HIOKI

CT6846A

AC/DC CURRENT PROBE

Instruction Manual

EN

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HIOKI

All regional contact information

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Warranty

Warranty malfunctions occurring under conditions of normal use in conformity with the Instruction Manual and Product Precautionary Markings will be repaired free of charge. This warranty is valid for a period of three (3) years from the date of purchase. Please contact the distributor from which you purchased the product for further information on warranty provisions.

Introduction

Thank you for choosing the Hioki CT6846A AC/DC Current Probe. To ensure your ability to get the most out of this device over the long term, please read this manual carefully and keep it available for future reference.
Carefully read the separate document entitled “Operating Precautions” before use.

Inspection

When you open the package, carefully inspect the device to ensure that everything is in good condition, and that no damage occurred during shipping. If the device seems to have been damaged or does not work as specified, contact your authorized Hioki distributor or reseller.

Overview

The CT6846A is an openable clamp current sensor designed to measure AC and DC currents of up to 1000 A at a high level of precision.
This, which has excellent frequency characteristics (amplitude, phase) and temperature characteristics (sensitivity, offset voltage), can be used to measure power with high precision as well as current.

Precautions for Use

Observe the following precautionary information to ensure that the device can be used safely and in a manner that allows it to perform as described in its specifications.

⚠DANGER

Do not preform measurement around a bare conductor. Doing so may result in a short-circuit or an electric shock. Take measurements at a location on an insulated wire with sufficient insulation for the circuit voltage.

The maximum measurement current varies with the frequency, and the current that can be measured continuously is limited. Do not measure currents in excess of the derating curve. Damage to the device or overheating can malfunction, a fire, or burn.

⚠WARNING

Do not place the cable in contact with the measured line. Any contact can cause the device to malfunction and lead to a short-circuit or electric shock.

⚠CAUTION

- Do not place any foreign object between the jaw tips or insert any foreign object into the gap of the jaws. Doing so may worsen the performance of the sensor or the opening-closing operation of the sensor head.
- Do not apply current to the device when the instrument connected with the device has been turned off. Doing so could damage the device.
- Do not plug/unplug the connector to/from a measuring instrument left turned on. Doing so will damage the device and instrument.
- Avoid stepping on or pinching the cable, which could damage its insulation.
- Do not drop the device or subject the device to impact. Doing so could damage the jaws’ facing core surfaces, adversely affecting measurement.
- Do not touch the cores with the jaw opened. If the cores are subject to static electricity, the device may be damaged.
- Do not leave the carrying case in an area exposed to direct sunlight or high temperatures, for example, in a vehicle. Leaving the case under a high-temperature environment can deform its interior.

- Keep the jaw closed when the device is not in use. Leaving the jaw open can cause dust or dirt lying on the facing core surfaces, damaging the device.
- The current flowing through the line to be measured can considerably exceed the maximum allowable current of the device when it is turned on and off. Make sure that there is no risk of overcurrent that could damage the device.
- Disengage the lock, then unplug the connector while gripping the connector’s shell (i.e., do not pull on the cable) to avoid damaging the connector.
- The cable is hardened in freezing temperatures. Do not bend or pull it to avoid tearing its shield or causing a break.

Symbol on the device

	Indicates that the device can only be used at a location on an insulated wire with sufficient insulation for the circuit voltage.

Shipping precautions

During shipment of the device, handle it carefully so that it is not damaged due to a vibration or shock.

Maintenance and Service

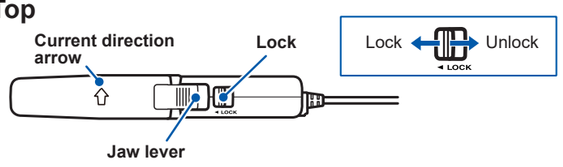
If the device becomes dirty, wipe the device softly with a soft cloth moistened with water or a neutral detergent.

IMPORTANT
Never use solvents such as benzene, alcohol, acetone, ether, ketone, thinners or gasoline. Doing so could deform and discolor the device.

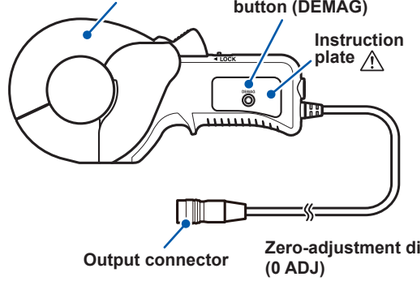
Measurements are degraded by dirt on the jaws’ facing core surfaces, so keep the surfaces clean by gently wiping them with a soft, dry cloth.

Part Names

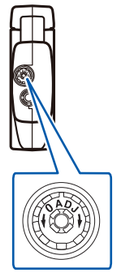
Top



Side



Bottom



Options

The options listed below are available for the device. To order an option, please contact your authorized Hioki distributor or reseller. Options are subject to change. Check Hioki’s website for the latest information.

CT9901 Conversion Cable

This cable can connect the device to a product that does not support a direct connection. (No accuracy reduced)

CT9902 Extension Cable (5 m)

- This one cable can extend the device’s output cable by 5 m (up to 10 m).
- Up to two extension cable is connectable. (The device’s performance is not assured with three or more extension cables connected.)
- Add the following values to the accuracy per cable:
  Amplitude accuracy: ±0.1% of reading (DC ≤ f ≤ 1 kHz)
  ±(0.5 + 0.01 × f) percent of reading (1 kHz < f)
  Phase accuracy: ±(0.1 × f) degrees (1 kHz < f)
  f: frequency (kHz)

Phase Compensation Values

For phase compensation of the PW6001 and PW3390, enter the following compensation values (typical):
Frequency: 10.0 kHz, phase difference: −1.05°
The PW8001, which can automatically set the phase compensation values, requires no entry.

Measuring Current

Inspecting the device before use

Check the device for any damage that may have occurred during storage or shipping, and perform functional checks before use. If you find any damage to the device, contact your authorized Hioki distributor or reseller.

Inspection item	Remedy
Any parts of the cable sheath have no damage.	If you find any damage, request the repair without use. Failure to do so could cause an electric shock.
The jaws have no crack or damage.	

⚠CAUTION

Do not place any conductors, around which the device is not clamped, near the jaws if they carry currents having a frequency of 10 kHz or higher.
Current flowing through nearby conductors may cause self-heating of the jaws, damaging the device.

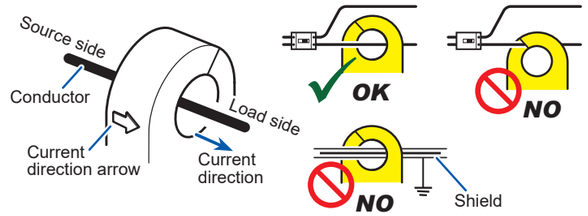
The device’s signal output circuit includes a protective resistance (output resistance). Use a measuring instrument, including a digital multimeter, with high input resistance to monitor the output signal. (1 MΩ or more is recommended.)

Procedure

1. **Connect the device to an measuring instrument that has been turned off.**
2. **Turn the instrument on.**
3. **Perform demagnetization (DEMAG) and zero adjustment (0 ADJ) (if needed).**
   See “Demagnetization (DEMAG) and zero adjustment (0 ADJ).”
4. **Unlock the jaw.**
5. **Press the jaw lever to open the jaw.**
6. **Clamp the device around one conductor only, then close the jaw.**

   IMPORTANT
   Clamp the sensor around only one conductor. Clamping the sensor around two or more of conductors in a bundle prevents the instrument from measuring any current regardless of whether the measurement target is a single-phase or three-phase circuit.

   - Check that the jaws’ tips engage fully with each other.
   - Clamping the device with its current direction arrow pointing to the source side will reverse the output signal’s polarity.

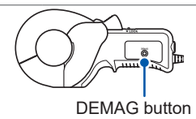


7. **Lock the jaw.**
8. **Start measurement.**
9. **Remove the device from the conductor after measurement have finished.**
10. **Turn the instrument off.**
11. **Disconnect the device from the instrument.**

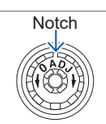
Demagnetization (DEMAG) and zero adjustment (0 ADJ)

Immediately after the device is turned on or if an over-current exceeding the rated current is input, the device will output an offset voltage. Because the offset voltage becomes an error for DC current measurement, perform demagnetization and zero adjustment as follows:

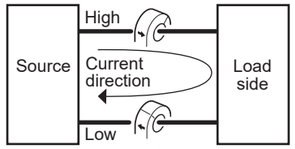
1. **Press the DEMAG button while opening the jaw.**



2. **Open and close the jaw several times, then check if the outputted offset voltage displayed on the measuring instrument’s screen has been stabilized.**
3. **Lock the jaw.**
4. **Turn the zero-adjust dial (0 ADJ) to zero the outputted offset voltage displayed on the instrument’s screen.**



- You cannot perform zero adjustment while current is inputted.
- Ambient temperatures and the surrounding environment, such as terrestrial magnetism and adjacent equipment generating magnetic fields, will affect outputted offset voltage. Perform zero adjustment at the location where you will measure current.
- If the device is connected to a zero-correction-equipped instrument, align the notch of the zero-adjustment dial with the center.
- Mechanical shock, for example from dropping the device, may cause the offset voltage to shift.
- Perform demagnetization (DEMAG) several times, leaving the jaw closed if the offset voltage cannot be zeroed.
- When measuring a DC or a low-frequency (1 kHz or less) low current, you can relatively increase sensitivity by wrapping the conductor several times around the jaw. The device can output a signal equal to 10 times the measured current by wrapping the conductor 10 times.
- Measurement in a high-frequency region may become susceptible to common-mode noise if the device is clamped to the high-potential side of a circuit. Clamp the device to the low-potential side as necessary.



- The device may output 1.65 MHz harmonic noise due to the operating principle.
- Measuring a high-frequency (1 kHz or more) large current can increase an error or distort an output waveform due to the influence of the conductor position. Place the conductor to be measured as close to the center of the jaws' aperture as possible. An adjacent conductor, around which the device is not clamped, carries a current of 500 A or more, or that with a frequency of 1 kHz or more can increase an error or distort an output waveform. Keep the device as far away from such conductors as possible during measurement.
- Keep the surface temperature of the conductor to be measured at 105°C or less.

Specifications

Accuracy labeling

Reading (display value):

Indicates the value displayed by the instrument. Limit values for reading errors are expressed as a percentage of the reading ("% of reading" or "% rdg").

Range:

Indicates the measurement range of the instrument. Limit values for range errors are expressed as a percentage of the range ("% of range" or "% rng").

Full scale (rated current):

Indicates the rated current. Limit values for full-scale errors are expressed as a percentage of the full scale ("% of full scale" or "% f.s.").

Operating environment	Indoor use, pollution level 2, altitude up to 2000 m (6562 ft.)
Operating temperature and humidity range	−40°C to 85°C (−40°F to 185°F), 80% RH or less (non-condensing)
Storage temperature and humidity range	−40°C to 85°C (−40°F to 185°F), 80% RH or less (non-condensing)
Standards	Safety: EN 61010 EMC: EN 61326
Withstand voltage	4260 V AC (current sensitivity: 1 mA), 50 Hz/60 Hz, for 1 min. Between the jaw and the cable's output terminal
Power supply	Suppliable from the PW8001, PW6001, PW3390, CT9555, CT9556, CT9557, U8977, or an external DC power supply. Rated supply voltage: ±11.5 V to ±15 V (tracking) Maximum rated current: ±300 mA (during measurement of 1000 A current with 55 Hz, when ±12 V power is supplied)
Maximum rated power	7 VA or less (during measurement of 1000 A current with 55 Hz, when ±12 V power is supplied)
Interface	Dedicated interface (ME15W)
Dimensions	Approx. 238W × 116H × 35D mm (9.37″W × 4.57″H × 1.38″D, excluding protrusions and the cable)
Dimensions of jaws	Approx. 116H × 35D mm (4.57″H × 1.38″D)
Output cable length	Approx. 3 m
Weight	Approx. 990 g (34.9 oz.)
Product warranty duration	3 years (excluding the jaws and cable)
Accessories	Mark band (×6), carrying case, Instruction Manual, Operating Precautions (0990A907)
Options	CT9901 Conversion Cable CT9902 Extension Cable
Memory function	Memory-function-equipped instruments can load the device's sensor information. Compatible model: PW8001
Rated current	1000 A AC/DC
Measurable conductor diameter	ϕ50 mm or less
Maximum input current	Current not more than the frequency derating curve (Fig. 1) Up to ±1900 A peak (design value) is allowable only within 20 ms at an ambient temperature of 40°C or less.
Output voltage	2 mV/A
Output resistance	50 Ω ±10 Ω
Adjustable range of offset voltage	±2 mV
Accuracy guarantee conditions	Accuracy guarantee duration: 1 year or 10000 cycles of opening/closing, whichever comes first Accuracy guarantee duration after adjustment made by Hioki: 1 year Accuracy guarantee temperature and humidity range: 0°C to 40°C (32°F to 104°F), 80% RH or less No warming up is required. Input: sine wave or DC; connected to a measuring instrument with an input resistance of 1 MΩ ±10%; line-to-earth voltage: 0 V; no external magnetic field; a conductor located at the aperture center

Measurement accuracy

Frequency	Amplitude ±[(% of reading) + ($ of full scale)]	Phase
DC	0.2% + 0.02%	—
DC < f ≤ 100 Hz	0.2% + 0.01%	±0.1°
100 Hz < f ≤ 500 Hz	0.5% + 0.02%	±0.2°
500 Hz < f ≤ 1 kHz	1% + 0.02%	±0.5°
1 kHz < f ≤ 5 kHz	2% + 0.02%	±(0.7 × f) degrees
5 kHz < f ≤ 10 kHz	5% + 0.02%	
10 kHz < f ≤ 50 kHz	30% + 0.02%	
Frequency band	100 kHz (±3 dB typical)	—

- Unit for f in the calculation formulas: kilohertz (kHz)
- DC accuracy is defined after the offset voltage has been regulated at ±0.2 mV or less.
- The amplitude and phase accuracy are defined for an input current not more than current of 110% of full scale and the derating curve (Fig. 1). However, the accuracy defined for the frequency range of DC < f < 10 Hz is the design values.
- Add ±0.03% of reading to the amplitude accuracy if an input current is within the range of 100% to 110% of full scale.

Linearity error[*1, *2]	±20 ppm typical

*1: The output voltage is measured while the input current (DC) is changed in 200 A increments in the following order: +1000 A, 0 A, −1000 A, 0 A, and +1000 A. This error is defined from differences between the regression line obtained from the above-described measurement and measured points.

*2: Defined as the ratio of errors to the rated current.

Output noise	600 µV rms or less (≤1 MHz)
Effects of temperature	At an ambient temperature of between −40°C and 0°C as well as 40°C and 85°C Amplitude sensitivity: ± 0.01% of reading per degree Celsius Offset voltage: ±0.005% of full scale per degree Celsius
Effects of magnetization	150 mA or less (value converted into an input current, defined after 1000 A DC is inputted)
Common-mode voltage rejection ratio (CMRR)	DC to 1 kHz: 150 dB or more 1 kHz to 10 kHz: 130 dB or more 10 kHz to 50 kHz: 100 dB or more (Effect on output voltage divided by common-mode voltage)
Effects of conductor position	DC to 100 Hz: ±0.2% of reading or less (100 A input) For a conductor 10 mm in diameter
Effects of external magnetic fields	150 mA or less (Values converted into input current, in a DC or 60 Hz magnetic field of 400 A/m)
Effects of radiated radio-frequency electromagnetic field	6% of full scale at 10 V/m
Effects of conducted radio-frequency electromagnetic field	6% of full scale at 10 V

Compatible instrument

1. PW8001 Power Analyzer

Combinatorial accuracy with the U7001

Frequency	Current	Active power	Phase
	±[(% of reading) + (% of range)]		
DC	0.22% + 0.07%	0.22% + 0.07%	(U7001 accuracy) + (sensor accuracy)
45 Hz ≤ f ≤ 66 Hz	0.22% + 0.06%	0.22% + 0.06%	
Bands other than DC or 45 Hz ≤ f ≤ 66 Hz	(U7001 accuracy) + (sensor accuracy) (Full-scale error also takes sensor rating into account.)		

- For other measurement items, the sum of the U7001 accuracy and sensor accuracy (full-scale error also takes sensor rating into account.)
- Add ±0.15% of range for the 20 A and 40 A ranges.
- The accuracy addition under each condition defined in the specifications of the Power Analyzer and sensor will also be applied.
- Defined after zero adjustment.

Combinatorial accuracy with the U7005

Frequency	Current	Active power	Phase
	±[(% of reading) + (% of range)]		
DC	0.22% + 0.05%	0.22% + 0.05%	(U7005 accuracy) + (sensor accuracy)
45 Hz ≤ f ≤ 66 Hz	0.21% + 0.03%	0.21% + 0.03%	
Bands other than DC or 45 Hz ≤ f ≤ 66 Hz	(U7005 accuracy) + (sensor accuracy) (Full-scale error also takes sensor rating into account.)		

- For other measurement items, the sum of the U7005 accuracy and sensor accuracy (full-scale error also takes sensor rating into account.)
- Add ±1% of range for the 20 A range.
- Add ±0.5% of range for the 40 A range.
- Add ±0.1% of range for the 100 A range.
- The accuracy addition under each condition defined in the specifications of the Power Analyzer and sensor will also be applied.
- Defined after zero adjustment.

2. PW6001 Power Analyzer

Combinatorial accuracy

Frequency	Current	Active power	Phase
	±[(% of reading) + (% of range)]		
DC	0.22% + 0.05%	0.22% + 0.07%	(PW6001 accuracy) + (sensor accuracy)
45 Hz ≤ f ≤ 66 Hz	0.22% + 0.04%	0.22% + 0.05%	
Bands other than DC or 45 Hz ≤ f ≤ 66 Hz	(PW6001 accuracy) + (sensor accuracy) (Full-scale error also takes sensor rating into account.)		

- For other measurement items, the sum of the PW6001 accuracy and sensor accuracy (full-scale error also takes sensor rating into account.)
- Add ±1% of range for the 20 A range.
- Add ±0.5% of range for the 40 A range.
- Add ±0.1% of range for the 100 A range.
- The accuracy addition under each condition defined in the specifications of the Power Analyzer and sensor will also be applied.
- Defined after zero adjustment.

3. PW3390 Power Analyzer

Combinatorial accuracy

Frequency	Current	Active power	Phase
	±[(% of reading) + (% of range)]		
DC	0.25% + 0.09%	0.25% + 0.09%	(PW3390 accuracy) + (sensor accuracy)
45 Hz ≤ f ≤ 66 Hz	0.24% + 0.07%	0.24% + 0.07%	
Bands other than DC or 45 Hz ≤ f ≤ 66 Hz	(PW3390 accuracy) + (sensor accuracy) (Full-scale error also takes sensor rating into account.)		

- For other measurement items, the sum of the PW3390 accuracy and sensor accuracy (full-scale error also takes sensor rating into account.)
- Add ±0.15% of range for the 20 A and 40 A ranges.
- The accuracy addition under each condition defined in the specifications of the Power Analyzer and sensor will also be applied.
- Defined after zero adjustment.

4. CT9555, CT9556, CT9557 Sensor Unit

Combinatorial accuracy

- The sensor accuracy is applicable. (Defined with an output coaxial cable of 1.6 m or less)
- Add accuracy of a sensor unit when RMS or Total output is used.
- The accuracy addition under each condition defined in the specifications of a measuring instrument and the sensor will also be applied.

5. U8977 3CH Current Unit

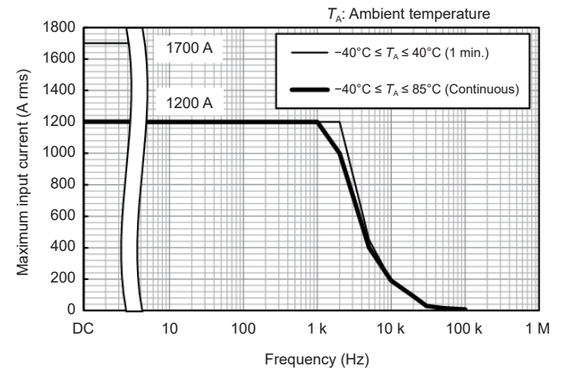
Combinatorial accuracy

- (U8977 accuracy) + (sensor accuracy)
- The accuracy addition under each condition defined in the specifications of the Memory HiCorder and sensor will also be applied.
- Defined after zero adjustment.

6. Other compatible products

Using the CT9901 Conversion Cable allows the device to be compatible with the following products.

Product name	Combinatorial accuracy, conditions
9555-10 Sensor Unit	(Combinatorial accuracy) = (sensor accuracy) Defined with an output coaxial cable of 1.6 m or less
3390, 3390-10 Power Analyzer	Recognized as [AC/DC 500 A]. Setting the CT ratio to [2] is required. (Combinatorial accuracy) = [3390(-10) accuracy] + (sensor accuracy), (power factor: 1) Defined after zero adjustment.
9602 AC/DC Clamp Input Unit	Recognized as [AC/DC 500 A] when connected to the 3193-10. Setting the CT ratio to [2] is required. (Combinatorial accuracy) = (9602 accuracy) + (sensor accuracy) + (±0.1% rdg), (power factor: 1) Defined after zero adjustment.
3334-10 AC/DC Power HiTester	Recognized as [AC/DC 500 A]. Setting the CT ratio to [50] is required. (Combinatorial accuracy) = (3334-10 accuracy) + (sensor accuracy), (power factor: 1) Defined after zero adjustment.
8971 Current Unit	The 9318 Conversion Cable (included in the 8971) is required. Recognized as [AC/DC 500 A] by an auto-recognition-equipped instrument. Setting the CT ratio to [2] is required. (Combinatorial accuracy) = (8971 accuracy) + (sensor accuracy) Defined after zero adjustment.



Defined when neither adjacent current nor external magnetic field exists and the conductor is located at the center of the jaw aperture.

Fig. 1. Frequency derating curve.