HIOKI

CM3281
CM3291

AC CLAMP METER

Instruction Manual

EN

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CM3281A961-02

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HIOKI

All regional contact information

www.hioki.com/

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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 CM3281, CM3291 AC Clamp Meter. To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference. Be sure to also read the separate document “Operating Precautions” before use.

CM3281	Average value measurement RMS conversion model
CM3291	True RMS measurement model

Target audience

This manual has been written for use by individuals who use the product in question or who teach others to do so. It is assumed that the reader possesses basic electrical knowledge (equivalent to that of someone who graduated from the electrical program at a technical high school).

Information on download site
For details on the product application, the update file for the instrument, and the instruction manual, please check Hioki’s website:
https://cloud.gennect.net/dl

Safety Notes

Symbols affixed to the device

⚠	Precaution or hazard (See corresponding topic.)
	The instrument can be connected to or disconnected from a live conductor
	The flexible sensor can be connected to or disconnected from live conductors when appropriate protective insulation is used. The clamp meter and test leads can only be connected to or disconnected from insulated conductors suited to the voltage of the conductor under measurement.

⚠DANGER

To avoid electric shock, do not touch the portion beyond the protective barrier during use.

Do not subject the instrument to any voltages when the resistance measurement or continuity check function is selected. Doing so may damage the instrument and result in bodily injury. To avoid electrical accidents, turn off the circuit before measuring it.

⚠WARNING

- **To avoid electric shock, short circuits and damage to the instrument, disconnect the test leads from the measurement object before switching the rotary switch.**
- **To prevent electric shock, when measuring the voltage of a power line use a test lead that satisfies the following criteria:**
  - **Conforms to safety standards IEC61010 or EN61010**
  - **Of measurement category III or IV**
  - **Its rated voltage is higher than the voltage to be measured**
- **The optional test leads for this instrument conform to the safety standard EN61010. Use a test lead in accordance with its defined measurement category and rated voltage.**
- **To prevent a short circuit accident, be sure to use the L9208 test leads with the sleeves attached when performing measurements in the CAT III measurement category. (For the measurement categories, see the “Measurement categories” section in the separate document “Operating Precautions”.)**
- **If the sleeves are removed during measurement, stop the measurement.**
- **To prevent an electric shock, do not exceed the every rating shown on either the instrument or each test lead, whichever is worse.**
- **Handle and dispose of batteries in accordance with local regulations.**

⚠CAUTION

Do not place foreign objects between the jaw tips (or flexible loop couplings) or insert foreign objects into the gaps of the jaws (or flexible loop couplings). Doing so may worsen the performances of the sensor or interfere with clamping action.

- The B indicator is displayed when the remaining battery capacity is low. In this case, the accuracy of the instrument is not guaranteed. Replace the battery immediately.
- To avoid battery depletion, set the rotary switch in the **[OFF]** position after use. (Even when the automatic power-saving function is enabled, the instrument consumes a small amount of the battery power.)

Inspection Before Measurement

- Before using the instrument, check it and verify that it operates properly to make sure that it suffered no damage during storage or transportation.
- If damage is suspected, check the section below before contacting your authorized Hioki distributor or reseller.

(1) Check the test lead for breaks.
If any, replace it with the new L9208 Test Lead.

(2) Check that the resistance measurement and continuity check operates normally.
If any one of them does not operate normally, send the instrument for repair to the your authorized Hioki distributor or reseller. The instrument may have been subject to a voltage of greater than 600 V during resistance measurement or continuity check.

(3) Check that the battery weakens.
If it weakens, replace the battery.

Functions

Automatic power-saving function

The instrument automatically turns off the LCD after it is not operated for 30 minutes.

- To enable the function
- To restore the instrument from a non-displaying state

1 Set the rotary switch in the **[OFF]** position and then set the rotary switch in a position other than **[OFF]**.

- To cancel automatic power-saving function

1 Set the rotary switch in a position other than **[OFF]** while holding down the **HOLD** key.
The text **[APS]** and **[OFF]** are displayed in turn on the LCD, and the automatic power-saving function is disabled.

Auto-range function

The instrument automatically selects the most appropriate measurement range.
The text **[AUTO]** is displayed on the LCD.

Manual-range function

Sets the measurement range manually.

1 Set the rotary switch in the **[OFF]** position and then set the rotary switch in a position other than **[OFF]** while holding down the Ω↔ / ~A↔ key.

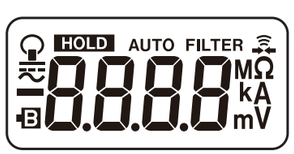
2 Press the Ω↔ / ~A↔ key to switch the measurement range.
(Any ranges can be set except for the continuity check.)

Overflow indication

If an input exceeds the measurement range, the text **[OF]** or **[−OF]** is displayed on the LCD.

Parts Names

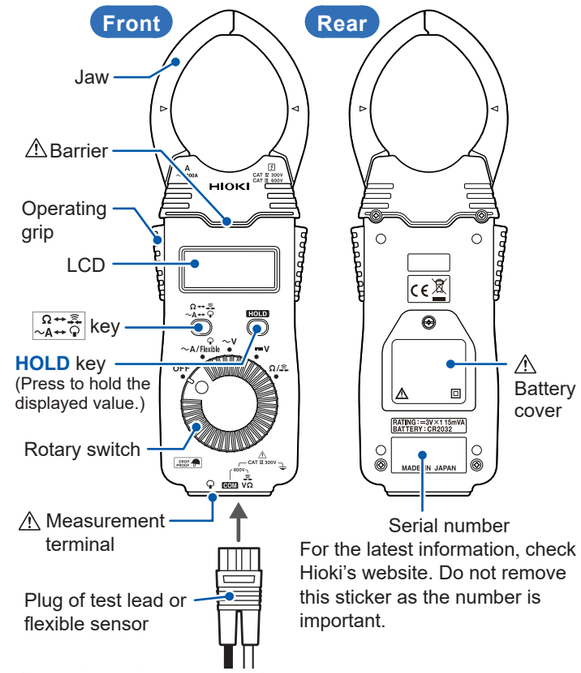
LCD (with all segments turned on)



[FILTER] : Not used
[HOLD] : Holds measured value
[AUTO] : Auto-range function
B : Low battery warning
: Connection of flexible loop
: Continuity check

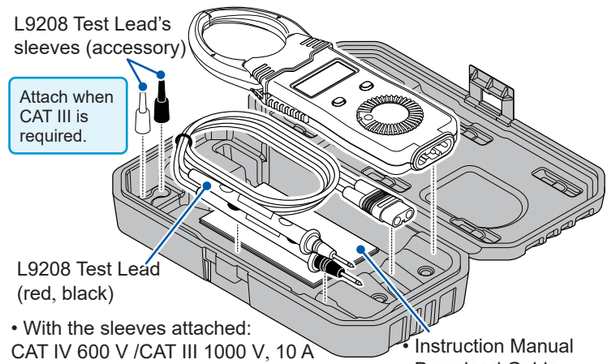
The instrument screen displays the alphanumeric characters as follows.

AC Clamp Meter



For the latest information, check Hioki’s website. Do not remove this sticker as the number is important.

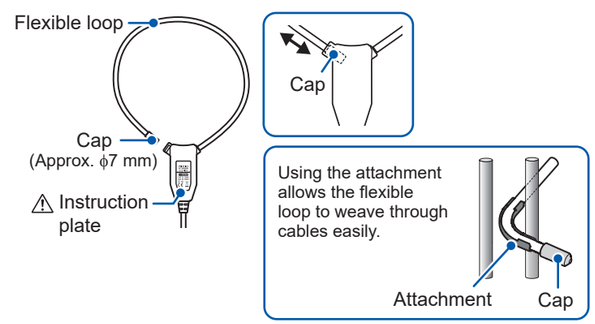
Carrying case storage



- With the sleeves attached:
CAT IV 600 V /CAT III 1000 V, 10 A
- Without the sleeves attached:
CAT II 1000 V, 10 A

- Instruction Manual
- Download Guide
- Operating Precautions

CT6280 AC Flexible Current Sensor (optional)

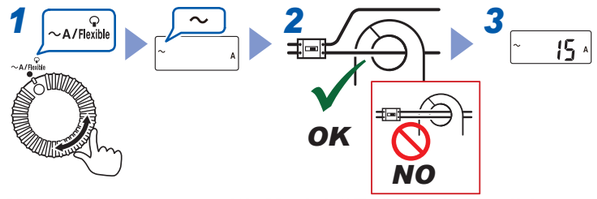


Measuring Methods

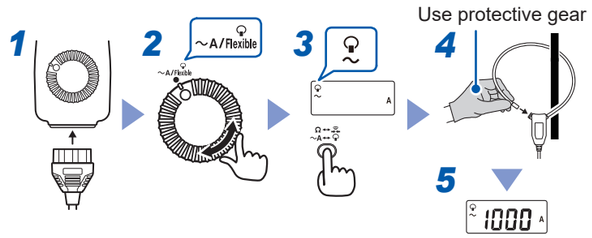
Before attaching the L4933*1 or L4934*2 on test leads, bring the test leads into measurement category II rating (remove the sleeves when using the L9208).
*1: No measurement category,
Maximum rated voltage to earth 30 V AC / 60 V DC, 3 A
*2: CAT III 300 V / CAT II 600 V, 3 A

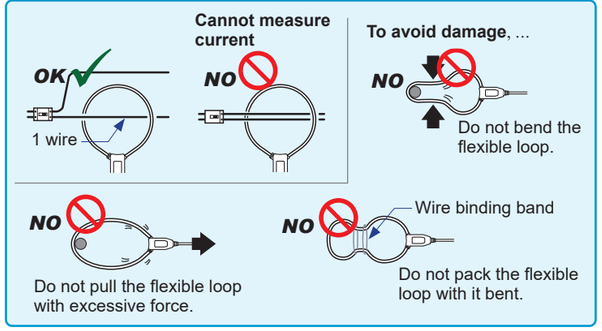
AC Current Measurement [~A/Flexible]

Measuring current with the instrument



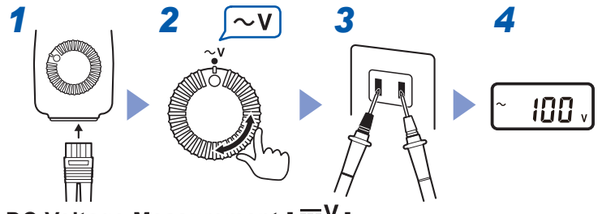
Measuring current with Model CT6280 AC Flexible Current Sensor (optional)



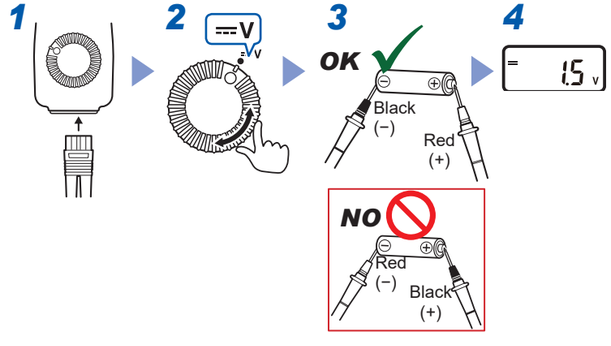


Voltage Measurement

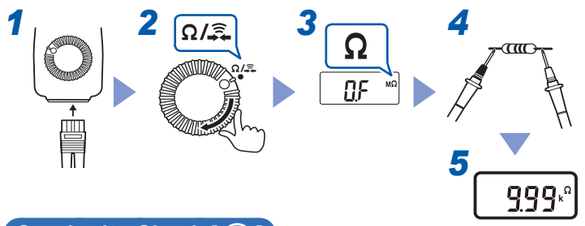
AC Voltage Measurement [~V]



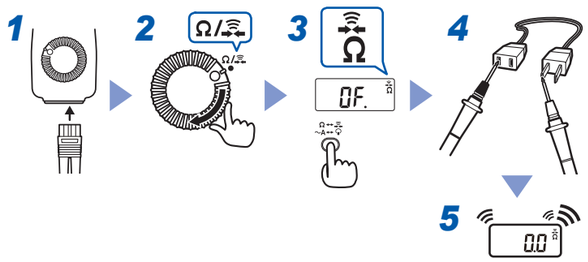
DC Voltage Measurement [⎓V]



Resistance Measurement [Ω]



Continuity Check [ ]

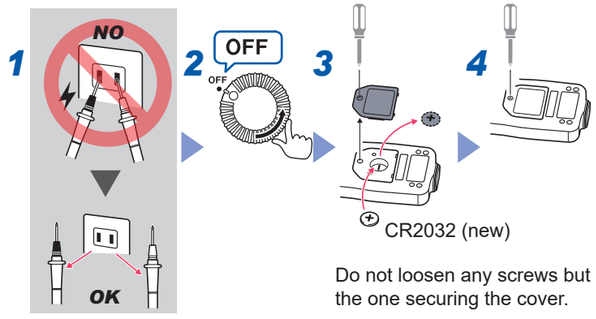


Cleaning

- Measurements are degraded by dirt on the mating surfaces of the jaw (or flexible loop coupling), so keep the surfaces clean by gently wiping with a soft, dry cloth.
- To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent.
- Wipe the LCD gently with a soft, dry cloth.

Replacing Battery

Necessary items: Phillips screwdriver (No.1) and Coin cell lithium battery (CR2032)



Do not loosen any screws but the one securing the cover.

Do not turn any one of the 3 screws inside the battery case. Doing so will cause the instrument to report abnormal measured values.

CALIFORNIA, USA ONLY
This product contains a CR Coin Lithium Battery which contains Perchlorate Material - special handling may apply.
See https://dtsc.ca.gov/perchlorate/

Specifications

Function Specifications

Display	Maximum count: 4199 counts
Battery indicator warning voltage	The mark is displayed at a battery voltage of 2.3 V±0.15 V or less.

General Specifications

Operating environment	Indoors, pollution degree 2, altitude up to 2000 m (6562 ft.)
Operating temperature and humidity	
Temperature	−25°C to 65°C (−13°F to 149°F) (For the 40 MΩ range: up to 40°C [104°F])
Humidity (no condensation)	Less than 40°C (104°F): 80% RH or less At least 40°C (104°F) but less than 45°C (113°F): 60% RH or less At least 45°C (113°F) but less than 50°C (122°F): 50% RH or less At least 50°C (122°F) but less than 55°C (131°F): 40% RH or less At least 55°C (131°F) but less than 60°C (140°F): 30% RH or less At least 60°C (140°F) but less than 65°C (149°F): 25% RH or less
Storage temperature and humidity	−25°C to 65°C (−13°F to 149°F), 80% RH or less (no condensation)
Drop-proof	Operate after a drop from 1 m on concrete
Standards	Safety: EN61010 EMC: EN61326
Power supply	Coin cell lithium battery CR2032 ×1 Rated power voltage: 3 V DC Maximum rated power: 15 mVA
Continuous operating time	CM3281: Approx. 120 hours CM3291: Approx. 70 hours (AC current measurement mode, continuous, unloaded, under conditions of temperature and humidity for guaranteed accuracy)
Dimensions	• CM3281, CM3291: Approx. 57W×198H×16D mm (2.24″W × 7.80″H × 0.63″D) • CT6280: Approx. 42W×65H×18D mm (1.65″W × 2.56″H × 0.71″D) (excluding the flexible loop and output cable)
Dimensions (Jaw)	Approx. 65W×13D mm (2.56″W × 0.51″D)
Mass	• CM3281, CM3291: Approx. 103 g (3.6 oz.) (including battery) • CT6280: Approx. 71 g (2.5 oz.)
Product warranty period	CM3281, CM3291, CT6280: 3 years
Accessories	• Carrying Case • L9208 Test lead • Coin cell lithium battery CR2032 (Installed in the instrument, for trial purposes) • Instruction Manual (This document) • Download Guide • Operating Precautions (0990A909)
Options	The following options are available for the instrument. To purchase an option, please contact your authorized Hioki distributor or reseller. Options are subject to change. Please check Hioki's website for the latest information. • CT6280 AC Flexible Current Sensor (Attachment and C0205 Carrying Case are included) • L4933 Contact Pin Set (Can be connected to the tip of the L9208, which comes with the instrument.)* • L4934 Small Alligator Clip Set (Can be connected to the tip of the L9208, which comes with the instrument.)* • L9208 Test Lead * Remove the sleeves to attach.

Basic Specifications

Maximum input current	• CM3281, CM3291 (Jaw): 2000 A AC, continuous (45 Hz to 66 Hz) • CT6280 (Flexible loop): 4200 A AC, continuous (50 Hz to 60 Hz)
Maximum input voltage	600 V AC/DC and 3×10^6 V·Hz or less (ACV, DCV)
Overload protection	600 V AC/DC (ACV, DCV, Ω, continuity)
Maximum rated voltage to earth	
CM3281, CM3291 (jaw)/ CT6280	600 V (Measurement category III), 300 V (Measurement category IV) (Anticipated transient overvoltage: 6000 V)
Voltage measurement terminal	300 V (Measurement category III) (Anticipated transient overvoltage: 4000 V)
AC measurement method	CM3281: Average value measurement RMS conversion model CM3291: True RMS measurement model
Display update rate	400 ms±25 ms
Noise rejection characteristics	NMRR DCV −40 dB or more (50 Hz/60 Hz) CMRR DCV −100 dB or more (50 Hz/60 Hz, 1 kΩ unbalance) ACV −60 dB or more (50 Hz/60 Hz, 1 kΩ unbalance) But, −45 dB or more for 600 V range.
Crest factor	CM3291: For 2500 counts or less, 2.5 Reduces linearly to 1.5 or less at 4200 counts But, 1.5 or less for 2000 A ACA range
Zero-display range	5 counts (AC current measured with jaw or flexible loop)
Effects of conductor position	• CM3281, CM3291: within ±5.0% (Specified with a 11-mm-diameter [22 mm^2] cable) • CT6280: within ±5.0% (At any positions, based on the center of sensor)
Maximum measurable conductor diameter	• CM3281, CM3291: ϕ46 mm or less • CT6280: ϕ130 mm or less
Model CT6280	Cross-section diameter of sensor cable: Approx. ϕ5.0 mm Sensor-tip cap diameter: Approx. ϕ7.0 mm Output cable length: Approx. 800 mm

Accuracy Specifications

rdg (reading or displayed value):The value currently being measured and indicated on the measuring instrument.
dgt (resolution):The smallest displayable unit on a digital measuring instrument, i.e., the input value that causes the digital display to show a "1" as the least-significant digit.

Conditions of guaranteed accuracy
- Guaranteed accuracy period: 1 year (Number of jaw and flexible loop open/close cycles: 10,000 or less)
- Temperature and humidity for guaranteed accuracy: 23°C±5°C (73°F±9°F), 80% RH or less
- Supply voltage for guaranteed accuracy: The mark is not displayed.
- Temperature characteristic: Measurement accuracy × 0.1/°C is added (excluding 23°C±5°C)
- AC waveform: sine wave

AC Current Measured With Jaw (CM3281)

Range	Accuracy range	Accuracy 50 Hz ≤ f ≤ 60 Hz
42.00 A	4.00 A to 41.99 A	±1.5% rdg ±5 dgt
420.0 A	40.0 A to 419.9 A	
2000 A	100 A to 1999 A	

AC Current Measured With Jaw (CM3291)

Range	Accuracy range	Accuracy		
		40 Hz ≤ f < 45 Hz	45 Hz ≤ f ≤ 66 Hz	66 Hz < f ≤ 1 kHz
42.00 A	4.00 A to 41.99 A	±2.0% rdg ±5 dgt	±1.5% rdg ±5 dgt	±2.0% rdg ±5 dgt
420.0 A	40.0 A to 419.9 A			
2000 A	100 A to 1999 A			

Accuracy is not defined for currents of 3×10^5 A·Hz or more.

AC Current Measured With Flexible loop (CM3281)

Range	Accuracy range	Accuracy 50 Hz ≤ f ≤ 60 Hz
420.0 A	40.0 A to 419.9 A	±3.0% rdg ±5 dgt*1
4200 A	400 A to 4199 A	

AC Current Measured With Flexible loop (CM3291)

Range	Accuracy range	Accuracy		
		40 Hz ≤ f < 45 Hz	45 Hz ≤ f ≤ 66 Hz	66 Hz < f ≤ 1 kHz
420.0 A	40.0 A to 419.9 A	±3.5% rdg ±5 dgt*1, *2	±3.0% rdg ±5 dgt*1	±3.5% rdg ±5 dgt*1, *2
4200 A	400 A to 4199 A			

AC Voltage

Range	Accuracy range	Accuracy		Input impedance
		45 Hz ≤ f ≤ 66 Hz	66 Hz < f ≤ 500 Hz	
4.200 V	0.400 V to 4.199 V	±1.8% rdg ±7 dgt	±2.3% rdg ±8 dgt	11 MΩ ±5%
42.00 V	4.00 V to 41.99 V			10 MΩ ±5%
420.0 V	40.0 V to 419.9 V			10 MΩ ±5%
600 V	400 V to 600 V			10 MΩ ±5%

DC Voltage

Range	Accuracy range	Accuracy	Input impedance
420.0 mV	40.0 mV to 419.9 mV	±2.5% rdg ±5 dgt	100 MΩ or more
4.200 V	0.400 V to 4.199 V	±1.0% rdg ±3 dgt	11 MΩ ±5%
42.00 V	4.00 V to 41.99 V		10 MΩ ±5%
420.0 V	40.0 V to 419.9 V		10 MΩ ±5%
600 V	400 V to 600 V		10 MΩ ±5%

Resistance

Range	Accuracy range	Accuracy	Open-circuit voltage
420.0 Ω	40.0 Ω to 419.9 Ω	±2.0% rdg ±4 dgt	3.4 V or less
4.200 kΩ	0.400 kΩ to 4.199 kΩ		
42.00 kΩ	4.00 kΩ to 41.99 kΩ		
420.0 kΩ	40.0 kΩ to 419.9 kΩ		
4.200 MΩ	0.400 MΩ to 4.199 MΩ	±5.0% rdg ±4 dgt	
42.00 MΩ	4.00 MΩ to 41.99 MΩ	±10.0% rdg ±4 dgt	

Continuity Check

Range	Accuracy	Threshold for buzzer sound	Open-circuit voltage
420.0 Ω	±2.0% rdg ±4 dgt	50 Ω±40 Ω or less	3.4 V or less

*1: Includes accuracy of CT6280 AC Flexible Current Sensor, ±1.0% rdg
*2: Accuracy is not defined for a current of 1000 A or more or that of 5×10^5 A·Hz or more.