

# Raising the Bar for High-Accuracy Measurement

Attain greater accuracy when measuring the efficiency of increasingly high-current, high-speed EV/HEV inverters

Dramatically improved frequency characteristics and anti-noise performance

**CT6875**

500 A AC/DC

DC to 2 MHz

DC to 100 kHz  
Earlier model (9709)

**CT6876**

1000 A AC/DC

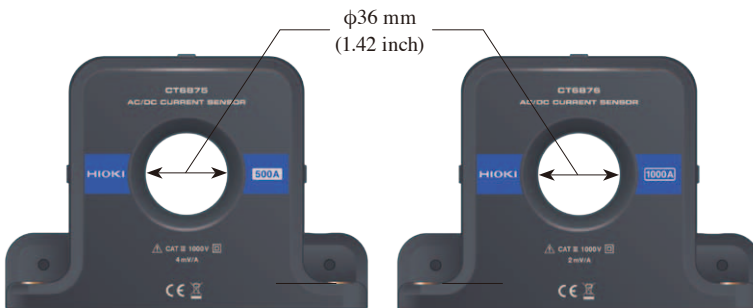
DC to 1.5 MHz

DC to 20 kHz  
Earlier model (CT6865)

**CT6877**

2000 A AC/DC

DC to 300 kHz



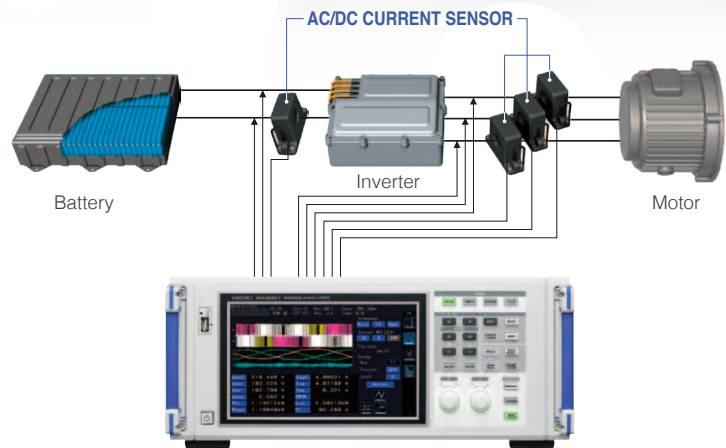
Example measurement setup with Power Analyzer PW6001

### POWER ANALYZER PW6001

Improve Power Conversion Efficiency

From DC to 2 MHz, industry's proven solution for high-accuracy power analysis.

The PW6001 features a phase shift function for current sensors to lock in accurate measurement of high-frequency power. 5 MS/s sampling at 18-bit resolution ensure true power analysis of PWM waveforms and results that are free of aliasing error.



HIOKI POWER ANALYZER PW6001

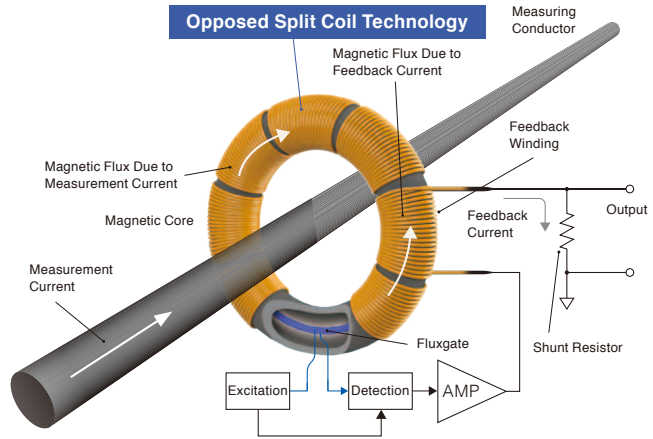
Evaluate inverter power conversion efficiency

# Unparalleled technology driving the evolution of current measurement

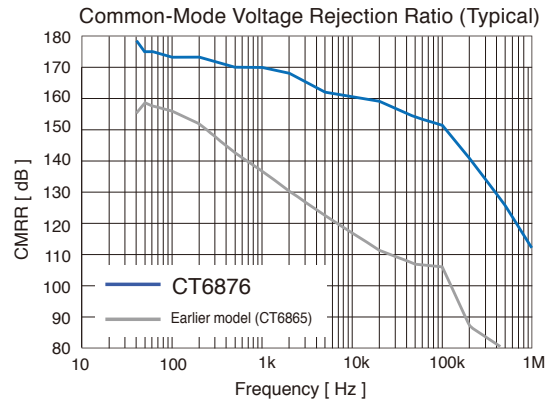
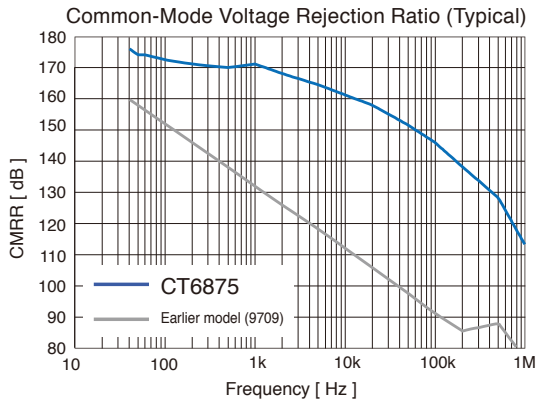
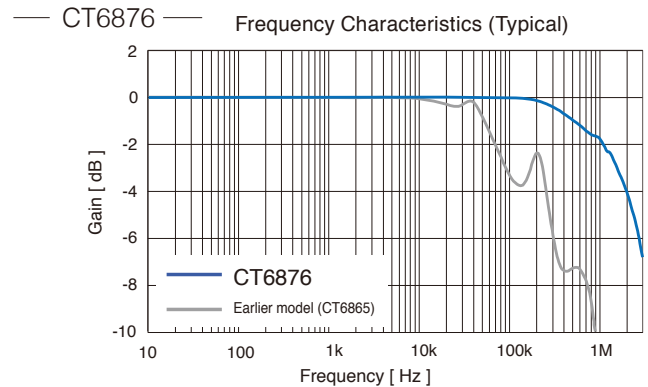
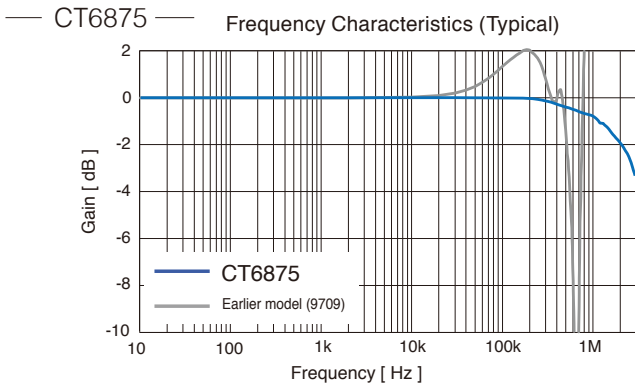
## Broadband Flux Gate Zero-Flux Method Sensor with New Opposed Split Coil\*

Current sensor performance is maximized with the "Zero Flux (Fluxgate Detection)" measurement method. High frequency current is detected with windings (CT method), and direct to low frequency current is detected with fluxgates. Use of a newly developed opposed split coil\* for the winding (CT) makes possible a broad measurement band, while strengthened shielding boosts anti-noise performance.

\*Opposed Split Coil: Coil in which divided windings are arranged opposite each other on a magnetic core to broaden the range of current detection

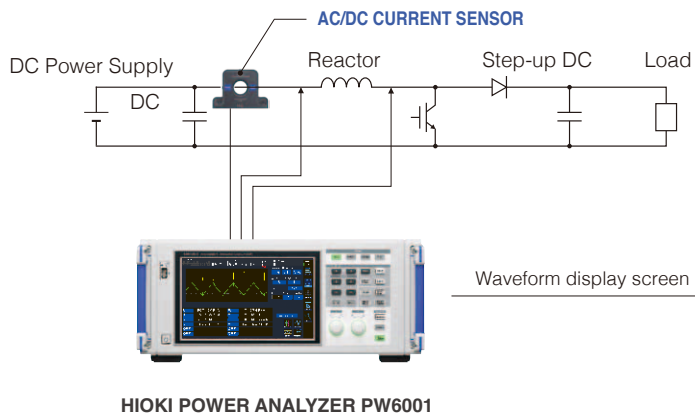


## Toward even higher-accuracy measurement... the key is flat frequency characteristics and CMRR performance.

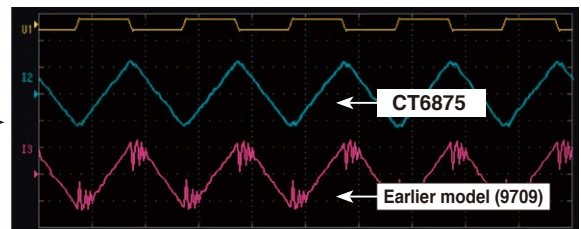


## Excellent noise resistance

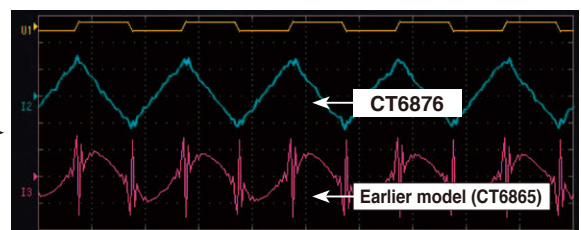
Improved noise resistance allows accurate measurement of switching current that until now would have been obscured by noise.



Comparison of measurement waveforms, CT6875 and Earlier model



Comparison of measurement waveforms, CT6876 and Earlier model



Example of Measured Waveforms for Switching Current at 100kHz (Measured with HIOKI PW6001)

## CT6875, CT6875-01



**AC/DC 500 A**  
**Frequency band:**  
**DC to 2 MHz** ( $\pm 3$  dB Typical)\*  
 \*CT6875-01: DC to 1.5 MHz ( $\pm 3$  dB Typical)  
 Diameter of measurable conductors:  
 $\phi$  36 mm (1.42 in) or less  
 Output connector: ME15W  
 Cable length: CT6875 3 m (9.84 ft)  
 CT6875-01 10 m (32.81 ft)

### Specifications

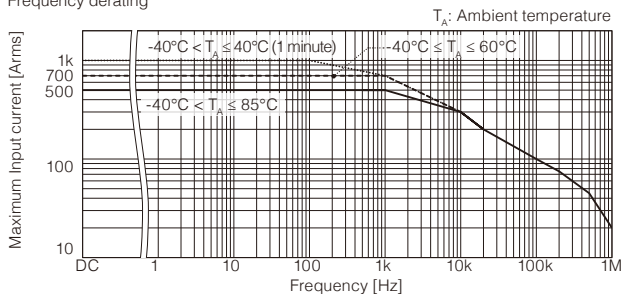
Accuracy (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

Frequency	Amplitude	Phase
DC	$\pm 0.04\%$ rdg. $\pm 0.008\%$ f.s.	-
DC < f < 16 Hz	$\pm 0.1\%$ rdg. $\pm 0.02\%$ f.s.	$\pm 0.1^\circ$
16 Hz $\leq$ f $\leq$ 45 Hz	$\pm 0.05\%$ rdg. $\pm 0.01\%$ f.s.	$\pm 0.1^\circ$
45 Hz < f $\leq$ 66 Hz	$\pm 0.04\%$ rdg. $\pm 0.008\%$ f.s.	$\pm 0.1^\circ$
66 Hz < f $\leq$ 100 Hz	$\pm 0.05\%$ rdg. $\pm 0.01\%$ f.s.	$\pm 0.1^\circ$
100 Hz < f $\leq$ 500 Hz	$\pm 0.1\%$ rdg. $\pm 0.02\%$ f.s.	$\pm 0.2^\circ$
500 Hz < f $\leq$ 1 kHz	$\pm 0.2\%$ rdg. $\pm 0.02\%$ f.s.	$\pm 0.4^\circ$
1 kHz < f $\leq$ 5 kHz	$\pm 0.4\%$ rdg. $\pm 0.02\%$ f.s.	$\pm 0.5^\circ$
5 kHz < f $\leq$ 10 kHz	$\pm 0.4\%$ rdg. $\pm 0.02\%$ f.s.	$\pm (0.1 \times f \text{ kHz})^\circ$
10 kHz < f $\leq$ 50 kHz	$\pm 1.5\%$ rdg. $\pm 0.05\%$ f.s.	$\pm (0.1 \times f \text{ kHz})^\circ$
50 kHz < f $\leq$ 100 kHz	$\pm 2.5\%$ rdg. $\pm 0.05\%$ f.s.	$\pm (0.1 \times f \text{ kHz})^\circ$
100 kHz < f $\leq$ 1 MHz	$\pm (0.025 \times f \text{ kHz})\%$ rdg. $\pm 0.05\%$ f.s.	$\pm (0.1 \times f \text{ kHz})^\circ$
Frequency band	2 MHz ( $\pm 3$ dB Typical)	-

- With sine wave input and centrally positioned conductor; does not reflect various effects.
- When connected to instrument with an input resistance of at least 1 M $\Omega$ .
- Amplitude accuracy and phase accuracy are defined for input of 110% f.s. or less that falls within the derating range.
- Values provided for frequencies of DC < f < 10 Hz are design values.
- Add  $\pm 0.01\%$  rdg. to the amplitude accuracy for input from 100% f.s. to 110% f.s.
- For the CT6875-01, add the following for frequencies of 1 kHz < f  $\leq$  1 MHz:
- Amplitude accuracy:  $\pm (0.005 \times f \text{ kHz})\%$  rdg. Phase accuracy:  $\pm (0.015 \times f \text{ kHz})^\circ$

Temperature and humidity range for guaranteed accuracy: 0°C to 40°C (32°F to 104°F), 80% RH or less  
 Effect of temperature: In ranges from -40°C to 0°C (-40°F to 32°F) and 40°C to 85°C (104°F to 185°F)  
 Amplitude sensitivity:  $\pm 20$  ppm of rdg./°C  
 Offset voltage:  $\pm 5$  ppm of f.s./°C  
 Magnetic susceptibility: 10 mA or less (Scaled value, after input of 500 A DC)  
 Common-mode voltage rejection ratio (CMRR): 140 dB or greater (50 Hz/60 Hz), 120 dB or greater (100 kHz) (Effect on output voltage/common-mode voltage)  
 Effect of conductor position: DC, 50 Hz/60 Hz:  $\pm 0.01\%$  rdg. or less (100 A input)  
 10 kHz:  $\pm 0.4\%$  rdg. or less (10 A input)  
 100 kHz:  $\pm 2.5\%$  rdg. or less (10 A input)  
 With a wire diameter of 10 mm  
 Effect of external magnetic field: 20 mA or less (Scaled value, in a DC and 60 Hz magnetic field of 400 A/m)  
 Maximum input current: Within the derating range  
 Maximum input of up to  $\pm 1500$  A peak (design value) allowed at 40°C or less for 20 ms or less  
 Output voltage: 4 mV/A  
 Offset voltage:  $\pm 15$  ppm Typical (23°C)  
 Linearity:  $\pm 5$  ppm Typical (23°C, no input)  
 Output impedance: 50  $\Omega$   $\pm 10$   $\Omega$   
 Operating temperature and humidity range: -40°C to 85°C, 80% RH or less (no condensation)  
 Storage temperature and humidity range: -40°C to 85°C, 80% RH or less (no condensation)  
 Power supply: Power supplied from PW6001, PW3390, CT9555, CT9556, CT9557, or external DC power supply  
 Dimensions: Approx. 160 mm (6.30 in) W  $\times$  112 mm (4.41 in) H  $\times$  50 mm (1.97 in) D  
 Mass: Approx. CT6875: 0.8 kg (28.2 oz), CT6875-01: 1.10 kg (38.8 oz)  
 Accessories: User Guide, marker bands, and operating precautions (0990A907)

Frequency derating



### POWER ANALYZER PW6001: Combined Accuracy

Frequency	Current	Power	Phase
DC	$\pm 0.06\%$ rdg. $\pm 0.038\%$ f.s. (f.s.=PW6001 Range)	$\pm 0.06\%$ rdg. $\pm 0.058\%$ f.s. (f.s.=PW6001 Range)	PW6001 accuracy + sensor accuracy
45 Hz $\leq$ f $\leq$ 66 Hz	$\pm 0.06\%$ rdg. $\pm 0.028\%$ f.s. (f.s.=PW6001 Range)	$\pm 0.06\%$ rdg. $\pm 0.038\%$ f.s. (f.s.=PW6001 Range)	
Bandwidths other than 45 Hz $\leq$ f $\leq$ 65 Hz and DC	PW6001 accuracy + sensor accuracy (Consider sensor rating when calculating f.s. error.)	PW6001 accuracy + sensor accuracy (Consider sensor rating when calculating f.s. error.)	

For other measurement parameters, add the PW6001 accuracy and the sensor accuracy (and consider the sensor rating when calculating the f.s. error).

## CT6876, CT6876-01



**AC/DC 1000 A**  
**Frequency band:**  
**DC to 1.5 MHz** ( $\pm 3$  dB Typical)\*  
 \*CT6876-01: DC to 1.2 MHz ( $\pm 3$  dB Typical)  
 Diameter of measurable conductors:  
 $\phi$  36 mm (1.42 in) or less  
 Output connector: ME15W  
 Cable length: CT6876 3 m (9.84 ft)  
 CT6876-01 10 m (32.81 ft)

### Specifications

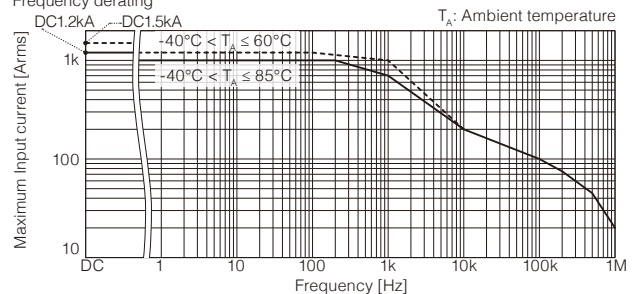
Accuracy (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

Frequency	Amplitude	Phase
DC	$\pm 0.04\%$ rdg. $\pm 0.008\%$ f.s.	-
DC < f < 16 Hz	$\pm 0.1\%$ rdg. $\pm 0.02\%$ f.s.	$\pm 0.1^\circ$
16 Hz $\leq$ f $\leq$ 45 Hz	$\pm 0.05\%$ rdg. $\pm 0.01\%$ f.s.	$\pm 0.1^\circ$
45 Hz < f $\leq$ 66 Hz	$\pm 0.04\%$ rdg. $\pm 0.008\%$ f.s.	$\pm 0.1^\circ$
66 Hz < f $\leq$ 100 Hz	$\pm 0.05\%$ rdg. $\pm 0.01\%$ f.s.	$\pm 0.1^\circ$
100 Hz < f $\leq$ 500 Hz	$\pm 0.1\%$ rdg. $\pm 0.02\%$ f.s.	$\pm 0.2^\circ$
500 Hz < f $\leq$ 1 kHz	$\pm 0.2\%$ rdg. $\pm 0.02\%$ f.s.	$\pm 0.4^\circ$
1 kHz < f $\leq$ 5 kHz	$\pm 0.5\%$ rdg. $\pm 0.02\%$ f.s.	$\pm 0.5^\circ$
5 kHz < f $\leq$ 10 kHz	$\pm 0.5\%$ rdg. $\pm 0.02\%$ f.s.	$\pm (0.1 \times f \text{ kHz})^\circ$
10 kHz < f $\leq$ 50 kHz	$\pm 2\%$ rdg. $\pm 0.05\%$ f.s.	$\pm (0.1 \times f \text{ kHz})^\circ$
50 kHz < f $\leq$ 100 kHz	$\pm 3\%$ rdg. $\pm 0.05\%$ f.s.	$\pm (0.1 \times f \text{ kHz})^\circ$
100 kHz < f $\leq$ 1 MHz	$\pm (0.03 \times f \text{ kHz})\%$ rdg. $\pm 0.05\%$ f.s.	$\pm (0.1 \times f \text{ kHz})^\circ$
Frequency band	1.5 MHz ( $\pm 3$ dB Typical)	-

- With sine wave input and centrally positioned conductor; does not reflect various effects.
- When connected to instrument with an input resistance of at least 1 M $\Omega$ .
- Amplitude accuracy and phase accuracy are defined for input of 110% f.s. or less that falls within the derating range.
- Values provided for frequencies of DC < f < 10 Hz are design values.
- Add  $\pm 0.01\%$  rdg. to the amplitude accuracy for input from 100% f.s. to 110% f.s.
- For the CT6876-01, add the following for frequencies of 1 kHz < f  $\leq$  1 MHz:
- Amplitude accuracy:  $\pm (0.005 \times f \text{ kHz})\%$  rdg. Phase accuracy:  $\pm (0.015 \times f \text{ kHz})^\circ$

Temperature and humidity range for guaranteed accuracy: 0°C to 40°C (32°F to 104°F), 80% RH or less  
 Effect of temperature: In ranges from -40°C to 0°C (-40°F to 32°F) and 40°C to 85°C (104°F to 185°F)  
 Amplitude sensitivity:  $\pm 20$  ppm of rdg./°C  
 Offset voltage:  $\pm 5$  ppm of f.s./°C  
 Magnetic susceptibility: 20 mA or less (Scaled value, after input of 1000 A DC)  
 Common-mode voltage rejection ratio (CMRR): 140 dB or greater (50 Hz/60 Hz), 120 dB or greater (100 kHz) (Effect on output voltage/common-mode voltage)  
 Effect of conductor position: DC, 50 Hz/60 Hz:  $\pm 0.01\%$  rdg. or less (100 A input)  
 10 kHz:  $\pm 0.5\%$  rdg. or less (10 A input)  
 100 kHz:  $\pm 3\%$  rdg. or less (10 A input)  
 With a wire diameter of 10 mm  
 Effect of external magnetic field: 40 mA or less (Scaled value, in a DC and 60 Hz magnetic field of 400 A/m)  
 Maximum input current: Within the derating range  
 Maximum input of up to  $\pm 1800$  A peak (design value) allowed at 40°C or less for 20 ms or less  
 Output voltage: 2 mV/A  
 Output impedance: 50  $\Omega$   $\pm 10$   $\Omega$   
 Offset voltage:  $\pm 15$  ppm Typical (23°C)  
 Linearity:  $\pm 5$  ppm Typical (23°C, no input)  
 Operating temperature and humidity range: -40°C to 85°C, 80% RH or less (no condensation)  
 Storage temperature and humidity range: -40°C to 85°C, 80% RH or less (no condensation)  
 Power supply: Power supplied from PW6001, PW3390, CT9555, CT9556, CT9557, or external DC power supply  
 Dimensions: Approx. 160 mm (6.30 in) W  $\times$  112 mm (4.41 in) H  $\times$  50 mm (1.97 in) D  
 Mass: Approx. CT6876: 0.95 kg (33.5 oz), CT6876-01: 1.25 kg (44.1 oz)  
 Accessories: User Guide, marker bands, and operating precautions (0990A907)

Frequency derating



### POWER ANALYZER PW3390: Combined Accuracy

Frequency	Current	Power	Phase
DC	$\pm 0.09\%$ rdg. $\pm 0.078\%$ f.s. (f.s.=PW3390 Range)	$\pm 0.09\%$ rdg. $\pm 0.078\%$ f.s. (f.s.=PW3390 Range)	PW3390 accuracy + sensor accuracy
45 Hz $\leq$ f $\leq$ 66 Hz	$\pm 0.08\%$ rdg. $\pm 0.058\%$ f.s. (f.s.=PW3390 Range)	$\pm 0.08\%$ rdg. $\pm 0.058\%$ f.s. (f.s.=PW3390 Range)	
Bandwidths other than 45 Hz $\leq$ f $\leq$ 65 Hz and DC	PW3390 accuracy + sensor accuracy (Consider sensor rating when calculating f.s. error.)	PW3390 accuracy + sensor accuracy (Consider sensor rating when calculating f.s. error.)	

For other measurement parameters, add the PW3390 accuracy and the sensor accuracy (and consider the sensor rating when calculating the f.s. error).

# Delivering both high-current measurement and broadband performance

Rated primary current

**2000 A**

Measurement Frequency Range

**300 kHz**

Accuracy

**±0.04% rdg. (±0.008% f.s.)**

## AC/DC CURRENT SENSOR

### CT6877



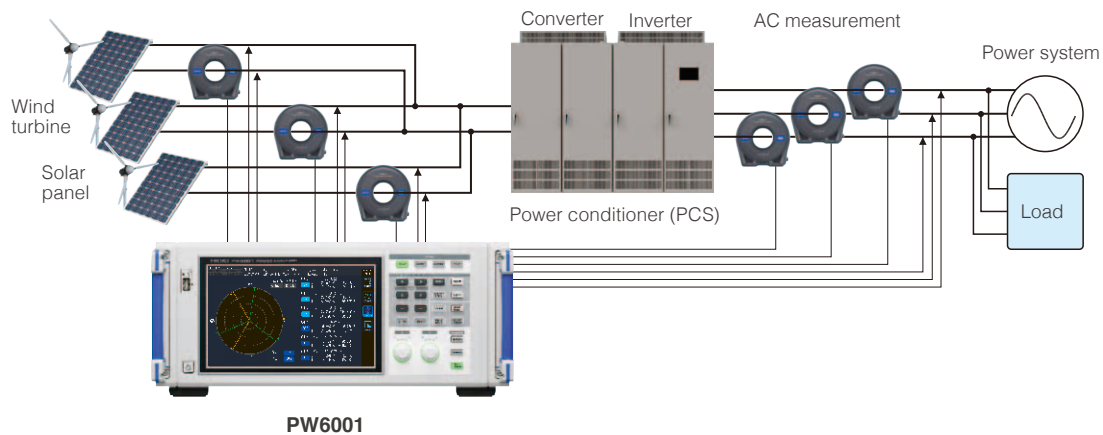
Available Spring 2019

## Specifications

(Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

	CT6877
Rated primary current	2000 A AC/DC
Maximum input current	±3200 A peak
Output voltage	1 mV/A
Basic accuracy (DC, 45 Hz ≤ f ≤ 66 Hz)	Amplitude: ±0.04% rdg. ±0.008% f.s. Phase: ±0.1°
Frequency band	DC to 300 kHz
Operating temperature and humidity range	-40°C to +85°C (-40°F to 185°F), 80% RH or less
Diameter of measurable conductors	φ80 mm (3.15 in) or less
Interface	Dedicated interface (ME15W)
Power supply	Power supplied from Power Analyzer PW6001/PW3390 or Sensor Unit CT9555/CT9556/CT9557
Dimensions (excluding protrusions and cables)	Approx. 286 mm (11.26 in) W × 296 mm (11.65 in) H × 126 mm (4.96 in) D

## Example measurement setup with Power Analyzer PW6001



## PV/Wind turbine Power Conditioner (PCS) Efficiency Measurement

### Model: AC/DC CURRENT SENSOR CT6875, CT6876, CT6877

Model No. (Order Code)	Rated current	Output cable length	
CT6875	500 A	3 m (9.84 ft)	
CT6875-01	500 A	10 m (32.81 ft)	
CT6876	1000 A	3 m (9.84 ft)	
CT6876-01	1000 A	10 m (32.81 ft)	
CT6877	2000 A	3 m (9.84 ft)	Available Spring 2019
CT6877-01	2000 A	10 m (32.81 ft)	Available Spring 2019

### Options

#### CONVERSION CABLE CT9901



Converts the sensor's ME15W output cable terminal to PL23

#### EXTENSION CABLE CT9902



Cable length: 5 m  
Extends sensor's output cable 5 m (16.41 ft); combine for maximum additional length of 10 m (32.81 ft).

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