

3288-20

CLAMP ON AC/DC HiTESTER

Instruction Manual

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The Declaration of Conformity for instruments that comply to CE mark requirements may be downloaded from the HIOKI website.

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 3288-20 CLAMP ON AC/DC HiTESTER. To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

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.

Overview

The HIOKI Model 3288-20 CLAMP ON AC/DC HiTESTER is a compact and lightweight instrument that enables you to measure up to maximum of AC/DC 1000 A. Besides measuring current, the 3288-20 also contains DMM functions for AC and DC voltage, resistance and continuity testing. With "True RMS" measurement, it can handle measurement of distorted current waveforms. In AC current mode it guarantees accuracy of measurement for frequency from 10 Hz.

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. 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 Symbols

	In the manual, the symbol indicates particularly important information that the user should read before using the instrument. The symbol printed on the instrument indicates that the user should refer to a corresponding topic in the manual (marked with the symbol) before using the relevant function.
	Indicates a double-insulated device.
	Indicates DC (Direct Current).
	Indicates AC (Alternating Current).
	Indicates both DC (Direct Current) and AC (Alternating Current).
	Indicates a grounding terminal.
	Indicates that the instrument may be connected to or disconnected from a live circuit.

Symbols for Various Standards

	This symbol indicates that the product conforms to safety regulations set out by the EC Directive.
	WEEE marking: This symbol indicates that the electrical and electronic appliance is put on the EU market after August 13, 2005, and producers of the Member States are required to display it on the appliance under Article 11.2 of Directive 2002/96/EC (WEEE).

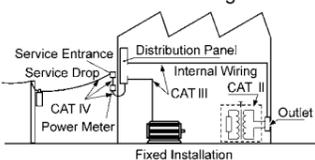
The following symbols in this manual indicate the relative importance of cautions and warnings.

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

Measurement categories

This instrument the current measurement section complies with CAT III 600 V safety requirements, and the voltage measurement section complies with CAT III 300 V, CAT II 600 V safety requirements. To ensure safe operation of measurement instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT II to CAT IV, and called measurement categories.

CAT II: Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.) CAT II covers directly measuring electrical outlet receptacles.
 CAT III: Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.
 CAT IV: The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection device (distribution panel).



Using a measurement 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.
 Use of a measurement instrument that is not CAT-rated in CAT II to CAT IV measurement applications could result in a severe accident, and must be carefully avoided.

Usage Notes

Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.
 Before using the instrument the first time, verify that it operates normally to ensure that no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.

DANGER

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

WARNING

- Check that there is no damage to the clamp sensor, instrument case before using. Do not use if there is any damage as it could lead to electric shock.
- Before using the instrument, make sure that the insulation on the test leads is undamaged and that no bare conductors are improperly exposed. Using the instrument in such conditions could cause an electric shock, so contact your dealer or Hioki representative for repair.
- During current measurement, to avoid an electric shock accident, do not connect the test leads to the instrument.
- To avoid electric shock when measuring live lines, wear appropriate protective gear, such as insulated rubber gloves, boots and a safety helmet.

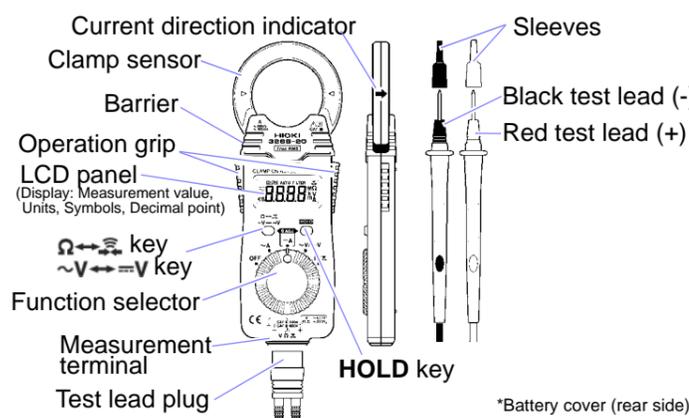
CAUTION

- Be careful to avoid dropping the instrument or otherwise subjecting them to mechanical shock, which could damage the mating surfaces of the core and adversely affect measurement.
- Keep the clamp jaws and core slits free from foreign objects, which could interfere with clamping action.

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

	Exposed to direct sunlight		Exposed to high temperature		In the presence of corrosive or explosive gases
	Exposed to liquids		Exposed to high humidity or condensation		Exposed to strong electromagnetic fields
	Exposed to high levels of particulate dust				Near electromagnetic radiators
	Subject to vibration				Near induction heating systems, (e.g., high-frequency induction heating systems and IH cooking utensils)

Names and Functions of Parts



Operation grip	The clamp sensor at the same side as the pushed grip opens.
Function selector	OFF, AC current [\sim A], DC current [--- A], AC Voltage/DC Voltage [\sim V/ --- V], Resistance and continuity test [Ω / ---]. (Power is turned on in any position other than OFF.)
Test lead Plug	Connect the test lead plug to the measurement terminal of the instrument for voltage measurement, resistance measurement or continuity testing. <ul style="list-style-type: none"> For [Ω/---] function: Resistance measurement [Ω] or Continuity testing [---] is switchable. For [\sim V/--- V] function: AC voltage [\sim V] or DC voltage [--- V] is switchable. For [--- A] function: Pressing this key together with HOLD key initiates zero adjustment.
$\Omega \leftrightarrow \text{---}$ key	
\sim V \leftrightarrow --- V key	
HOLD key	When press HOLD key, HOLD appears in the display and the digital display value is maintained. Press HOLD key again to cancel the data HOLD function.

Functions and Display

The display is blanked automatically. (Auto Power Save Function)

- The auto power save function is activated automatically when the power is turned on. (Not possible to cancel)
- This function automatically switches to the power save state when 10 minutes have elapsed since the last operation. (Power save state)
- To restore from the auto power save state, turn the function selector to the OFF position once.

NOTE

The auto power save function cannot be canceled. A minute amount of power continues to flow while in the power save state. If you will not be using the tester for an extended period of time, set the function selector to OFF or remove the battery.

Zero-adjust Function

- Before measuring DC current [--- A], you must perform zero adjustment by simultaneously pressing the $\Omega \leftrightarrow \text{---}$ and **HOLD** keys while there is no input to the instrument.
- The zero adjustment function compensates for sensor magnetization and changes in current display over time. This function is only effective with measurement of DC current [--- A].

NOTE

Please do not perform zero adjustment while there is any input to the instrument. Also note that the zero-adjust function will not function when the display count is greater than 1000.

The measurement range is automatically set to the most appropriate range. (Auto-range Function)

When measuring an AC current [\sim A], DC current [--- A], AC voltage [\sim V], DC voltage [--- V], or resistance [Ω], the measurement range is automatically set to the most appropriate range.

A manual range setting becomes available. (Manual Range Function)

Power on the tester while holding down the $\Omega \leftrightarrow \text{---}$ or **HOLD** key to select a manual range for measuring AC current [\sim A], DC current [--- A], AC voltage [\sim V], DC voltage [--- V] or resistance [Ω]. Note that this function is not available for continuity testing. Press the $\Omega \leftrightarrow \text{---}$ key to step to the next range. To switch between AC voltage [\sim V] and DC voltage [--- V], press and hold the \sim V \leftrightarrow --- V key for at least one second.

Indication when the input is out of range. (Overflow indication)

When the input exceeds the measurement range, "O.F" or "-O.F" is displayed.

Specifications

Zero-adjust Function	Before measuring DC current [--- A], you must perform zero adjustment by simultaneously pressing the $\Omega \leftrightarrow \text{---}$ and HOLD keys.
Data hold indication	HOLD
Auto power save	Power save state when 10 minutes have elapsed since the last operation.
LCD panel	4199 maximum display value
Out of range indication	O.F or -O.F
Battery low warning	" is on, the measurement accuracy cannot be guaranteed.
Zero suppression	5 count or less (current measurement only)
Display update rate	400 ms \pm 25 ms
Range switching	Auto range / Manual range
Crest factor	Current range: 3 max. (1000 A range is 2 max.) Voltage range: 1.5 max.
Dielectric strength	4290 V rms sine wave (for 1 min) between case and circuit. 7060 V rms sine wave (for 1 min) between clamp sensor and case. 5400 V rms sine wave (for 1 min) between clamp sensor and circuit.
Location for use	Altitude up to 2000 m (6562 feet), indoors Pollution Degree 2
Maximum conductor diameter for measurement	35 mm (1.38") or less
Operating temperature and humidity	0 to 40°C (32 to 104°F), 80%RH max. (no condensation)
Temperature characteristics	In 0 to 40°C range: 0.1 x Measurement accuracy /°C (In 32°F to 104°F range: 0.56 x Measurement accuracy /°F)
Storage temperature	-10 to 50°C (14 to 122°F), 80%RH max. (no condensation)
Power supply	CR2032 lithium battery x 1 (Rated supply voltage 3 V DC)
Maximum rated power	15 mVA
Continuous operating time	Approx. 35 hours (continuous, no load)
Dimensions	Approx. 57W x 180H x 16D mm (2.24"W x 7.09"H x 0.63"D)
Mass	Approx. 150 g (5.3 oz.)
Accessories	Instruction Manual, L9208 Test Leads, 9398 Carrying Case
Maximum rated voltage to earth	Current measurement (ACA, DCA): Measurement Category CAT III 600 V (anticipated transient overvoltage 6000 V) Voltage measurement (ACV, DCV): Measurement Category CATIII 300 V, CATII 600 V (anticipated transient overvoltage 4000 V)
Applicable standards	Safety : EN 61010, EMC: EN 61326

Accuracy

- Guaranteed accuracy period is 1 year (Opening and closing of the Clamp sensor 10,000 times, whichever comes first).
- Accuracy guarantee for temperature and humidity: 23±5°C (73°F±9°F) and 80%RH or less (no condensation)
- Battery warning indicator is not lighting.

AC current measurement: true RMS value, DC current measurement: average value

Function	Range	Accuracy ±(%rdg.+dgt.)*		Max. input current
		45 to 66 Hz	10 to 45, 66 to 500 Hz	
ACA (\sim A)	100.0 A 1000 A	±(1.5%+5)	±(2.0%+5)	1000 A rms AC continuous (See Figure. 1)
DCA (--- A)		DC ±(1.5%+5)		1000 A DC continuous

Effect of conductor position: within ±2.0% (in any direction from sensor center)

AC voltage measurement: true RMS value, DC voltage measurement: average value

Function	Range (Accuracy range)	Accuracy ±(%rdg.+dgt.)*	Input impedance	Max. input voltage
ACV (\sim V)	4.200 V (0.400 to 4.199 V) 42.00 V (4.00 to 41.99 V) 420.0 V (40.0 to 419.9 V) 600 V (400 to 600 V)	±(2.3%+8) 30 to 500 Hz	11 M Ω ±5% 10 M Ω ±5% 10 M Ω ±5% 10 M Ω ±5%	600 V rms AC
DCV (--- V)	420.0 mV (40.0 to 419.9 mV) 4.200 V (0.400 to 4.199 V) 42.00 V (4.00 to 41.99 V) 420.0 V (40.0 to 419.9 V) 600 V (400 to 600 V)	±(1.3%+4)	100 M Ω or more 11 M Ω ±5% 10 M Ω ±5% 10 M Ω ±5% 10 M Ω ±5%	600 V DC

Resistance measurement

Function	Range (Accuracy range)	Accuracy ±(%rdg.+dgt.)*	Open terminal voltage	Overload protection
Ω	420.0 Ω (40.0 to 419.9 Ω)	±(2.0%+4)	3.4 V or less	250 V AC/DC
	4.200 k Ω (0.400 to 4.199 k Ω)	±(2.0%+4)	0.7 V (typ.) 3.4 V or less	
	42.00 k Ω (4.00 to 41.99 k Ω)	±(2.0%+4)	0.47 V (typ.) 3.4 V or less	
	420.0 k Ω (40.0 to 419.9 k Ω)	±(2.0%+4)	0.47 V (typ.) 3.4 V or less	
	4.200 M Ω (0.400 to 4.199 M Ω)	±(5.0%+4)	0.47 V (typ.) 3.4 V or less	
42.00 M Ω (4.00 to 41.99 M Ω)	±(10.0%+4)	0.47 V (typ.) 3.4 V or less		

Continuity test

Function	Range	Accuracy ±(%rdg.+dgt.)*	Threshold level (beep sound)	Open terminal voltage	Overload protection
---	420.0 Ω	±(2.0%+6)	Less than 50 Ω ±40 Ω	3.4 V or less	250 V AC/DC

* rdg.: reading or displayed value, dgt.: resolution

Measurement Procedures

Check the following before using the instrument.

NOTE

After turning on the instrument and changing over the functions, it could take a dozen seconds to stabilize the display.

Check items	Diagnose and Solution
Check whether the cladding of the test lead is not torn and the white or red portion (insulation layer) inside the cable is not exposed.	When damage is found, replace with the specified new test leads Model L9208. Failure to do so may result in electric shock.
Check whether the clamp sensor or the case is free of damage.	If damage is present, avoid using the instrument. Use of the instrument under these conditions may result in electric shock.
Make sure that the mating portion of the clamp sensor tip is mate properly.	If the mating portions do not mate properly, accurate measurements cannot be guaranteed. Gently wipe off any dirt with a soft cloth found on the surface of the mating portions. If the sensors do not mate properly, repair is necessary.
Make sure there are no missing display of the LCD panel.	If missing, repair is necessary.
Make sure that the display of the LCD panel is not dim or faint.	If the display is dim or faint, the environmental condition may be low temperature (lower than 0°C) or battery may be exhausted. In case of battery exhaustion, replace battery. If the display remains dim even after the battery is replaced, repair is necessary.
Make sure that the battery indicator "E" does not light up when power is turned on.	If the indicator is on, the measurement accuracy cannot be guaranteed. Replace battery immediately.
Check whether Zero adjustment can be made by pressing both $\Omega \leftrightarrow \text{---}$ key and HOLD key simultaneously in DC current measurement mode.	If Zero adjustment cannot be made, accurate measurement is not possible. Repair is necessary.
Check whether the reading is around 0 A when no measurements are being made in AC current measurement mode. (Although there is the case that the reading is around 0.1 A, the accuracy of measurement can be guaranteed as it is.)	When some large value is displayed, something is wrong with the instrument. Repair is necessary. (See-Troubleshooting)
Check whether the reading is around 0 V while the test leads are short-circuited in voltage measurement mode. (Although there is the case that the reading is around 0.01 V in AC voltage measurement mode, the accuracy of measurement can be guaranteed as it is.)	If the reading is not around 0 V, check whether the test leads are open circuit or not. When no open circuit condition is present, the instrument itself needs repair.

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Make sure that an abnormal value is not displayed when a known value is measured in voltage measurement mode.	If an abnormal value is displayed, repair is necessary.
Check whether the reading is around 0 Ω while the test leads are short-circuited in resistance measurement mode. (Check for open circuit in the test leads)	If the reading is not around 0 Ω , replace the test leads Model L9208.
Check whether the "O.F." appear when moving the test leads apart.	If the "O.F." does not appear, repair is necessary.
Check whether a beep sound is generated when the test leads are short-circuited in continuity test mode.	When the test leads are not open circuited and no beep sound is generated, repair is necessary.

⚠ DANGER

Observe the following precautions to avoid electric shock.

- Always verify the appropriate setting of the function selector before connecting the test leads. Disconnect the test leads from the measurement object before switching the function selector.
- Never apply voltage to the test leads when the Resistance, or Continuity Test functions are selected. Doing so may damage the instrument and result in personal injury. To avoid electrical accidents, remove power from the circuit before measuring.

⚠ CAUTION

- Removable sleeves are attached to the metal pins at the ends of the test leads. To prevent a short circuit accident, be sure to use the test leads with the sleeves attached when performing measurements in the CAT III measurement category. Remove the sleeves from the test leads when performing measurements in the CAT II measurement categories. For details on measurement categories, see "Measurement categories" in the instruction manual.
- When performing measurements with the sleeves attached, be careful to avoid damaging the sleeves. If the sleeves are inadvertently removed during measurement, be especially careful in handling the test leads to avoid electric shock.
- The tips of the metal pins are sharp, so take care not to injure yourself.

Current Measurement

⚠ DANGER

The maximum rated voltage between input terminals and ground is CAT III 600 V. In current measurement mode, attempting to measure voltages exceeding CAT III 600 V with respect to ground could damage the instrument and result in personal injury.

⚠ CAUTION

Do not exceed the maximum input current rating. Doing so may cause the heat generation of clamp sensors and result in damage to the instrument or burn injuries.

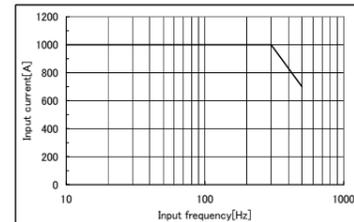


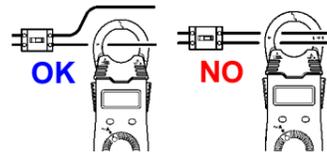
Figure 1. Permissible current to frequency

NOTE

Attach the clamp around only one conductor.

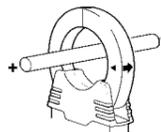
Measuring AC Current [\sim A]

- Set the function selector to \sim A.
- Clamp the tester on the conductor, so that the conductor passes through the center of the clamp core.



Measuring DC Current [--- A]

- Set the function selector to --- A.
- After making sure that there is no input to the instrument, perform zero adjustment by simultaneously pressing the $\Omega \leftrightarrow \text{---}$ and **HOLD** keys.
- Clamp the line to be measured so that the arrow on the side of the clamp sensor points in the direction of current flow and the line is position in the center of the sensor jaws. (A negative reading will result if the arrow points in the opposite direction.)



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Voltage Measurement

⚠ DANGER

- The maximum input voltage is 600 V AC/DC. Attempting to measure voltage in excess of the maximum input could destroy the instrument and result in personal injury or death.
- To avoid electrical shock, be careful to avoid shorting live lines with the test leads.
- In voltage measurement mode, the maximum rated voltage between input terminals and ground is CAT III 300 V, CAT II 600 V. In current measurement mode, attempting to measure voltages exceeding CAT III 300 V, CAT II 600 V with respect to ground could damage the instrument and result in personal injury.

NOTE

Make sure that the test lead plug is inserted into the measurement terminal of the instrument correctly.

Measuring AC Voltage [\sim V]

- Set the function selector to \sim V/ --- V.
- Connect the test leads to the object to be measured. When measuring AC voltage, the polarity of the leads can be ignored.

Measuring DC Voltage [--- V]

- Set the function selector to \sim V/ --- V.
- Press \sim V \leftrightarrow --- V key to display --- V.
- Connect the red (+) lead to the +side of the circuit to be measured and the black (-) lead to the -side. A negative reading will result if the leads are reversed.

Resistance Measurement [Ω]

Plug the test leads into the measurement terminal.

- Set the function selector to Ω / --- .
- Connect the test leads to the object to be measured.

Continuity Test [---]

Plug the test leads into the measurement terminal.

- Set the function selector to Ω / --- .
- Press the $\Omega \leftrightarrow \text{---}$ key, so that the --- indication appears.
- Connect the test leads to the object to be measured. Conductivity is good when the beep sounds.

Replacing Battery

⚠ WARNING

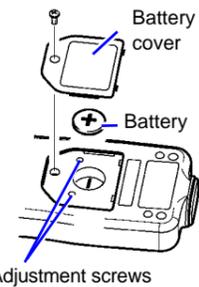
- If the instrument is connected to a line that is to be measured, dangerous voltage levels may be applied to the terminals, and removing the case may expose live components. To avoid electric shock when replacing the battery, first disconnect the instrument and the test leads from the object being measured. Also, after replacing the battery, always replace the cover and tighten the screw before using the instrument.
- Use only CR2032 (Panasonic or MAXELL) lithium battery. Use of any other battery may result in explosion.
- Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.
- Be sure to insert them with the correct polarity. Otherwise, poor performance or damage from battery leakage could result. Replace batteries only with the specified type.
- Handle and dispose of batteries in accordance with local regulations.
- Keep batteries away from children to prevent accidental swallowing.

NOTE

- When the battery is exhausted, the "E" indication appears in the display.
- The battery included with this instrument was inserted for Testing Purposes only. Battery life will vary. Please replace the original battery with a new battery as soon as it is depleted.
- CR2032 lithium batteries (Panasonic or MAXELL) can be purchased at electronics and appliance stores where specialized batteries are sold.
- Do not turn the adjustment screws as this may disrupt the measurement values.

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- Remove the instrument and the test leads from the test item, and power the instrument off.
- Remove the instrument from the case, and remove the screws on the battery cover.
- Remove the used battery.
- Being careful about the polarity, insert the new battery of the specified type. (CR2032 lithium battery: Panasonic or MAXELL)
- Replace the battery cover and fasten the screws.



CALIFORNIA, USA ONLY

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

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.

Troubleshooting

When the instrument is not functioning properly and if you have not performed the pre-operation inspection, please do so now. If you cannot find a problem in the pre-operation inspection, please refer to the following symptoms before contacting your dealer or the nearest Hioki representative. When you send the unit for repair, please pack the unit carefully so that it will not be damaged during transport, and write a detailed description of the problem. Hioki cannot bear any responsibility for damage that occurs during shipment.

Symptom	Description
The measured value of current or voltage is different from the measured value with other clamp-on tester.	<ul style="list-style-type: none"> Waveform containing components out of the frequency property range cannot be measured accurately. In the case that the sample to be measured is a distorted waveform, the measured value with the 3288-20 and that with another clamp-on tester using MEAN value method (Average value rectified, effective value display) are different. Using true RMS method, the 3288-20 can measure such a waveform accurately. In the case that the sample to be measured is the waveform with both AC and DC components, half or full-wave rectified waveform, accurate measurement is not be possible due to the large margin of error. We recommend using another instrument with AC+DC mode.
The measured current value is smaller than expected.	<ul style="list-style-type: none"> The measurement value is not correct, if the measurement is performed leaving the clamp jaws open.
The measured current value is larger than expected. (current value is displayed even with no input.)	<ul style="list-style-type: none"> Accurate measurement is not possible in the presence of strong magnetic fields, such as transformers and high-current conductors, or in the presence of strong electromagnetic fields such as radio transmitters.
Roaring sound is heard around the clamp sensors.	When the current of the sample is higher than 500 A or the frequency is higher than 200 Hz, the roaring sound may be generated from the clamp sensors.

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