

CT6841, CT6843 CT6841-05, CT6843-05 AC/DC CURRENT PROBE

Instruction Manual **EN**

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CT6841A981-04 18-10H



HIOKI

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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 purchasing the HIOKI Model CT6841, CT6841-05, CT6843 and CT6843-05 AC/DC Current Probe. To obtain maximum performance from the device, please read this manual first, and keep it handy for future reference.

Inspection

When you receive the device, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the accessories and cables. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Safety

This instrument is designed to conform to IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, using the instrument in a way not described in this manual may negate the provided safety features. Before using the instrument, be certain to carefully read the following safety notes.

⚠ DANGER Mishandling during use could result in injury or death, as well as damage to the instrument. Be certain that you understand the instructions and precautions in the manual before use.

⚠ WARNING With regard to the electricity supply, there are risks of electric shock, heat generation, fire, and arc discharge due to short circuits. If persons unfamiliar with electricity measuring instrument are to use the instrument, another person familiar with such instruments must supervise operations.

Safety Symbol

	Indicates cautions and hazards. When the symbol is printed on the instrument, refer to a corresponding topic in the Instruction Manual.
	Indicates that only insulated conductors suited to the voltage of the circuit under test can be measured.
In this manual, the risk seriousness and the hazard levels are classified as follows.	
⚠ DANGER	Indicates an imminently hazardous situation that will result in death or serious injury to the operator.
⚠ WARNING	Indicates a potentially hazardous situation that may result in death or serious injury to the operator.
⚠ CAUTION	Indicates a potentially hazardous situation that may result in minor or moderate injury to the operator or damage to the instrument or malfunction.
IMPORTANT	Indicates information related to the operation of the instrument or maintenance tasks with which the operators must be fully familiar.
	Indicates prohibited actions.
	Indicates the action which must be performed.

Symbols for Various Standards

	Indicates the Waste Electrical and Electronic Equipment Directive (WEEE Directive) in EU member states.
	Indicates that the product conforms to regulations set out by the EU Directive.

Instrument Installation

Avoid the following locations that could cause an accident or damage to the instrument.

⚠ WARNING	<ul style="list-style-type: none"> • Exposed to direct sunlight • Exposed to high temperature • In the presence of corrosive or explosive gases • Exposed to water, oil, other chemicals, or solvents • Exposed to high humidity or condensation • Exposed to a strong electromagnetic field or electrostatic charge • Exposed to high levels of particulate dust • Near induction heating systems (such as high-frequency induction heating systems and IH cooking equipment) • Subject to vibration
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Usage Notes

Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.

Preliminary Checks

Before using the instrument, verify that it operates normally to ensure that no damage occurred during storage or shipping. If you find any damage, contact your authorized Hioki distributor or reseller.

⚠ DANGER Do not use the device to measure bare conductors. Doing so may result in a short-circuit or electrical shock. Make measurements at a location on an insulated wire that has a suitable amount of insulation for the circuit voltage.

⚠ WARNING

- Before using the instrument, make sure that the insulation on the cable is undamaged and that no bare conductors are improperly exposed. Using the instrument in such conditions could cause an electric shock, so contact your authorized Hioki distributor or reseller for repair.
- Avoid contact between the cable and the measured line in order to protect the cable from damage. Any contact can cause the device to malfunction and lead to short-circuits or electric shock.

- Ensure that the input does not exceed the maximum input current to avoid instrument damage, short-circuiting and electric shock resulting from heat building.

CAUTION



- This instrument is not drip-proof. Water droplets on the connector may result in malfunctions.
- Keep the cables well away from heat sources, as bare conductors could be exposed if the insulation melts.
- To avoid damage to the instrument, protect it from physical shock when transporting and handling. Be especially careful to avoid physical shock from dropping.
- The cable is hardened under the 0 degree or colder environment. Do not bend or pull it to avoid tearing its shield or cutting cable.
- When the power to lines to be measured is turned on or off, a current flowing through the lines can exceed considerably the maximum allowable current of the device. This could result in damage to the device. Make sure that there is not any over-current.
- This instrument is designed for use indoors. It can be operated at temperatures between -40 and 85° C without degrading safety.
- Store the instrument with the clamp closed. If the clamp being open is subject to physical shock unexpectedly, the tips of the clamp sensor may be deformed.
- If foreign objects are pinched between the clamp tips, remove them gently with a soft brush or others, avoiding opening and closing the clamp forcibly. The clamp sensor with foreign objects stuck or deformed sensor cannot perform accurate measurements.



- Avoid stepping on or pinching cables, which could damage the cable insulation.
- Be careful to avoid dropping the instrument or otherwise subjecting them to mechanical shock, which could damage the mating surfaces and adversely affect measurement.
- Do not touch the cores with the clamp opened. If the cores are subject to static electricity, the instrument may be damaged.

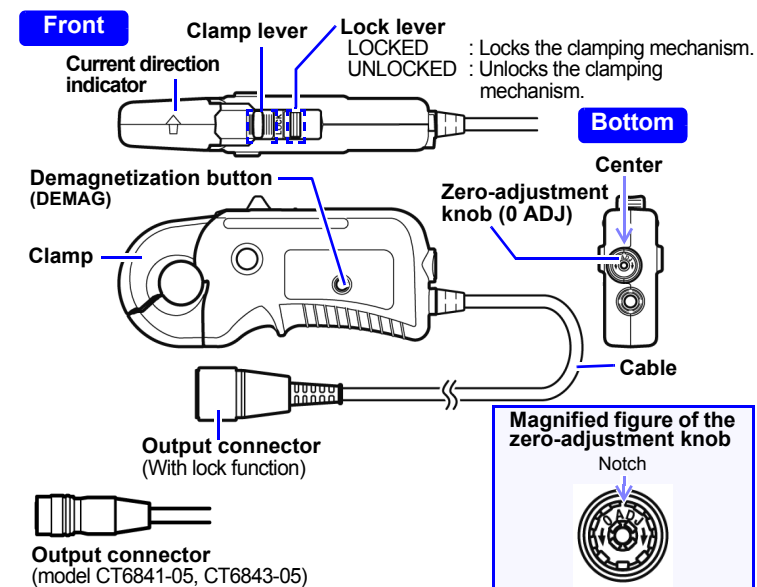
Overview

The CT6841, CT6841-05, CT6843 and CT6843-05 AC/DC Current Probes are designed to measure AC and DC currents of up to 20 A or 200 A, respectively, at a high level of precision. They offer excellent frequency characteristics (amplitude and phase) as well as excellent temperature characteristics (sensitivity and offset) and can be used not only for current measurement, but also for high-precision power measurement.

Usage with Other Hioki Products

This device is used in connection with a dedicated instrument (Hioki). See "Specifications" for details.

Names of Parts



Options

9705 Conversion Cable*1, 9318 Conversion Cable*1, CT9900 Conversion Cable*1, CT9901 Conversion Cable*2
The Conversion Cable makes it possible to connect to and use with products that cannot be directly connected to the CT6841, CT6841-05, CT6843 or CT6843-05. (Refer to "Connection example") (No figures are added to the accuracy.)

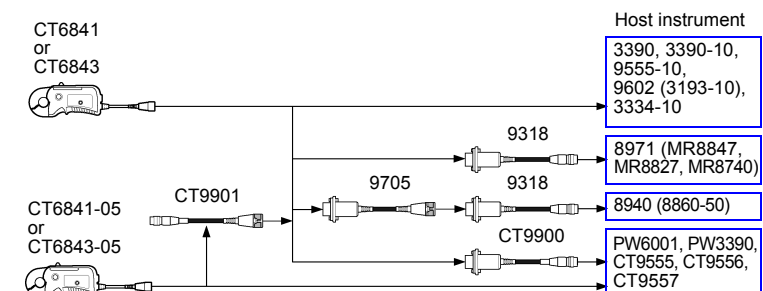
CT9902 Extension Cable*2(5 m), CT9903 Extension Cable*1(5 m)

- Single sensor cable, 5 m extension (max. 10 m extension)
- Up to two extension cable is connectable. (If three or more extension cables are connected to the device, its performance is not guaranteed)
- Add the following values to each of the accuracy per cable:
Amplitude accuracy: $\pm 0.1\% \text{ rdg. (DC} \leq f^{*3} \leq 1 \text{ kHz)}$
 $\pm 0.5\% \text{ rdg. (1 kHz} < f^{*3})$
Phase accuracy: $\pm(0.1 \times f^{*3} \text{ kHz})^\circ \text{ (1 kHz} < f^{*3})$

*1: For CT6841, CT6843 *2: For CT6841-05, CT6843-05

*3: frequency

Connection Example



Cannot be directly connected to any parenthesized models. A module is required. Refer to "Combined accuracy and conditions" specified in the specifications.

Measurement Procedure

Pre-operation Inspection

Before using the instrument, verify that it the instrument operates normally to ensure that no damage occurred during storage or shipping. If you find any damage, contact your authorized Hioki distributor or reseller.

Check Items	Diagnose and Solution
involving the connector or sensor base?	If you are unable to make measurements properly, discontinue use and contact your authorized Hioki distributor or reseller.
Is the cable insulation torn?	If there is any damage, electric shock may result. Discontinue use and have the sensor repaired.
Is there any cracking or damage on the sensor?	

⚠ DANGER Do not use the device to measure bare conductors. Doing so may result in a short-circuit or electrical shock. Make measurements at a location on an insulated wire that has a suitable amount of insulation for the circuit voltage.

⚠ CAUTION

- To prevent damage to the sensor and connected instruments, never connect or disconnect a sensor while the power is on.
- When the connected instrument's power is turned off, do not apply current to the sensor. Doing so may damage the device.

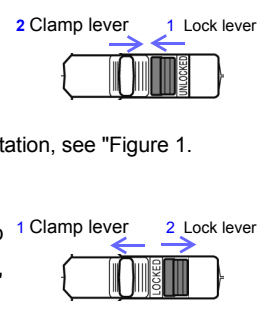
- CAUTION**
- Do not place conductors carrying currents at frequencies of 10 kHz or higher in close proximity to the clamp mechanism, even if the device is not clamped to them. Current flowing in nearby conductors may cause self-heating of the clamp mechanism, damaging the device.
 - When disconnecting the output connector, be sure to release the lock before pulling off the connector. Forcibly pulling the connector without releasing the lock, or pulling on the cable, can damage the connector.
 - Ground-shielded conductors cannot be accurately measured. (See Figure 2-1)
 - Make sure to pass only one conductor through. Single-phase (2-wire) or three-phase (3-wire) cables conducted together will not produce any reading. (See Figure 2-2)

The device's signal output circuit incorporates protective resistance (output resistance). When monitoring the device with a digital multimeter or other instrument, be sure to use an instrument with a high input resistance.

Measurement procedure

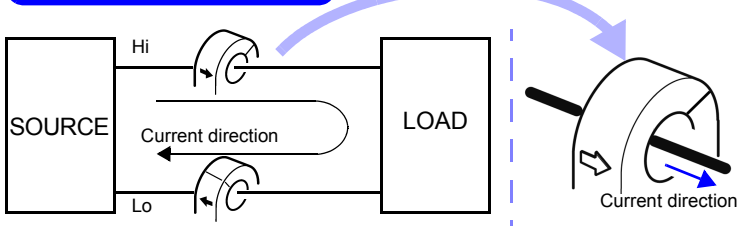
At the start of measurement

- Connect the device to the product with which you wish to use it (while that product's power is off).
- Turn on the product with which you wish to use the device.
- Perform zero-adjustment (0 ADJ) or demagnetization (DEMAG) as necessary. (See "Demagnetization (DEMAG) and zero-adjustment (0 ADJ).")
- Slide the lock lever until the "UNLOCKED" label is visible in place. Then slide the clamp lever to open the clamp mechanism. Apply the clamp mechanism to roughly the center of the conductor being measured. (For more information about clamp mechanism orientation, see "Figure 1. Example Wiring.")
- Slide the clamp lever to close the clamp mechanism, verify that the tips of the clamp mechanism have met each other properly, and slide the lock lever until the "LOCKED" label is visible to lock the mechanism in place.
- Start measurement.



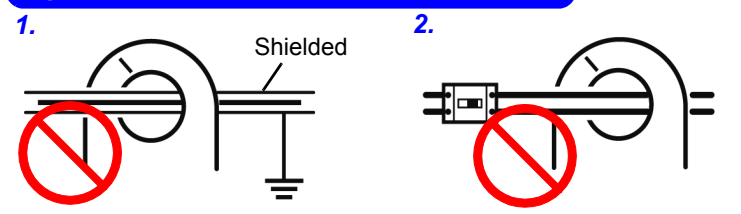
Wiring

Figure 1. Example Wiring



- Make sure the direction of the arrow on the case matches the direction of the current flow, as shown in Figure 1. If they are oriented incorrectly, the output signal from the sensor will be reversed
- When the device is used with a wattmeter, follow the wiring instructions provided with the wattmeter.
- High-frequency large current at a frequency of 1 kHz or higher can increase measurement error or distort the measured waveform due to the position of the conductor to be measured. Locate the conductor as close as possible to the center of the clamp. Unclamped conductors carrying a high-frequency large current can also increase measurement error or distort the measured waveform. Keep unclamped conductors away from the clamp of the device.

Figure 2. Examples of Prohibited Measurement



Demagnetization (DEMAG) and zero-adjustment (0 ADJ)

An offset will be output immediately after the power is turned on and when an overcurrent in excess of the rated current is input to the device. Since this offset will cause an error during DC current measurement, perform zero-adjustment as follows:

- Slide the clamp lever to open the clamp mechanism and press the "DEMAG" button on the panel.
- Open and close the clamp mechanism two or three times, confirm that the offset output is stabilized, and then slide the lock lever until the "LOCKED" label is visible to lock the mechanism in place.
- Monitor the offset output and perform zero-adjustment with the zero-adjustment knob on the bottom of the device.

IMPORTANT

- Zero-adjustment cannot be performed while the device is receiving current input.
- Because offset output varies with the surrounding environment and the ambient temperature (terrestrial magnetism and devices that generate magnetic fields), zero-adjustment should be performed at the same location at which measurements will be made.
- If the device is connected to an instrument with a zero correction function, align the notch of the zero-adjustment knob with the center.
- Mechanical shock, for example from dropping the instrument, may cause the offset to shift.
- If unable to fully correct values, perform demagnetization (DEMAG) several times with the clamp in the closed position.

When measurement is complete

- Slide the lock lever until the "UNLOCKED" label is visible. Then slide the clamp lever to open the clamp mechanism and remove the device from the conductor.
- Turn off the product with which the device is being used.
- Disconnect the device from the product's connector.

- When measuring a DC or low-frequency (1 kHz or less) current of small magnitude, you can increase sensitivity on a relative basis by wrapping the conductor several times around the clamp mechanism. Wrapping the conductor 10 times will cause the device to output a signal equal to 10 times the measured current.
- When clamping the device on the high-potential side of a circuit (for example, the "Hi" side shown in "Figure 1. Example Wiring") in the high-frequency domain, measurements may be affected by common-mode noise. To address this issue, clamp the device to the low-potential side (for example, the "Lo" side shown in "Figure 1. Example Wiring") as necessary.
- 1.5-MHz harmonic noise arising from the operating principle can be emitted.

Maintenance Service

WARNING Customers are not allowed to modify, disassemble, or repair the instrument. Doing so may cause fire, electric shock, or injury.

IMPORTANT

- Periodic calibration is necessary in order to ensure that the instrument provides correct measurement results of the specified accuracy.
- Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.
- If the instrument seems to be malfunctioning, confirm that the cables are not open circuited before contacting your authorized Hioki distributor or reseller.
- Pack the instrument so that it will not sustain damage during shipping, and include a description of existing damage. We do not take any responsibility for damage incurred during shipping.
- To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent.

Specifications

Accuracy

f.s.: maximum display value or scale length (Rated current)
rdg.: reading value (The value currently being measured and indicated on the measuring instrument)

The specs of the CT6841-05 are the same as those of the CT6841 except the output connector and options.
The specs of the CT6843-05 are the same as those of the CT6843 except the output connector and options.

Operating Environment	Indoors, Pollution Degree II, altitude up to 2000 m (6562-ft.)
Storage temperature and humidity	-40°C to 85°C (-40°F to 185°F), 80%RH or less (non-condensation)
Operating temperature and humidity	-40°C to 85°C (-40°F to 185°F), 80%RH or less (non-condensation)
Dielectric strength	4260 V AC (Sensitive current 1 mA), 50 Hz/60 Hz, for 1 minute, Jaw - cable output connector
Applicable standards	Safety : EN61010 EMC : EN61326
Product warranty period	3 years
Rated current	CT6841: 20 A AC/DC, CT6843: 200 A AC/DC
Output voltage	CT6841: 0.1 V/A, CT6843: 0.01 V/A
Maximum input current	Within a derating
Output resistance	50 Ω (±5%)
Temperature and humidity range of guaranteed accuracy	0°C to 40°C (32°F to 104°F), 80%RH or less
Period of guaranteed accuracy	1 year (Opening and Closing of the Sensor: Maximum 10000 times)
Guaranteed accuracy period from adjustment made by Hioki	1 year (Opening and Closing of the Sensor: Maximum 10000 times)

Accuracy
Sine wave input; Conductor at center position; Connected with Model 9555-10; Not including each effect; Measuring instrument that has an input resistance of 1 MΩ or higher
Amplitude accuracy (Defined at the rated value or less and within the derating curve; The accuracy defined for the frequency range of DC < f < 5 Hz is the design value)
Phase accuracy (Defined at the rated value or less and within the derating curve; The accuracy defined for the frequency range of DC < f < 10 Hz is the design value)

Frequency	Amplitude	Phase
DC	±0.3% rdg. ±0.05% f.s. Note: An accuracy of ±0.05% f.s. is accomplished after the offset voltage is adjusted within a range of ±0.5 mV.	-
DC < f ≤ 100 Hz	±0.3% rdg. ±0.01% f.s.	±0.1°
100 Hz < f ≤ 500 Hz	±0.3% rdg. ±0.02% f.s.	±0.2°
500 Hz < f ≤ 1 kHz	±0.5% rdg. ±0.02% f.s.	±0.5°
1 kHz < f ≤ 5 kHz	±1.0% rdg. ±0.02% f.s.	±1.0°
5 kHz < f ≤ 10 kHz	±1.5% rdg. ±0.02% f.s.	±1.5°
10 kHz < f ≤ 50 kHz	±2.0% rdg. ±0.02% f.s.	±(0.5+0.1 × f kHz)°
50 kHz < f ≤ 100 kHz	±5.0% rdg. ±0.05% f.s.	
100 kHz < f ≤ 300 kHz	±10% rdg. ±0.05% f.s.	
300 kHz < f ≤ 500 kHz	±15% rdg. ±0.05% f.s.	-
500 kHz < f < 1 MHz	±30% rdg. ±0.05% f.s.	-

Frequency	Amplitude	Phase
DC	±0.3% rdg. ±0.02% f.s. Note: An accuracy of ±0.02% f.s. is accomplished after the offset voltage is adjusted within a range of ±0.2 mV.	-
DC < f ≤ 100 Hz	±0.3% rdg. ±0.01% f.s.	±0.1°
100 Hz < f ≤ 500 Hz	±0.3% rdg. ±0.02% f.s.	±0.2°
500 Hz < f ≤ 1 kHz	±0.5% rdg. ±0.02% f.s.	±0.5°
1 kHz < f ≤ 5 kHz	±1.0% rdg. ±0.02% f.s.	±1.0°
5 kHz < f ≤ 10 kHz	±1.5% rdg. ±0.02% f.s.	±1.5°
10 kHz < f ≤ 50 kHz	±5.0% rdg. ±0.02% f.s.	±(0.5+0.1 × f kHz)°
50 kHz < f ≤ 100 kHz	±15% rdg. ±0.05% f.s.	
100 kHz < f ≤ 300 kHz	±15% rdg. ±0.05% f.s.	
300 kHz < f ≤ 500 kHz	±30% rdg. ±0.05% f.s.	-

Offset adjustment range	CT6841: ±4 mV, CT6843: ±2 mV
Noise	5 mV pp or less (100 kHz or less)
Temperature coefficient	-40°C to 0°C and 40°C to 85°C (-40°F to 32°F and 104°F to 185°F) Amplitude sensitivity : ±0.01% rdg./° or less Offset voltage : ±0.005% f.s./°C or less
Effect of conductor position	±0.1% rdg. or less (CT6841: at 20 A input, DC to 100 Hz, using with the wire 5 mm diameter) (CT6843: at 100 A input, DC to 100 Hz, using with the wire 5 mm diameter)
Effect of external electromagnetic field	50 mA or less (Scaled value, In a DC or 60 Hz magnetic field of 400 A/m)
Effect of magnetic	CT6841: 10 mA or less (Scaled value, after 20 A DC input) CT6843: 30 mA or less (Scaled value, after 200 A DC input)
Effect of common-mode voltage	0.05% f.s. or less (1000 V rms, DC to 100 Hz)

Effect of radiated radio-frequency electromagnetic field	6% f.s. at 10 V/m														
Effect of conducted radio-frequency electromagnetic field	6% f.s. at 3 V/m														
Measurable conductor diameter	φ20 mm (0.79") or less														
Supply voltage	±11 V to ±15 V (Tracking)														
Power supply capacity	CT6841: ±200 mA or less (20 A/ 55 Hz measurement, with ±12 V power supply) CT6843: ±250 mA or less (200 A/ 55 Hz measurement, with ±12 V power supply)														
Rated consumption	CT6841: 5 VA or less (20 A/55 Hz measurement, with ±12 V power supply) CT6843: 6 VA or less (200 A/55 Hz measurement, with ±12 V power supply)														
Dimensions	Approx. 153W × 67H × 25D mm (excluding protrusions, cable) Approx. 6.02"W × 2.64"H × 0.98"D														
Mass	CT6841: Approx. 350 g (12.3oz), CT6843: Approx. 370 g (13.1oz)														
Cable length	Approx. 3 m														
Output connector	CT6841, CT6843 : hioki PL23 (Male) CT6841-05, CT6843-05 : hioki ME15W (Male)														
Accessories	Instruction manual, Mark band (6), Carrying Case														
Options	<table border="1"> <tr> <td rowspan="4">CT6841 CT6843</td> <td>CT9900</td> <td>Conversion Cable</td> </tr> <tr> <td>CT9903</td> <td>Extension Cable</td> </tr> <tr> <td>9318</td> <td>Conversion Cable</td> </tr> <tr> <td>9705</td> <td>Conversion Cable</td> </tr> <tr> <td rowspan="2">CT6841-05 CT6843-05</td> <td>CT9901</td> <td>Conversion Cable</td> </tr> <tr> <td>CT9902</td> <td>Extension Cable</td> </tr> </table>	CT6841 CT6843	CT9900	Conversion Cable	CT9903	Extension Cable	9318	Conversion Cable	9705	Conversion Cable	CT6841-05 CT6843-05	CT9901	Conversion Cable	CT9902	Extension Cable
CT6841 CT6843	CT9900		Conversion Cable												
	CT9903		Extension Cable												
	9318		Conversion Cable												
	9705	Conversion Cable													
CT6841-05 CT6843-05	CT9901	Conversion Cable													
	CT9902	Extension Cable													

Combined accuracy and conditions

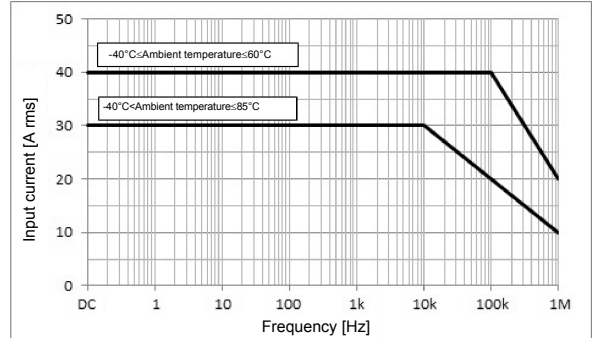
Combined accuracy = Accuracy of CT6841(-05) or CT6843(-05) + Accuracy of combined product (Power factor: 1)

Combined product	Required option	
	CT6841 CT6843	CT6841-05 CT6843-05
CT9555, CT9556, CT9557 Sensor Unit ¹	CT9900	-
PW3390 Power Analyzer	CT9900	-
PW6001 Power Analyzer	CT9900	-
9602 AC/DC Clamp Input Unit ²	-	CT9901
3334-10 AC/DC Power Meter	-	CT9901
8940 F/V Unit ³	9705+9318	CT9901+9705+9318
8971 Current Unit ³	9318	CT9901+9318
9555-10 Sensor Unit	-	CT9901
3390, 3390-10 Power Analyzer	-	CT9901

- *1: Add the sensor unit output accuracy to the combined accuracy when one of the addition functions, that is, RMS output or TOTAL OUTPUT, is used.
- *2: Add ±0.1% rdg. to the combined accuracy.
- *3: The sensor recognition methods vary according to the Memory HiCorder settings (refer to the manuals of Memory HiCorder to be connected).

Derating

Model CT6841



Model CT6843

