HIOKI

3291-50

CLAMP ON HiTESTER

Instruction Manual

EN

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HIOKI

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- Regional contact information
- The latest revisions of instruction manuals and manuals in other languages.
- Declarations of Conformity for instruments that comply with CE mark requirements.

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 one (1) year 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 3291-50 CLAMP ON HiTESTER. To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

Overview

Because it employs a small, thin-type sensor the 3291-50 Clamp On HiTester can clamp even in narrow places. In addition, the angle of the display panel can be changed to suit the measuring location and the back light makes the instrument easy to use even in dark places.

Inspection

Initial Inspection

When you receive the instrument, inspect it carefully to ensure that no damage occurred during shipping. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Maintenance and Service

- To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.
- If the protective functions of the instrument are damaged, either remove it from service or mark it clearly so that others do not use it inadvertently.
- If the instrument seems to be malfunctioning, contact your dealer or Hioki representative.

Safety

This manual contains information and warnings essential for safe operation of the instrument and for maintaining it in safe operating condition. Before using it, be sure to carefully read the following safety precautions.

⚠DANGER

This instrument is designed to comply with IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the instrument. However, using the instrument in a way not described in this manual may negate the provided safety features. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from instrument defects.

Safety Symbol

⚠	Indicates cautions and hazards. When the symbol is printed on the instrument, refer to a corresponding topic in the Instruction Manual.
~	Indicates AC (Alternating Current).
⎓	Indicates DC (Direct Current).
⚡	Indicates that the instrument may be connected to or disconnected from a live circuit.
⧈	Indicates a double-insulated device.

Notation of the This Manual

⊘	Indicates a prohibited action.

Symbols for Various Standards

CE	This symbol indicates that the instrument conforms to regulations set out by the EC Directive.
	Indicates the Waste Electrical and Electronic Equipment Directive (WEEE Directive) in EU member states.

The following symbols in this manual indicate the relative importance of cautions and warnings.

⚠DANGER	Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
⚠WARNING	Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
⚠CAUTION	Indicates that incorrect operation presents a possibility of injury to the user or damage to the device.
NOTE	Indicates advisory items related to performance or correct operation of the instrument.

Measurement categories

To ensure safe operation of measuring instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT II to CAT IV, and called measurement categories.

⚠DANGER

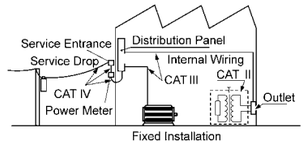
- **Using a measuring instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.**
- **Using a measuring instrument without categories in an environment designated with the CAT II to CAT IV category could result in a severe accident, and must be carefully avoided.**

This instrument complies with CAT III 600 V, CAT IV 300 V safety requirements.

CAT II: When directly measuring the electrical outlet receptacles of the primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.)

CAT III: When measuring the primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets

CAT IV: When measuring the circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection device (distribution panel)



Usage Notes

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

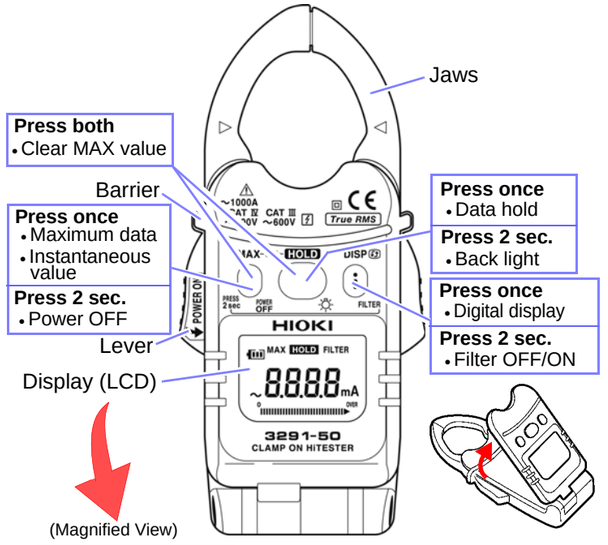
⚠WARNING

Do not allow the instrument to get wet, and do not take measurements with wet hands. This may cause an electric shock.

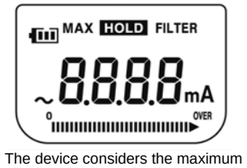
⚠CAUTION

- Do not store or use the instrument where it could be exposed to direct sunlight, high temperature or humidity, or condensation. Under such conditions, the instrument may be damaged and insulation may deteriorate so that it no longer meets specifications.
- This instrument contains a magnetic core. The device should not be used by anyone with a pacemaker or any other electronic medical devices installed in his body.

Names and Functions of Parts



(Magnified View)



* The device considers the maximum displayed value to be the MAX value.

~	Alternating current (AC)
MAX	MAX value
HOLD	Data hold function
FILTER	Filter ON
▮▮▮▮▮	Bar graph
OVER	Over range
▭	Battery low warning (4 levels)

Specifications

Measurement specification

- Temperature and humidity for guaranteed accuracy: 23±5°C (73±9°F), 80%RH or less.
- Guaranteed accuracy period: 1 year, opening and closing of the jaws 10,000 times, whichever comes first.
- Guaranteed accuracy range: 2.00 A or above

AC current A rms（true rms indication, Auto range）

Zero-display range: 0.30 A or less

Range	Guaranteed accuracy	Minimum resolution	Accuracy	
			FILTER OFF	FILTER ON
60 A	2.00 A to 60.00 A	0.01 A	±1.5%rdg.±5dgt. (45 Hz to 66 Hz) ±3%rdg.±5dgt. (66 Hz to 400 Hz)	±1.5% rdg. ±5dgt. (50 Hz to 60 Hz)
600 A	54.0 A to 600.0 A	0.1 A		
1000 A	540 A to1000 A	1 A		

Effect of conductor position	Within±5.0% (in any position based on the center of the jaws)
Maximum rated voltage to earth	600 Vrms Measurement category III (anticipated transient overvoltage 6000 V), 300 Vrms Measurement category IV (anticipated transient overvoltage 6000 V)
Crest factor	2.8 or less (up to 600 A), 1.68 or less (1000 A range)
Diameter of measurable conductor	30 mm dia. or less
Temperature characteristics	Add measurement accuracy × 0.05 / °C (except 23°C±5°C (73°F±9°F))
Response time	1.1 sec. or less
Maximum input current	1000 A continuous

We define measurement tolerances in terms of rdg. (reading) and dgt. (digit) values, with the following meanings:
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.

Example	Calculation
Accuracy spec. :±1.5%rdg. ±5dgt. Measurement range :60.00 A Measurement values:30.00 A	(A) Reading error (± %rdg.) : ± 1.5% of 30.00 A = ± 0.45 A (B) Digit error (± dgt.) : ± 5dgt. =± 0.05 A (Due to minimum resolution of 0.01 A) (C) Total error: (A)+(B) = ± 0.50 A The limit error value for the measured value of 30.00 A is 29.50 A 〜 30.50 A based on the total error (C).

General Specifications

Display update rate	1.1 sec. or less
Display	LCD: monochrome, 91 segments
Operating temperature and humidity	0 to 40°C (32 to 104°F), 80%RH or less (with no condensation)
Storage temperature and humidity	-10 to 50°C (14.0 to 122.0°F), 80%RH or less (with no condensation)
Location for use	indoors, Pollution degree 2, Altitude up to 2000 m (6562 feet)
Rated supply voltage	3 VDC
Maximum rated power	25 mVA
Power supply	CR2032 x 1 Lithium battery
Battery lifetime	Approx.20 hours (continuous, no load, at 23°C)
Dimensions	Approx. 50 W × 136 H × 26 D mm (1.97"W×5.35"H×1.02"D) (Without protrusions)
Mass	Approx. 115 g (4.1 oz.)
Dielectric strength	7060 Vrms /1 minute, 1 mA sensitivity current between the jaws and case
Applicable standards	Safety EN61010 EMC EN61326
Accessories	9757 Carrying case, Strap, Instruction manual, CR2032 Lithium battery
Product warranty period	1 year

Functions

Power supply control	ON: Grasping the lever and opening wide the jaws (sideways). OFF: Press POWER OFF key for 2 seconds or longer.
Filter	Details of operation: Low pass filter ON/OFF Cutoff frequency:180 Hz±30 Hz (-3dB) Initial setting: OFF (Always OFF when the power supply is turned on; non-filtered data is not saved) Activate/De-activate: Press FILTER key for 2 seconds or longer. *When set to ON, the filter removes noise and other unwanted frequency components.
Data hold	Details of operation: Holds measured values (data update is halted) Activate: Pressing the HOLD key once. De-activate:Pressing the HOLD key once. Filter ON/OFF
MAX value display	Details of operation: Displays the maximum measured values reached since the power has been turned on. Activate/De-activate: Pressing the MAX key once. Clear displayed maximum value: Press MAX key and HOLD key at the same time. Filter ON/OFF

Auto power-off	Details of operation: The power cuts off when "0" is displayed continuously for 1 minute. Any key operation is not performed for approx.10 minutes. To de-activate: Power ON while pressing the HOLD key.
Battery Level Indicator	Details of operation:Displays 4 levels of remaining battery charge. *Refer to “Replacing Battery”.
Back light	Activate/De-activate: Press ☼ key for 2 seconds or longer. (About 15 seconds lighting.) Frequent use of backlight reduces battery life.
Liquid crystal display (LCD) reversal	Details of operation: Automatically reverses when the display panel is opened and closed. Manual reversal: Pressing the DISP key once. *Refer to “Opening and Closinng the Display Panel”.
Bar graph	Shows the proportion of the measured value to the range.
Over-Range Display	Displays “OVER” when a high crest factor current is inputted, which means an out of the accuracy guarantee. *Refer to “Crest factor”.

Measurement Procedures

Pre-Operation Inspection (Check the following before using the instrument.)

- Before using the instrument the first time, verify that it operates normally to ensure that the no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.
- The jaws or the case shall be free of damage. (If damage has occurred, avoid using the instrument. Use of the instrument under these conditions may result in electric shock.)
- The mating portions of the jaws should be free of any scratches or cracks.
- Battery power should be near full capacity when power is turned on. (Refer to “Replacing Battery”)
- The reading should be around 0 A when no measurements are being made.

⚠DANGER

- This instrument should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs. Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.
- To avoid electric shock, do not touch the portion beyond the protective barrier during use.

⚠CAUTION

- Be careful to avoid dropping the instrument or otherwise subjecting them to mechanical shock, the jaws tip will be damaged, negatively influencing measurement.
- Do not input current greater than 1000 A. It will damage the device.

NOTE

- Please note that waveforms that include elements outside the frequency characteristic range may not be measured correctly.
- Correct measurement may be impossible in the presence of strong magnetic fields, such as near transformers and high-current conductors, or in the presence of strong electromagnetic fields such as near radio transmitters.

AC Current Measurement

⚠DANGER

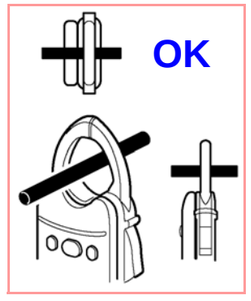
To avoid short circuits and potentially life-threatening hazards, never attach the instrument in current measurement mode to a circuit that operates at more than the maximum rated voltage CAT III 600 V, CAT IV 300 V, or over bare conductors.

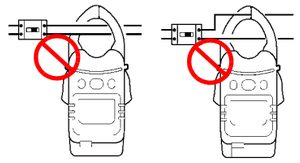
NOTE

- Correct measurement may be impossible for the case of rush current or significantly fluctuating current.
- There are cases when error could be larger depending on positioning of sensors and conductor.
- When the measuring value exceeds 1000 A the digital display will blink.
- Waveforms around 20 Hz or below may be displayed as “----”.
- At a low temperature, there are cases when the reading may not be around 0 A without any input signal. But it does not affect measurement.

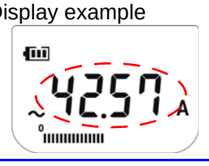
Open Jaws to Power On.

1. Clamp the tester on the conductor, so that the conductor passes through the center of the clamp core.
   - Clamp the tester on one wire only.
   - Put the conductor perpendicular to the sensor, as shown in the sketch.
2. The effective value is shown on the digital display.



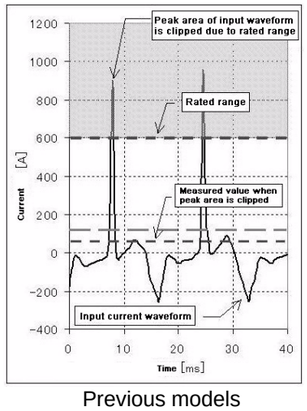


Display example

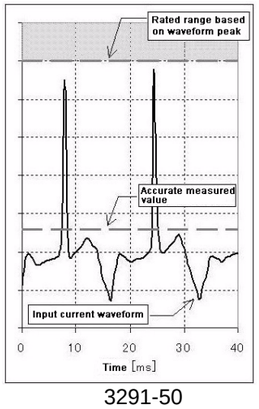


Crest factor

“Crest factor = Waveform peak value/ Internal rated range” is defined for this instrument. There are cases when the accurate measurement cannot be performed with our previous models, because a top portion of the waveform is clipped off due to the rated range if a high crest factor current (= RMS is low and a waveform peak is high) is flowed. This instrument defines the range based on a waveform peak value and measured value so that the accurate measurement can be performed. As for a high crest factor current, its measured value becomes small to the range. If a current exceeding a crest factor of 2.8 is inputted, “OVER” is displayed. This measurement is the out of accuracy guarantee range and the measured value is for reference purpose only.



Previous models



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Regarding the MAX value display

(1) Press the MAX key once to confirm the MAX value. Whenever a maximum value is updated, the display will be updated.
(2) A maximum value will be cleared by pressing【MAX】key and【HOLD】key simultaneously whether when a maximum value is displayed or an instantaneous value is displayed.

NOTE

- As far as the Data Hold mode is on, MAX value cannot be updated.
- The MAX value is cleared with FILTER ON/OFF.

Filter function

The default setting of Filter is OFF. Please change the setting according to the use.

Replacing Battery

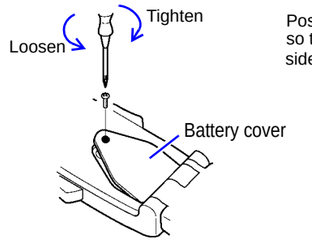
⚠WARNING

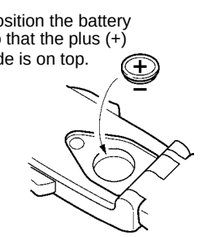
- To avoid electric shock when replacing the battery first disconnect the clamp from the object to be measured. After replacing the batteries, replace the cover and screws before using the instrument.
- Use only CR2032 lithium battery. Use of any other battery may result in explosion.
- Be sure to insert them with the correct polarity. Otherwise, poor performance or damage from battery leakage could result.
- Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.
- Handle and dispose of batteries in accordance with local regulations.
- Keep batteries away from children to prevent accidental swallowing.
- To avoid corrosion from battery leakage, remove the batteries from the instrument if it is to be stored for a long time.

NOTE

- ▮▮▮ at the upper left on the display screen indicates the remaining power level. When the battery approaches the exhausting value, ▯ is displayed and a few minutes later, power turns off automatically. When ▯ is displayed, the accuracy of measurement value is not guaranteed. Replace the new batteries soon.
- At a low or high temperature, the battery life is reduced faster.
- The batteries included with the device were installed for factory testing purposes. CR2032 lithium batteries can be purchased at electronics and appliance stores where specialized batteries are sold.
- Although the remaining power level indicator may become lower for a moment due to the internal processing, it is not an anomaly.

Replacing the Batteries





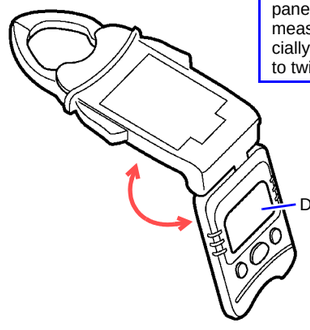
1. Press and hold the POWER OFF key for 2 seconds or longer to turn off the device's power.
2. Remove the battery cover screws on the back of the device with a Phillips screwdriver, then remove the battery cover.
3. Replace with a new battery. When inserting a new battery (CR2032 lithium battery), be sure to position the polarities in their proper orientations.
4. Replace the battery cover and fasten the screws.

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

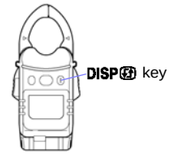
Opening and Closing the Display Panel

Adjust the angle of the display panel for better viewing.

Take measurements with the display panel flipped open in order to view the measurement results more clearly, especially in tight locations, without needing to twist the jaw at an awkward angle.

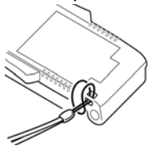


The display can also be reversed by pressing the DISP key.



Attaching the strap

Fix the strap for fall prevention.



Make the strap go through the hole just like the Figure shown.

Error Display

When an error is displayed on the LCD, the HiTester requires repair. Contact your supplier or Hioki representative.

Error Display	Meaning	Remedial Action
Err0	Internal ROM Error	Repair is necessary. Contact your supplier or Hioki representative.
Err1		
Err2	Calibration Data Faulty	
Err3		