HIOKI

9691,9692,9693

CLAMP ON AC/DC SENSOR

Instruction Manual

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Introduction

Thank you for purchasing the HIOKI "9691, 9692, 9693 CLAMP ON AC/DC SENSOR." To obtain maximum performance from the product, please read this manual first, and keep it handy for future reference

Initial Inspection

When you receive the product, 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.

Preliminary Checks

- Before using the product 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.
- Before using the product, make sure that the insulation on the cables is undamaged and that no bare conductors are improperly exposed. Using the product in such conditions could cause an electric shock, so contact your dealer or Hioki representative for repair.

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name:	HIOKI E.E. CORPORATION
Manufacturer's Address:	81 Koizumi, Ueda, Nagano 386-1192, Japan
Product Name:	CLAMP ON AC/DC SENSOR
Model Number:	9691, 9692, 9693

The above mentioned products conform to the following product specifications:

Safety:	EN61010-2-032:2002
EMC:	EN61326-1:2006 ClassB equipment Basic immunity test requirement EN61326-2-2:2006 ClassB equipment Portable test, measuring and monitoring equipment used in low-voltage distribution systems

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC.

HIOKI E.E. CORPORATION

15 October 2008

Atsushi Mizuno
Director of Quality Assurance

9691A999-03

Maintenance and Service

- To clean the product, 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 product seems to be malfunctioning, contact your dealer or Hioki representative.

Overview

The 9691, 9692, and 9693 CLAMP ON AC/DC SENSORs are designed for use on the 3290 CLAMP ON AC/DC HiTESTER. All three sensors are interchangeable. When any of these sensors is connected to the 3290, the 3290 automatically detects this connection and sets up the range for the sensor. The 3290 Clamp On AC/DC HiTESTER combined with a Clamp On AC/DC Sensor is used to perform DC, AC, or AC+DC measurement on a live line.

Safety

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

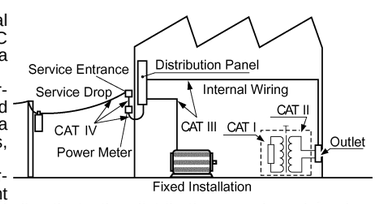
DANGER

This product is designed to conform to 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 product. 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 product defects.

Measurement categories (Overvoltage categories)

This product complies with CATIII safety requirements. To ensure safe operation of measurement products, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT I to CAT IV, and called measurement categories.These are defined as follows.

CAT I: Secondary electrical circuits connected to an AC electrical outlet through a transformer or similar device.
CAT II: Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.)
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).
Higher-numbered categories correspond to electrical environments with greater momentary energy. So a measurement device designed for CAT III environments can endure greater momentary energy than a device designed for CAT II.Using a measurement product in an environment designated with a higher-numbered category than that for which the product is rated could result in a severe accident, and must be carefully avoided.Never use a CAT I measuring product in CAT II, III, or IV environments.The measurement categories comply with the Overvoltage Categories of the IEC60664 Standards.



Safety Symbol

⚠	In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the product. The ⚠ symbol printed on the product 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.
ϟ	Indicates that the instrument may be connected to or disconnected from a live circuit.

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 product
NOTE Advisory items related to performance or correct operation of the product.

rdg.:reading value (The value currently being measured and indicated on the measuring product)

Usage Notes

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

DANGER

- **To avoid short circuits and potentially life-threatening hazards, never attach the product to a circuit that operates at more than the 600 V AC.**
- **This product 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.**

WARNING

- **To avoid electric shock, do not allow the product to get wet, and do not use it when your hands are wet.**
- **To avoid electric shock when measuring live lines, wear appropriate protective gear, such as insulated rubber gloves, boots and a safety helmet.**
- **To avoid damage to the product, do not exceed the maximum input current rating, which depends on the frequency of the current being measured. Be careful about the evolution of heat, when the input frequency is high.**

CAUTION

- Do not store or use the product where it could be exposed to direct sunlight, high temperature or humidity, or condensation. Under such conditions, the product may be damaged and insulation may deteriorate so that it no longer meets specifications.
- The ends of the clamp sensor are very delicate. Be careful not to drop the sensor or otherwise subject it to impact. Clamps with deformed or damaged contact surfaces may result in inaccurate measurement.
- Keep the clamp jaws and core slits free from foreign objects, which could interfere with clamping action.
- Avoid stepping on or pinching the cable, which could damage the cable insulation.
- To avoid damaging the cables, do not bend or pull the cables.

NOTE

Accurate 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.

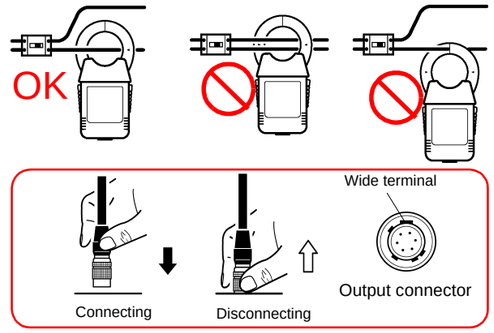
Measurement Procedures

CAUTION

- Do not connect or disconnect the output connector of the clamp-on sensor while power is supplied to the 3290 or the sensor is clamping a conductor to be measured.
- When disconnecting the output connector of the clamp-on sensor from the 3290 sensor connector, be sure to hold it by the metal part and pull it upward. If it is pulled by the cable, the lock will not be released and a broken wire in the cable may result.
- The maximum continuous-input limit is obtained from the temperature increase due to self-heating during measurement. To prevent damage to the clamp-on sensor, do not input a current exceeding this limit.
- The maximum continuous-input limit varies depending on the clamp-on sensor and the frequency of the current to be measured. Please see the dilating-characteristics graph by frequency in "Specifications."

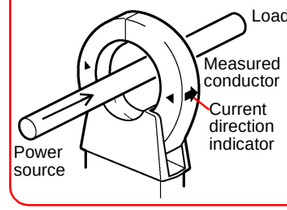
NOTE

- The reading may show a measurement greater than the actual value due to magnetic-field interference. The amount of interference varies depending on the sensor. For details, see "External magnetic-field interference" in Specifications.
- The hall element is used for the detector of the clamp-on sensor. The hall element tends to drift with age or due to the ambient temperature. Keep this fact in mind when performing measurement continuously.
- When a conductor to be measured is placed in the center of the clamp core, measurement is performed the most accurately, with no effect of the conductor position.
- Refer to the relevant instruction manual for how to operate and set the 3290.
- Attach the clamp around only one conductor. Single-phase (2-wire) or three-phase (3-wire) cables clamped together will not produce any reading.

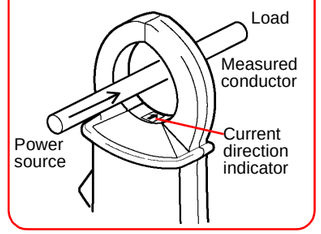


When connecting the clamp-on sensor to the 3290, hold it by the area above the metal part of the output connector when inserting it. If it is held by the metal part, it won't be possible to insert the output connector into the sensor connector. Make sure the wide terminal of the connector is at the top when the connector is inserted.
When disconnecting the clamp-on sensor from the 3290, hold the metal part of the connector when pulling it out. If it is held by the area above the metal part, it won't be possible to disconnect the connector.

9691 CLAMP ON AC/DC SENSOR



9692,9693 CLAMP ON AC/DC SENSOR



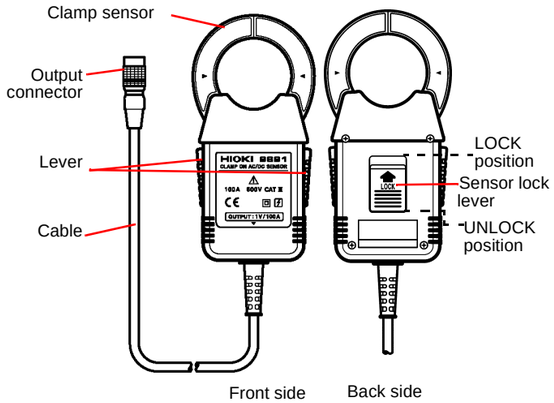
1. Confirm that power of the 3290 is OFF.
2. Connect the output connector of the sensor to the sensor connector of the 3290.
3. Press the POWER key of the 3290 to turn it ON.
4. Open the ends of the clamp core. Orient the current direction indicator on the sensor in the current direction of the conductor to be measured, then clamp the conductor so that it passes through the center of the clamp core. (For DC measurement, perform zero adjustment on the 3290 before clamping a conductor with the clamp sensor. For AC measurement, note that the current direction indicator need not be oriented in the current direction.)
5. The 9691 has a lock mechanism on its rear panel side to prevent the sensor from opening during measurement. To prevent the sensor from possibly being opened due to vibration or other similar causes, be sure to lock it before starting measurement. (Even if the sensor opens slightly during measurement, the measurement value will be less and accuracy cannot be guaranteed.)

NOTE

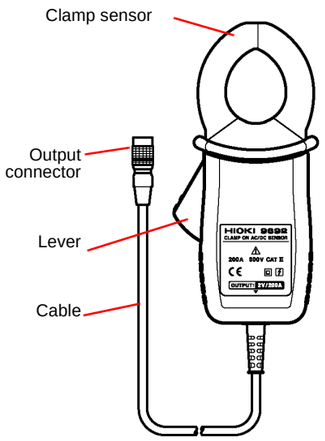
Make sure that the sensor lock lever of the 9691 is slid into the Lock or Unlock position. Leaving the level set midway between these two positions may disable the lock function.

Parts Names

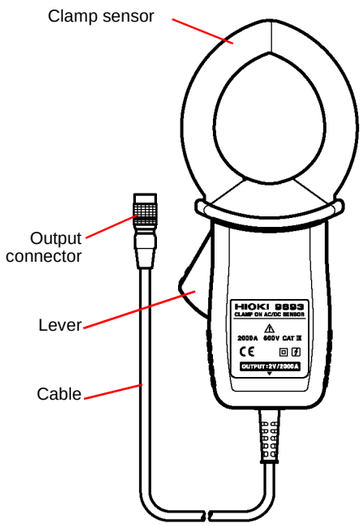
9691 CLAMP ON AC/DC SENSOR



9692 CLAMP ON AC/DC SENSOR



9693 CLAMP ON AC/DC SENSOR



Specifications

9691 CLAMP ON AC/DC SENSOR

Rated current	AC/DC 100 A
Output voltage	AC/DC 1 V/100 A
Output resistance	100 Ω or less
Maximum permissible input	100 Arms continuous (Derating according to frequency)
Maximum peak current value	150 A
Accuracy guarantee for temperature and humidity	23°C±5°C(73°F±9°F), 80%RH or less, no condensation
Guaranteed accuracy period	1 year (Opening and closing of the sensor: 10,000 times)

(1) Continuous input

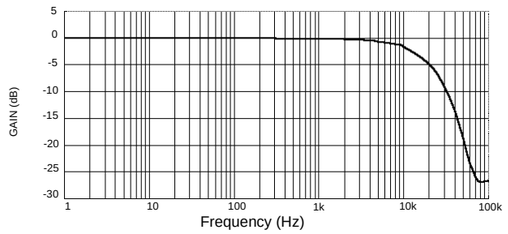
Range	DC	to 66Hz	66 to 500Hz
0 to 80A	±1.0%rdg.±0.5mV	±1.0%rdg.±0.5mV	±2.0%rdg.±0.5mV
80 to 100A			±2.5%rdg.±0.5mV

(2) Peak input

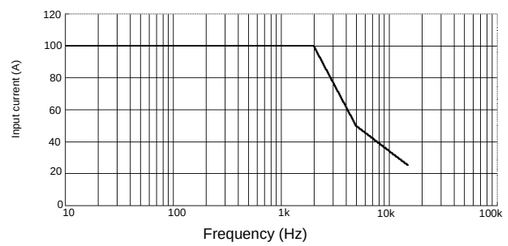
Range	DC	to 66Hz	66 to 500Hz
0 to 110A	±1.0%rdg.±2mV	±1.0%rdg.±2mV	±2.0%rdg.±2mV
110 to 150A			±2.5%rdg.±2mV

Frequency band	DC to 10 kHz (-3dB)
Effect of conductor position	Within ±1.0% (at 80 A (55 Hz))
Effect of external electromagnetic field	0.5 A equivalent or less (in an external electromagnetic field of 400 A/m)
Temperature characteristics	0 to 40°C range: 0.1 x accuracy specifications/°C 32 to 104°F range: 0.18 x accuracy specifications/°F
Operating temperature and humidity range	0 to 40°C, 32 to 104°F, 80% RH or less; no condensation
Storage temperature range	-10 to 50°C, 14 to 122°F, 80% RH or less; no condensation
Location for use	Indoor, altitude up to 2000 m (6566 feet)
Maximum permitted circuit voltage	600 V
Dielectric strength	5.55 kV AC for 1 minute (sensor - case, sensor - circuit)
Power supply	± 5 V ±0.25 V (supply from the outside)
Maximum rated power	50 mVA
Measurable conductor diameter	ϕ35 mm (1.38") or less
Dimensions	Approx. 53W x 129H x 18D mm Approx. 2.09"W x 5.08"H x 0.71"D (excluding protruding parts)
Mass	Approx. 230 g (8.1 oz.) (including batteries)
Cable length	Approx. 2 m (6.5 feet)
Accessory	Instruction manual 1
Applicable standards	SafetyEN61010 Measurement categories III (Anticipated Transient Overvoltage: 6000 V), Pollution Degree 2 EMC EN61326

9691 Frequency characteristics



9691 Derating according to frequency



9692 CLAMP ON AC/DC SENSOR

Rated current	AC/DC 200 A
Output voltage	AC/DC 2 V/200 A
Output resistance	100 Ω or less
Maximum permissible input	200 Arms continuous (Derating according to frequency)
Maximum peak current value	300 A
Accuracy guarantee for temperature and humidity	23°C±5°C(73°F±9°F), 80%RH or less, no condensation
Guaranteed accuracy period	1 year (Opening and closing of the sensor: 10,000 times)

(1) Continuous input

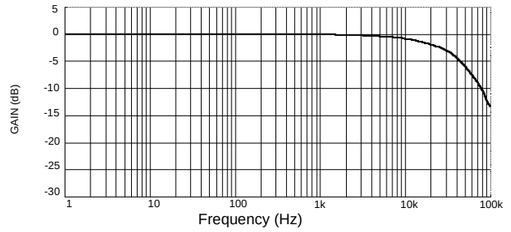
Range	DC	to 66Hz	66 to 1kHz
0 to 200A	±1.0%rdg.±0.5mV	±1.0%rdg.±0.5mV	±2.0%rdg.±0.5mV

(2) Peak input

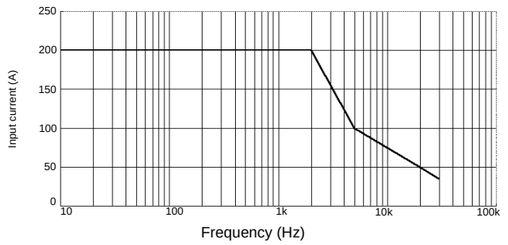
Range	DC	to 66Hz	66 to 1kHz
0 to 300A	±1.0%rdg.±2mV	±1.0%rdg.±2mV	±2.0%rdg.±2mV

Frequency band	DC to 20 kHz (-3dB)
Effect of conductor position	Within ±0.5%
Effect of external electromagnetic field	0.7 A equivalent or less (in an external electromagnetic field of 400 A/m)
Temperature characteristics	0 to 40°C range: 0.1 x accuracy specifications/°C 32 to 104°F range: 0.18 x accuracy specifications/°F
Operating temperature and humidity range	0 to 40°C, 32 to 104°F, 80% RH or less; no condensation
Storage temperature range	-10 to 50°C, 14 to 122°F, 80% RH or less; no condensation
Location for use	Indoor, altitude up to 2000 m (6566 feet)
Maximum permitted circuit voltage	600 V
Dielectric strength	5.55 kV AC for 1 minute (sensor - case, sensor - circuit)
Power supply	± 5 V ±0.25 V (supply from the outside)
Maximum rated power	50 mVA
Measurable conductor diameter	ϕ33 mm (1.30") or less
Dimensions	Approx. 62W x 167H x 35D mm Approx. 2.44"W x 6.57"H x 1.38"D (excluding protruding parts)
Mass	Approx. 410 g (14.5 oz.) (including batteries)
Cable length	Approx. 2 m (6.5 feet)
Accessory	Instruction manual 1
Applicable standards	SafetyEN61010 Measurement categories III (Anticipated Transient Overvoltage: 6000 V), Pollution Degree 2 EMC EN61326

9692 Frequency characteristics



9692 Derating according to frequency



9693 CLAMP ON AC/DC SENSOR

Rated current	AC/DC 2000 A
Output voltage	AC/DC 2 V/2000 A
Output resistance	100 Ω or less
Maximum permissible input	2000 Arms (Derating according to frequency)
Maximum peak current value	2840 A
Accuracy guarantee for temperature and humidity	23°C±5°C(73°F±9°F), 80%RH or less, no condensation
Guaranteed accuracy period	1 year (Opening and closing of the sensor: 10,000 times)

(1) Continuous input

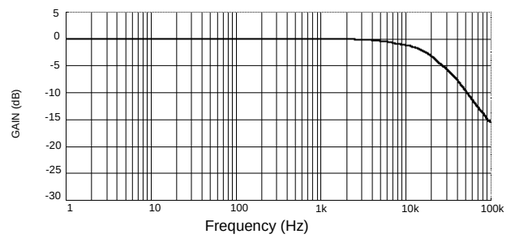
Range	DC	45 to 66Hz	to 45Hz, 66 to 1kHz
0 to 1800A	±1.5%rdg.±0.5mV	±1.0%rdg.±0.5mV	±2.0%rdg.±0.5mV
1800 to 2000A		±2.0%rdg.±0.5mV	-

(2) Peak input

Range	DC	45 to 66Hz	to 45Hz, 66 to 1kHz
0 to 2300A	±1.5%rdg.±2mV	±1.0%rdg.±2mV	±2.0%rdg.±2mV
2300 to 2840A	±6.0%rdg.±2mV	±6.0%rdg.±2mV	-

Frequency band	DC to 15 kHz (-3dB)
Effect of conductor position	Within ±0.7%
Effect of external electromagnetic field	2.0 A equivalent or less (in an external electromagnetic field of 400 A/m)
Temperature characteristics	0 to 40°C range: 0.1 x accuracy specifications/°C 32 to 104°F range: 0.18 x accuracy specifications/°F
Operating temperature and humidity range	0 to 40°C, 32 to 104°F, 80% RH or less; no condensation
Storage temperature range	-10 to 50°C, 14 to 122°F, 80% RH or less; no condensation
Location for use	Indoor, altitude up to 2000 m (6566 feet)
Maximum permitted circuit voltage	600 V
Dielectric strength	5.55 kV AC for 1 minute (sensor - case, sensor - circuit)
Power supply	± 5 V ±0.25 V (supply from the outside)
Maximum rated power	50 mVA
Measurable conductor diameter	ϕ55 mm (2.17") or less
Dimensions	Approx. 62W x 196H x 35D mm Approx. 2.44"W x 7.72"H x 1.38"D (excluding protruding parts)
Mass	Approx. 500 g (17.6 oz.) (including batteries)
Cable length	Approx. 2 m (6.5 feet)
Accessory	Instruction manual 1
Applicable standards	SafetyEN61010 Measurement categories III (Anticipated Transient Overvoltage: 6000 V), Pollution Degree 2 EMC EN61326

9693 Frequency characteristics



9693 Derating according to frequency