

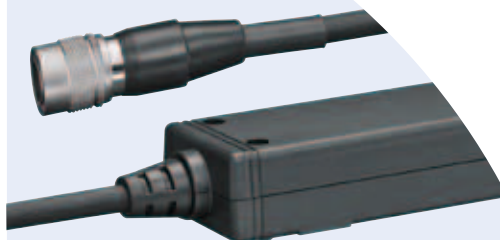
# HIOKI

instrumentos  
de medida

## AC/DC CURRENT SENSOR CT6904

NEW

Ultra-High Performance AC/DC Current Sensor



## World-Class Accuracy & Measurement Range (40× Conventional Models)

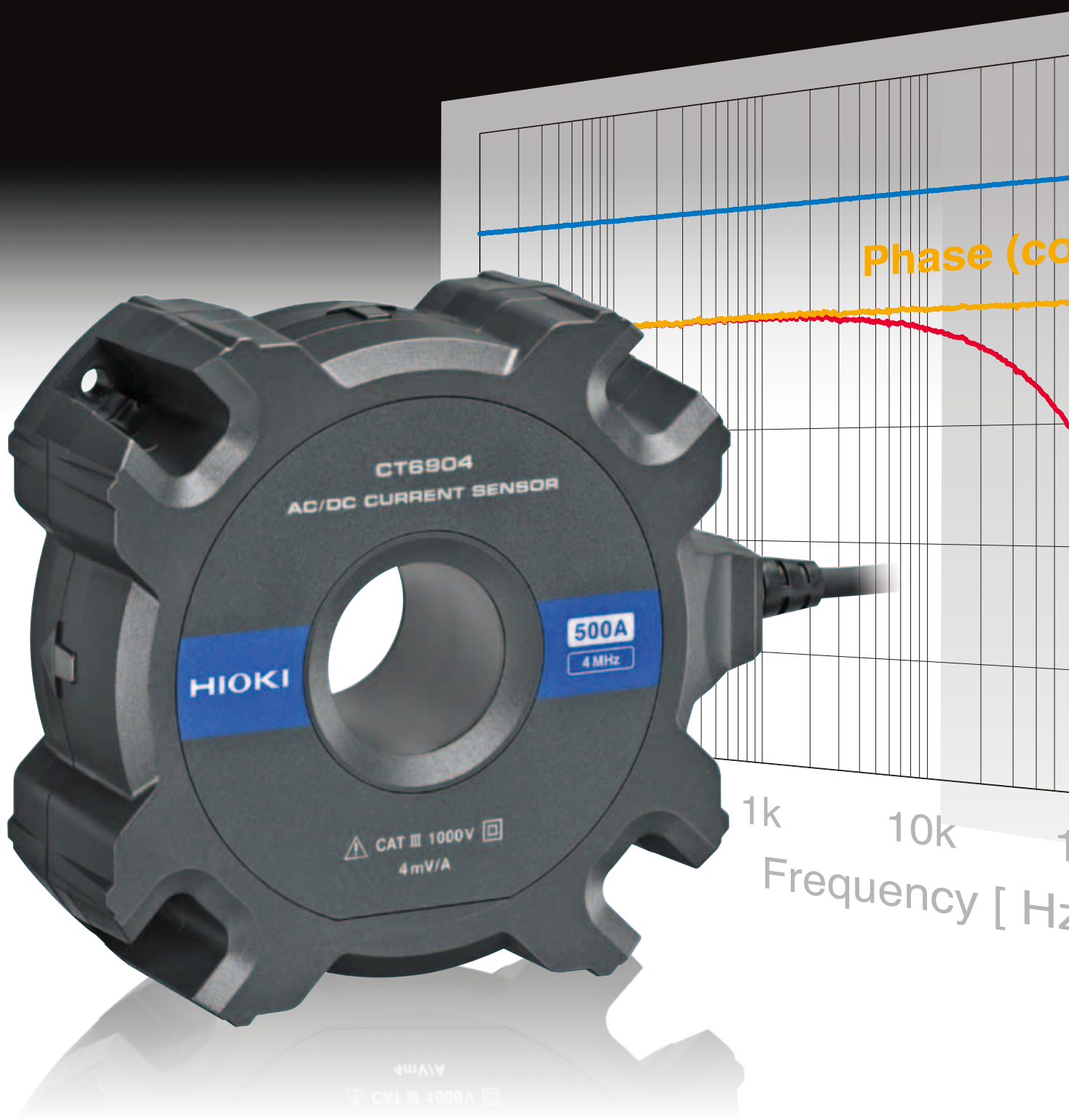
- **500 A (rms)** Rated for measurement of large currents
- **4 MHz (±3 dB)** Wide measurement frequency range
- **±10 ppm** Excellent linearity
- **±0.02% rdg. (±0.007% f.s.)** Superior basic measurement accuracy
- **120 dB (100 kHz)** High Common-Mode Rejection Ratio (CMRR)



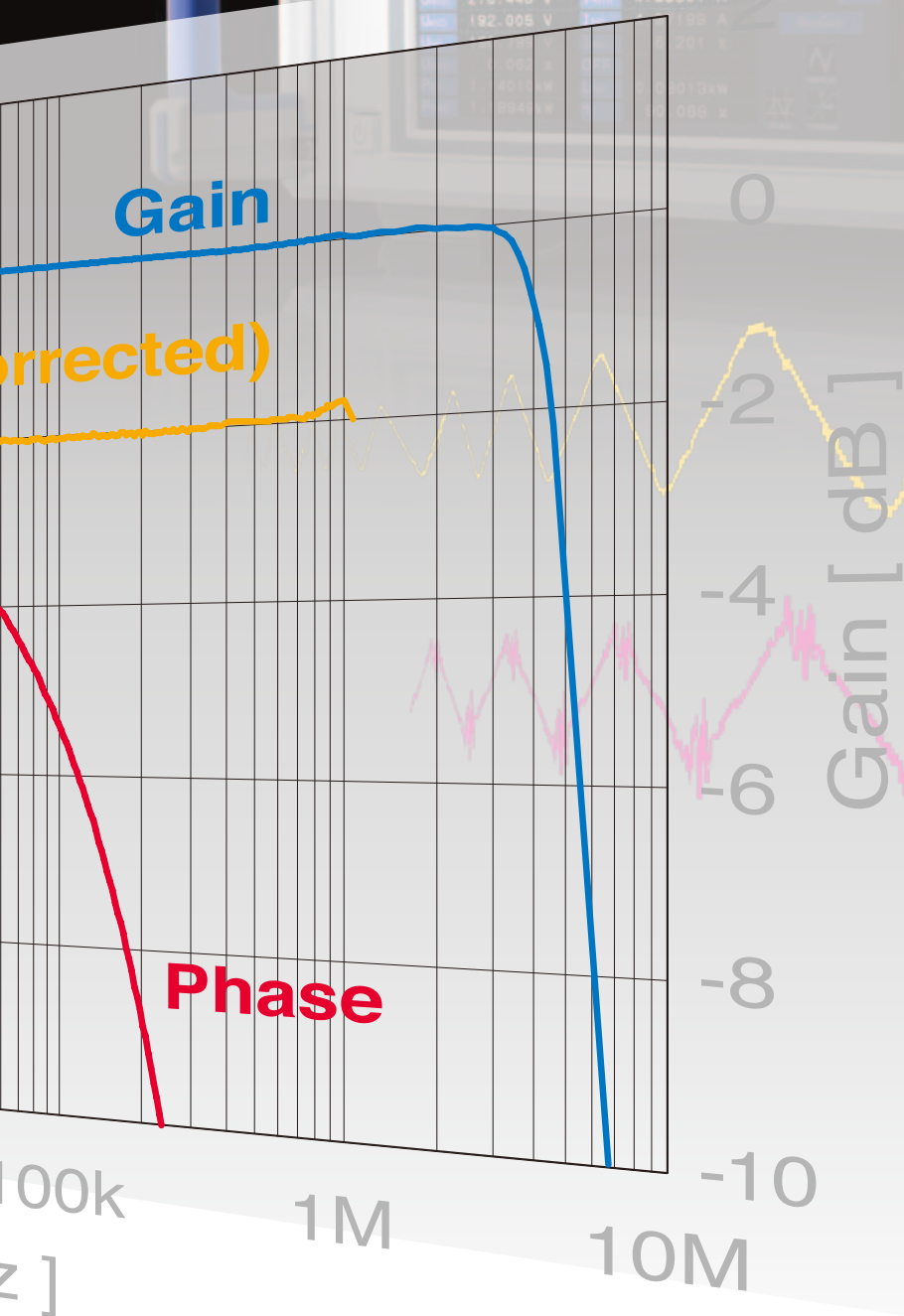
# Changing the World of Current Measurement

Rating	Measurement Frequency Range	Linearity	Accuracy	CMRR
<b>500 A</b> (rms)	<b>4 MHz</b> ( $\pm 3$ dB)	$\pm 10$ ppm	$\pm 0.02\%$ rdg. ( $\pm 0.007\%$ f.s.)	<b>120 dB</b> (100 kHz)

High inverter efficiency and improved power saving technology performance for the power electronics, natural energy, and automotive industries. Responsive to the advanced demands of every industrial field.



Maximum Performance When Combined with  
POWER ANALYZER PW6001



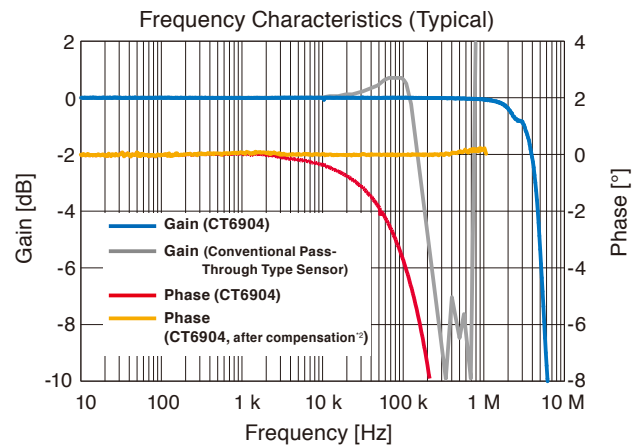
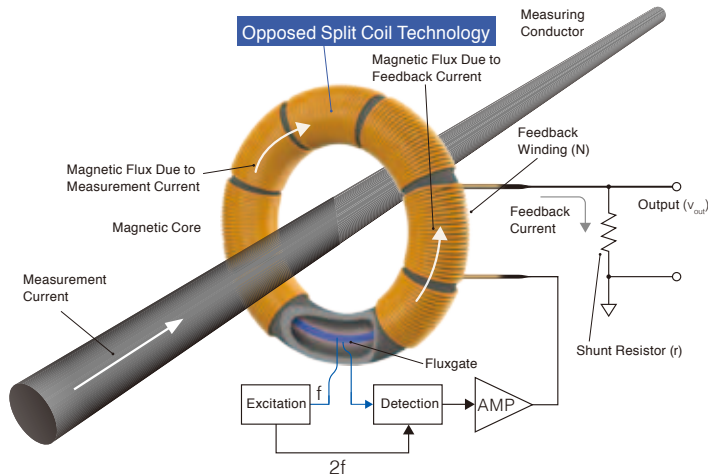
Waveform captured  
by the New CT6904

Waveform captured  
by legacy sensor

# Providing True Current Measurement

## 4 MHz Measurement Range, 40× Conventional Models

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. Newly developed opposed split coil technology<sup>\*1</sup> is used in winding (CT) areas, achieving a wide measurement range from DC to 4 MHz.



\*1 Opposed Split Coil: Coil in which divided windings are arranged opposite each other on a magnetic core to broaden the range of current detection

\*2 When performing phase compensation with HIOKI POWER ANALYZER PW6001

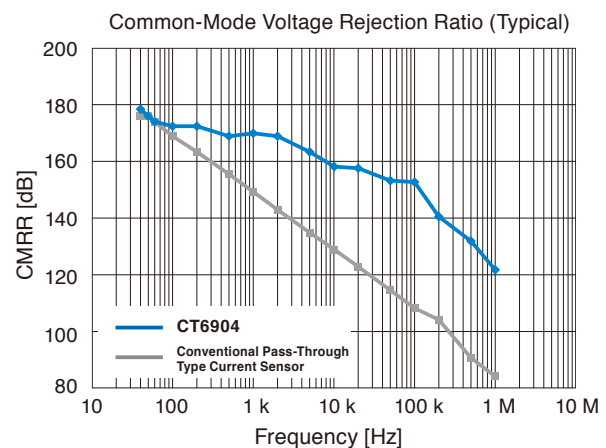
## High Noise Resistance Common-Mode Rejection Ratio (CMRR) of 120 dB or More (100 kHz)

The opposite split coil is completely shielded with a uniquely shaped solid shield, achieving both broad bandwidth and superior noise resistance. This allows accurate measurement without influence from surrounding voltage.



**Solid Shield**

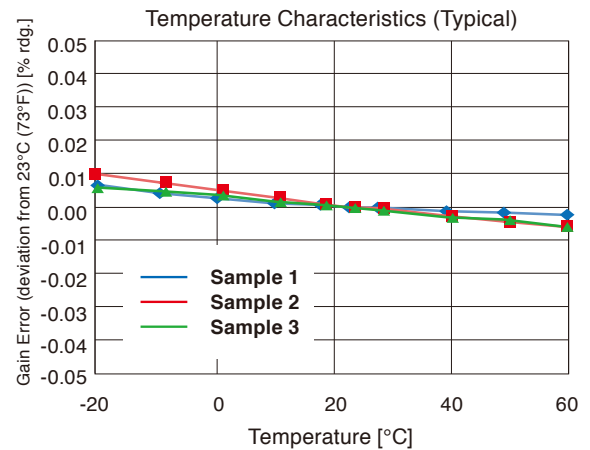
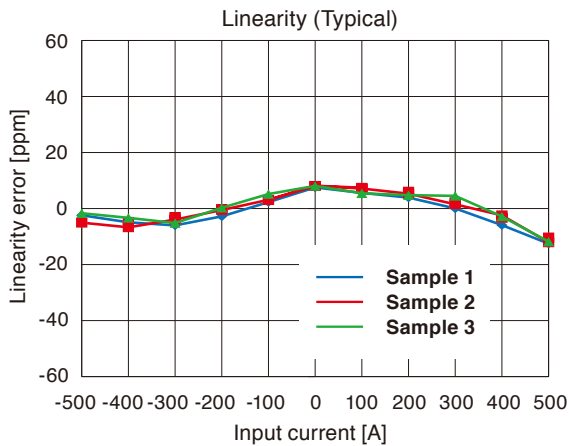
Aluminum shield machined into a unique shape to eliminate influence on current measurements





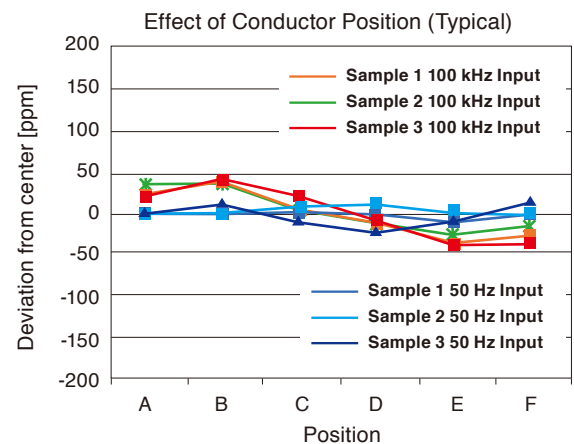
## Highly Accurate and Highly Stable: $\pm 10$ ppm Linearity, $\pm 0.02\%$ rdg. $\pm 0.007\%$ f.s. Basic Accuracy

By using a fluxgate element for DC to low frequency current detection, we have been able to achieve a level of measurement accuracy and temperature stability that is not possible with the Hall element method. Even at high frequencies the conductor position has little effect on measurement values, enabling measurements with high reproducibility.



Linearity: Input current (DC) converted to +500 A → 0 A → -500 A → 0 A → +500 A at 100 A intervals to measure output voltage. Determined by the difference between the regression line (calculated from the above measurements) and measurement points.

Effect of Conductor Position on Inner Core  
(A to F: Position)



## Shaped for Highly Accurate Measurement

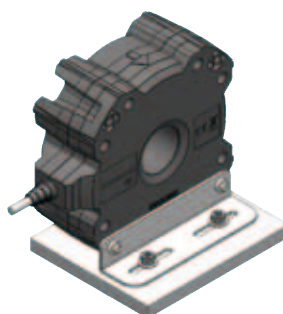
The longer the measured conductor, the greater the measurement error due to conductor inductance and parasitic capacitance. To reduce these errors, it is necessary to keep the conductor short.

With the CT6904, you can select from a variety of installation methods, allowing you to minimize the length of the measured conductor.

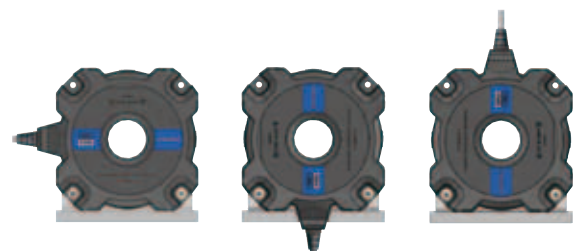
### Supports a Variety of Installation Scenarios



Wall Installation



Fastening Bracket  
(Made to Order)



The output cable can face in any direction.

# Example Applications

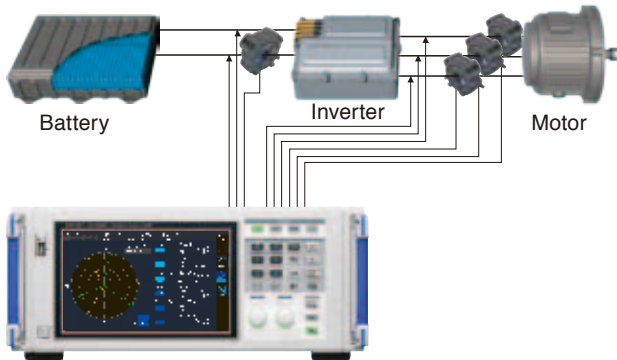
- Providing True Current Measurement with Unmatched Measurement Range and Noise Resistance -

## High-Precision and Efficiency Testing of SiC/GaN Inverters

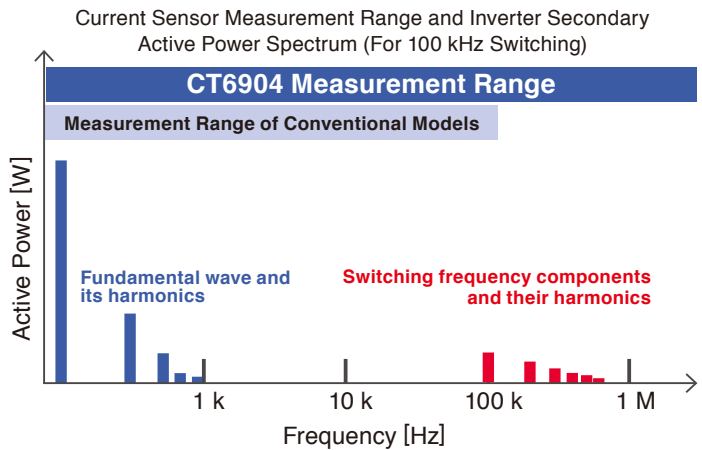
A wide range and minimal voltage current phase error are essential for the highly precise measurement of switching frequency power during PWM output.

The CT6904, which features flat frequency characteristics over a wide range, provides accurate measurement of not only fundamental wave current but also switching frequency current.

Since the CT6904 achieves both wide-range and highly accurate measurement performance, it can be used in combination with a power analyzer for more precise measurements of inverter input/output power and efficiency than ever before.



HIOKI POWER ANALYZER PW6001



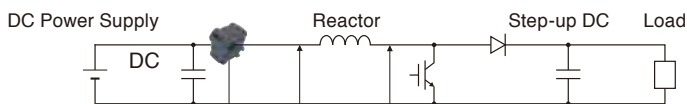
Perform highly accurate measurement of switching frequency components not possible with conventional models.

## Reactor/Transformer Loss Analysis

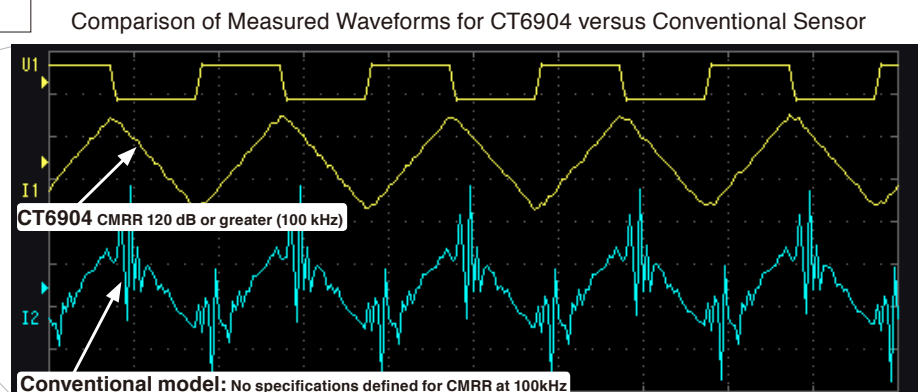
Reactor and transformer loss measurement is becoming increasingly important for furthering the efficiency and miniaturization of power converters.

Switching current, which has been obscured by noise until now, can be measured accurately thanks to the superior noise resistance of the CT6904.

In addition, by using the phase correction function of the POWER ANALYZER PW6001, previously difficult reactor and transformer loss measurements for large currents, high frequencies and low power factors can now be performed easily and quickly.



HIOKI POWER ANALYZER PW6001



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

# Specifications

## Input · Output · Measurement Specifications

### 1. Basic Specifications

Rated primary current	500 A AC/DC
Diameter of measurable conductors	φ 32 mm (1.26 in) or less
Maximum input current	Within derating shown in figure below. However, up to ±1000 A peak is allowable if within 20 ms (design value). When measuring current in the vicinity of derating, use a cooling time that is 10x or more greater than current input time.
Output voltage	4 mV/A
Maximum rated voltage to ground	1000 V CAT III Expected transient overvoltage: 8000 V
Linearity	±10 ppm Typical (23°C (73°F))
Offset voltage	±10 ppm Typical (23°C (73°F), no input)

### 2. Accuracy Specifications

Accuracy guarantee conditions	Guaranteed accuracy period: 1 year Guaranteed accuracy period after adjustment made by Hioki: 1 year Temperature and humidity for guaranteed accuracy: 23°C ±5°C (73°F ±9°F), 80% RH or less Warm-up time: 30 min. or more Input waveform: sine wave, Connection: measuring instrument with an input resistance of 0.9 MΩ to 1.1 MΩ Terminal-to-ground voltage: 0 V, no external magnetic field, conductor center position		
Accuracy	Frequency	Amplitude	Phase
	DC	±0.025% rdg. ±0.007% f.s.	-
	DC < f < 16 Hz	±0.2% rdg. ±0.02% f.s.	±0.1°
	16 Hz ≤ f < 45 Hz	±0.1% rdg. ±0.02% f.s.	±0.1°
	45 Hz ≤ f ≤ 65 Hz	±0.02% rdg. ±0.007% f.s.	±0.08°
	65 Hz < f ≤ 850 Hz	±0.05% rdg. ±0.007% f.s.	±0.12°
	850 Hz < f ≤ 1 kHz	±0.1% rdg. ±0.01% f.s.	±0.4°
	1 kHz < f ≤ 5 kHz	±0.4% rdg. ±0.02% f.s.	±0.4°
	5 kHz < f ≤ 10 kHz	±0.4% rdg. ±0.02% f.s.	±(0.08xf)°
	10 kHz < f ≤ 50 kHz	±1% rdg. ±0.02% f.s.	±(0.08xf)°
	50 kHz < f ≤ 100 kHz	±1% rdg. ±0.05% f.s.	±(0.08xf)°
	100 kHz < f ≤ 300 kHz	±2% rdg. ±0.05% f.s.	±(0.08xf)°
	300 kHz < f ≤ 1 MHz	±5% rdg. ±0.05% f.s.	±(0.08xf)°
	Frequency range	4 MHz (±3 dB Typical)	-
	• Unit for f in accuracy calculations: kHz • Amplitude accuracy and phase accuracy are defined below the rated value and within the continuous range of ambient temperature of 50°C (122°F) of the derating in the figure. However, the design value is DC < f < 10 Hz. • For the specifications for an output cable length of 10 m (32.81 ft) (made to order), add an amplitude accuracy of ±0.015(%) rdg. to 50 kHz < f ≤ 1 MHz. The frequency range is 2 MHz (±3 dB Typical).		
Effects of temperature	Within the range of -10°C to 18°C (14°F to 64°F) or 28°C to 50°C (82°F to 122°F) Amplitude sensitivity: ±0.005% rdg./°C Offset voltage: ±0.005% f.s./°C Phase: ±0.017°/°C		
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	±0.01% rdg. or less (100 A input, 50 Hz/60 Hz), when using wire with 10 mm (0.39 in) outer diameter		

## Function Specifications

### Connectable products

#### 1. POWER ANALYZER PW6001

##### Combined Accuracy

Frequency	Current	Power	Phase
DC	±0.045% rdg. ±0.037% f.s. (f.s. = PW6001 Range)	±0.045% rdg. ±0.057% f.s. (f.s. = PW6001 Range)	
45 Hz ≤ f ≤ 65 Hz	±0.04% rdg. ±0.027% f.s. (f.s. = PW6001 Range)	±0.04% rdg. ±0.037% f.s. (f.s. = PW6001 Range)	PW6001 accuracy + CT6904 accuracy
Bandwidths other than 45 Hz ≤ f ≤ 65 Hz and DC	PW6001 accuracy + CT6904 accuracy (Consider sensor rating when calculating f.s. error.)	PW6001 accuracy + CT6904 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).

- For 10 A Range and 20 A Range, apply ±0.12% f.s. (f.s. = PW6001 Range)

#### 2. POWER ANALYZER PW3390

##### Combined Accuracy

Add the power analyzer accuracy and the sensor accuracy (and consider the sensor rating when calculating f.s. error).

#### 3. SENSOR UNIT CT9555

##### Combined Accuracy

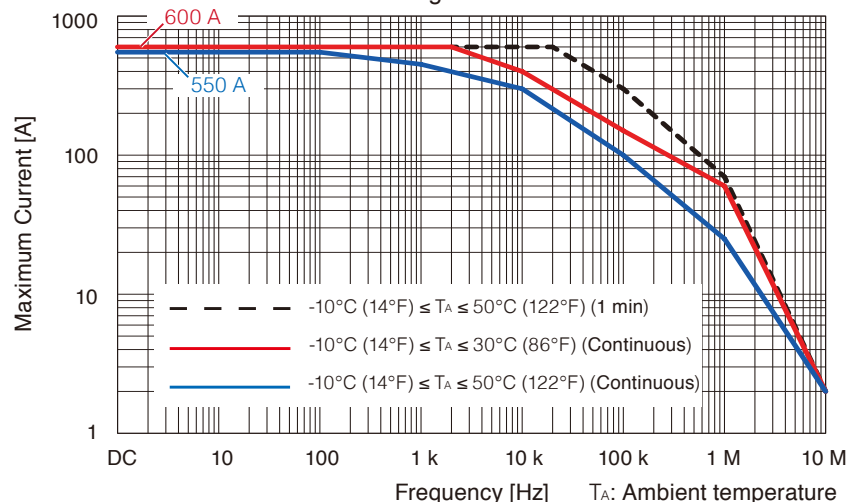
Sensor accuracy x 1.5 (when the output coaxial cable is no longer than 1.6 m (5.25 ft))

- For the specifications for an output cable length of 10 m (32.81 ft) (made to order), a frequency range of 1 MHz (±3 dB Typical).

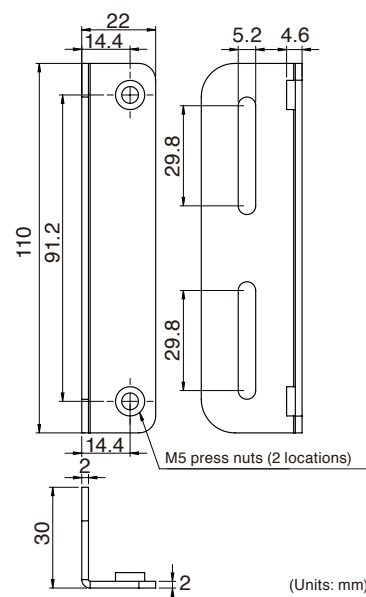
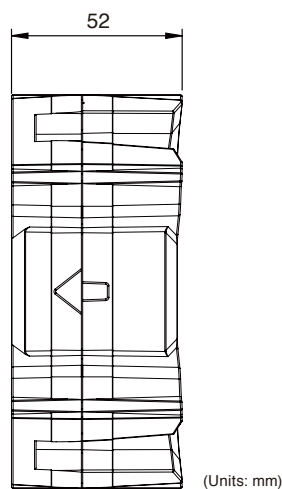
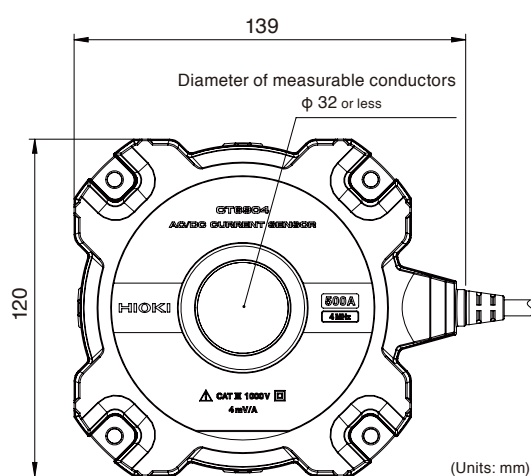
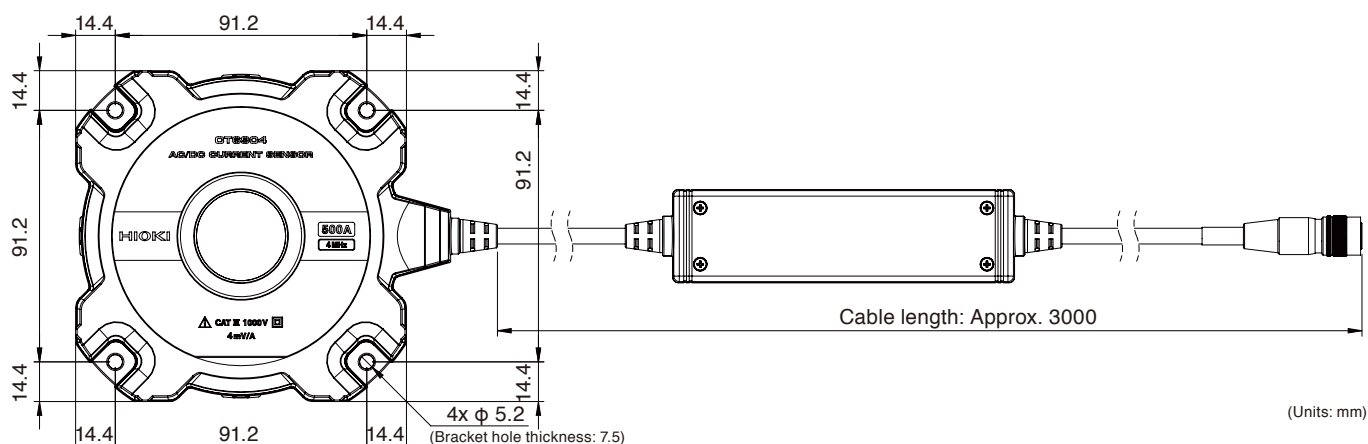
## General Specifications

Operating environment	Indoors, Pollution Degree 2, altitude up to 2000 m (6562.20 ft)
Operating temperature and humidity range	-10°C to 50°C (14°F to 122°F), and 80% RH or less (no condensation)
Storage temperature and humidity range	-20°C to 60°C (-4°F to 140°F), and 80% RH or less (no condensation)
Dielectric withstand voltage	7.4 kV AC (sensed current of 1 mA), 50 Hz/60 Hz: 1 min Distance between feed-through window and cable output terminal
Power supply	Power supplied from PW6001, PW3390, and CT9555
Max. power consumption	7 VA (500 A/55 Hz measurement, with a power supply of ±12 V)
Interface	Dedicated interface (ME15W)
Dimensions	Approx. 139 mm (5.47 in) W x 120 mm (4.72 in) H x 52 mm (2.05 in) D (excluding protrusions and cables)
Output cable length	Approx. 3 m (9.84 ft) (including relay box) (Specifications for an output cable length of 10 m (32.81 ft) (made to order): Approx. 10 m (32.81 ft) (including relay box))
Bracket hole diameter	φ 5.2 mm (0.20 in) (M5 screws, Recommended tightening torque: 1.5 N · m to 2.0 N · m)
Mass	Approx. 1.0 kg (35.3 oz) (Specifications for an output cable length of 10 m (32.81 ft) (made to order): Approx. 1.3 kg (45.9 oz)
Product warranty period	3 years
Accessories	- Instruction manual - Carrying case - Color labels (for channel identification)

### Derating Characteristics



# Dimensional Drawing



Fastening Bracket (Made to Order)  
Dimensions



## Model: AC/DC CURRENT SENSOR CT6904

Model No. (Order Code) (Specifications)

CT6904

For PW6001 and others, ME15W terminal

Accessories: Instruction manual x 1, Carrying case x 1, Color labels (for channel identification) x 1

## \* Made-To-Order Options for the CT6904

Model No. (Order Code) (Specifications)

-- 10 m (32.81 ft) Output Cable Specifications

-- Fastening Bracket

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