalent or lower (400A/m, 60Hz and DC)	200mA equivalent or lower (400A/m, 60Hz and DC)
Maximum rated voltage to earth	CAT III 1000Vrms	CAT III 1000Vrms	CAT III 1000Vrms	CAT III 1000Vrms
Dimensions, Mass	70W(2.76")×100H(3.94")×53D(2.09")mm, CT6862: 340g(12.0 oz.), CT6863: 350g(12.3oz.)		160W(6.30")×112H(4.41")×50D(1.97")mm, 9709: 850g(30.0oz.) CT9895: 1000g(35.3oz)	
Power supply	Sensor Unit 9555-10			
Options (sold separately)	Sensor Unit 9555-10, Connection Cable L9217			

* : 45 to 66 Hz, DC: DC compatible sensor   ** : Includes derating characteristics   *** : No phase precision regulations

Type 2 Current Sensor Options

	Sensor Unit 9555-10
Appearance	
Compatible current sensors	9272-10, 9277, 9728, 9279, CT6862, CT6863, 9709, CT6865
Output terminals	BNC terminals
Power supply	AC Adapter 9418-15 (100 to 240 V AC)
Accessories	Instruction manual, AC Adapter 9418-15

	Connection Cord L9217
Appearance	
Cord length	3 m
Terminals	Isolated BNC to isolated BNC

Type 2 Current Sensor Connection Diagram
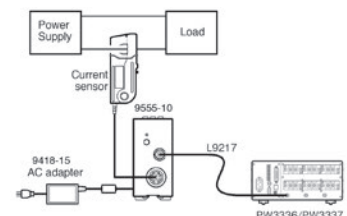
Instrument

Power Meter PW3336 (2-channel)
PW3336-01 (2-channel, with GP-IB terminal)
PW3336-02 (2-channel, with D/A output terminal)
PW3336-03 (2-channel, with GP-IB terminal and D/A output terminal)

Power Meter PW3337 (3-channel)
PW3337-01 (3-channel, with GP-IB terminal)
PW3337-02 (3-channel, with D/A output terminal)
PW3337-03 (3-channel, with GP-IB terminal and D/A output terminal)

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

Current measurement options: Type 1
Can be connected to the current sensor input terminals on the PW3336/PW3337 series.

For 50/60Hz commercial power lines

CLAMP ON SENSOR 9660
100A AC
φ15mm(0.59")

CLAMP ON SENSOR 9661
500A AC
φ46mm(1.81")

CLAMP ON SENSOR 9669
1000A AC
φ55mm(2.17"),
80(3.15")×20(0.79")mm busbar

FLEXIBLE CLAMP ON SENSOR CT9667
500A AC/ 5000A AC (selectable),
φ254mm (10"),
Power supply: LR06 alkaline battery
or AC ADAPTER 9445-02/03 (sold separately)

Current measurement options: Type 2

Requires SENSOR UNIT 9555-10 and CONNECTION CORD L9217

CLAMP ON SENSOR 9272-10
20A/ 200A AC
φ46mm(1.81")
POWER SUPPLY: 9555-10

AC/DC Clamp SENSOR CT6841
20A AC/DC
Ø 20MM (0.79")
POWER SUPPLY: 9555-10

AC/DC Clamp SENSOR CT6843
200A AC/DC
Ø 20MM (0.79")
POWER SUPPLY: 9555-10

AC/DC Clamp SENSOR 9279/01
500A AC/DC
Ø 40MM (1.57")
POWER SUPPLY: 9555-10

SENSOR UNIT 9555-10
POWER SUPPLY:
100V to 240V AC (50/60Hz)

AC/DC CURRENT SENSOR CT6862
50A AC/DC
φ24mm(0.94")
POWER SUPPLY: 9555-10

AC/DC CURRENT SENSOR CT6863
200A AC/DC
φ24mm(0.94")
POWER SUPPLY: 9555-10

AC/DC CURRENT SENSOR 9709
500A AC/DC
φ36mm(1.42")
POWER SUPPLY: 9555-10

AC/DC CURRENT SENSOR CT6865
1000A AC/DC
φ36mm(1.42")
POWER SUPPLY: 9555-10

CONNECTION CORD L9217
For sensor output
Cord length: 3m
Isolated BNC to isolated BNC

Communications and control options

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

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

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

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

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

PW Communicator software

Software applicativo per PC

PW Communicator è un applicativo software fornito in dotazione ai wattmetri PWxxxx che consente l'interfacciamento a PC tramite connessione su porta LAN-RJ45, su seriale RS232 o su seriale GP-IB.
L'applicativo software offre le funzionalità di configurazione dello strumento, di impostazione dell'intervallo temporale di acquisizione dei dati, di elaborazione dei calcoli numerici basati sui dati raccolti, di calcolo dei parametri di efficienza elettrica, la visualizzazione istantanea di 10 o più parametri di misura e le relative forme d'onda, e molto altro.

Monitoraggio valori istantanei
La funzione di visualizzazione dei valori istantanei trasferisce a monitor le misurazioni svolte dal wattmetro connesso.

Monitoraggio forme d'onda
Questa funzione consente di visualizzare a monitor le forme d'onda dei segnali di tensione e corrente misurati dal wattmetro PWxxxx connesso.

Impostazioni
Tramite l'applicativo PW Communicator si possono configurare le condizioni di misura di PWxxxx.

Sincronizzazione di più unità
Utilizzando più unità PWxxxx in sincronizzazione, è possibile calcolare l'efficienza elettrica ingresso/uscita di un convertitore di potenza o raffrontare più apparecchiature elettriche in contemporanea. Questa funzione può essere utilizzata per controllare in modo sincrono fino a 8 wattmetri, anche in configurazione mista PW3335-PW3336-PW3337.
Per la sincronizzazione è necessario il cavo opzionale 9165.
È possibile sincronizzare 2 unità PW6001 tramite il cavo in fibra ottica L6000.

Salvataggio dati su file CSV
L'applicativo consente di memorizzare fino a 180 dati di misura su file CSV, con un intervallo di registrazione fisso.
L'intervallo di registrazione è configurabile da un minimo di 200millisecondi, fino a una cadenza massima di 60 minuti.

CARATTERISTICHE DEL SOFTWARE	
Ambiente operativo	Compatibile PC/AT
Sistema operativo	Windows 7, Win 8, Win 8.1 (32/64bit)
Memoria fissa	Minimo 2GB
Interfaccia	LAN, RS232, GP-IB

Report software: per la creazione di report indicanti il rispetto dei requisiti definiti della norma CEI EN 62301 – STAND-BY (disponibile a breve)
Driver per Labview: il driver per Labview consente di acquisire le misurazioni effettuate dai wattmetri PWxxxx su software National Labview (marchio registrato di National Instruments Corporation)

I modelli proposti

Wattmetri di Precisione

	PW6001	3390	PW3337	PW3336	PW3335
Canali di misura V e I	fino a 6 e 6	4 e 4	4 e 3	2 e 2	1 e 1
Misura di tensione	fino a 1500V	fino a 1500V	fino a 1000V	fino a 1000V	fino a 1000V
Misura diretta di corrente	fino a 50A*		fino a 65A	fino a 65A	fino a 30A
Misura indiretta di corrente	fino a 1000A	fino a 1200A	fino a 5000A	fino a 5000A	fino a 5000A
Banda di Frequenza	da DC a 2MHz	da DC a 150kHz	da DC a 100kHz	da DC a 100kHz	da DC a 100kHz
Parametri elettrici (V, I, P, Q, S, PF, FQ, …)	•	•	•	•	•
Integrazione di Energia	•	•	•	•	•
Distorsione Armonica Totale THD%	•	•	•	•	•
Analisi componenti armoniche V e I	• (fino 50° ordine)	• (fino 100° ordine)	• (fino 50° ordine)	• (fino 50° ordine)	• (fino 50° ordine)
Campionamento	5MHz	500kHz	700kHz	700kHz	700kHz
Cadenza di registrazione	da 200 msec a 60 min	da 50 msec a 60 min	da 200 msec a 60 min	da 200 msec a 60 min	da 200 msec a 60 min
Memorizzazione dati	memoria interna e USB key	CF Card	su PC	su PC	su PC
Display grafico	•	•			
Interfacce	LAN, RS232 (GP-IB)	USB, LAN, CF Card	LAN, RS232 (GP-IB)	LAN, RS232 (GP-IB)	LAN, RS232 (GP-IB)
Alimentazione	Rete	Rete	Rete	Rete	Rete
Analisi FFT sulle forme d'onda	•	•			
Opzione rendimento meccanico dei motori	•	•			

* tramite modulo opzionale