HIOKI

9658

CLAMP ON LEAK SENSOR

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 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 9658 CLAMP ON LEAK SENSOR. To obtain maximum performance from the product, please read this manual first, and keep it handy for future reference.

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.

Safety

⚠ DANGER

This product 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 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.

Safety symbols

⚠	• 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. • In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the product.
~	Indicates AC (Alternating Current).
⊗	Wear appropriate protective insulation (insulating rubber gloves and boots, helmet and etc.) when connecting and disconnecting from live electric circuits.

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	Indicates advisory items related to performance or correct operation of the product.

We define measurement tolerances in terms of f.s. (full scale) and rdg. (reading) values, with the following meanings:

f.s. (maximum display value or scale length)
The maximum displayable value or scale length. This is usually the name of the currently selected range.

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

Measurement categories

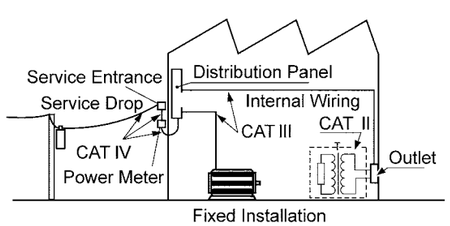
This product complies with CAT III safety requirements.
To ensure safe operation of measurement products, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT II to CAT IV, and called measurement categories. These are defined as follows.

CAT II: Primary electrical circuits in equipment connected to a wall outlet via 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 between the distribution panel and outlets.

CAT IV: The circuit from the service drop to the service entrance, then to the power meter and to the primary overcurrent protection device.

Using a measurement iproduct 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.
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.



Notes on Use

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

⚠ DANGER

- **When conductors being measured carry in excess of the safe voltage level (SELV-E) and not more than 150 V, to prevent short circuits and electric shock while the clamp core jaw is open, make sure that conductors to be measured are insulated with material conforming to (1) Overvoltage Category III, (2) Pollution Degree 2, and (3) Basic Insulation Requirements for Working Voltages of 150 V.**
  Refer to the following standards regarding the meanings of underlined terms.
  IEC 61010-1
  IEC 61010-2-031
  IEC 61010-2-032
- **To avoid short circuits and potentially life-threatening hazards, never attach the clamp to a circuit that operates at more than the maximum rated voltage (voltage to ground) / 150V, or over bare conductors.**
- **Clamp on leak sensor 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

- **Do not allow the product to get wet, and do not take measurements with wet hands. This may cause an electric shock.**
- **To avoid electric shock when measuring live lines, wear appropriate protective gear, such as insulated rubber gloves, boots and a safety helmet.**
- **Note that the product may be damaged if voltage exceeding the selected measurement range is applied for a long time.**
- **Before using the product, make sure that the insulation on the cable 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.**
- **To avoid electric shock when measuring the ground conductor on an E (PE) transformer connection site, be careful not to approach high voltage devices or conductors. Also, if close to high voltage charging devices or if measurement is otherwise difficult, first change the route of the grounding wire.**

⚠ CAUTION

- Avoid stepping on or pinching the cable, which could damage the cable insulation.
- Keep the cables well away from heat sources, as bare conductors could be exposed if the insulation melts.
- Never plug in or unplug the sensor connector when the measuring conductor is the core. The power meter or the sensor may fail.
- 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.
- To avoid damage to the product, protect it from vibration or shock during transport and handling, and be especially careful to avoid dropping. The product could be damaged or its performance degraded.
- This is a precision product: to avoid damage, do not clamp any foreign objects in the end of the clamp core, or insert anything in the core gap.
- This product is not designed to be entirely water- or dust-proof. To avoid damage, do not use it in a wet or dusty environment.
- This product is designed for indoor use, and operates reliably from 0℃ to 50℃.
- Adjustments and repairs should be made only by technically qualified personnel.

NOTE

- 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.
- Common Electric Circuits and Coordination of Insulation
  The maximum rated voltage to earth for the Model 9658 is voltage relative to ground. Correlation with the nominal voltage of common electric circuits is defined by IEC 60664 according to the maximum anticipated transient overvoltage (impulse voltage) for the electric circuit being measured.

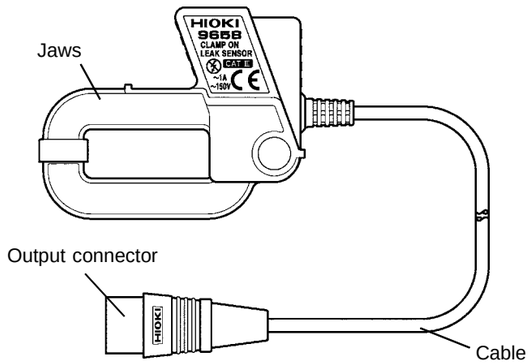
Three-phase Four-wire	Three-phase Three-wire	Voltage to Ground	CATIII Recommended Impulse Withstand Voltage
120/208 120/240	240	150	2500

(Extracted from EN 61010-2-032)

Coordination of insulation: determination of the safe and appropriate characteristics of electrical insulation of wiring and connected devices according to the operating voltage.

Voltage to ground: the voltage between a power line and earth ground in a grounding-dependent electric circuit, or the voltage between one power line and any other power line in a grounding-independent circuit.

Part Names



Measurement Procedure

Pre-Operation Inspection

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.

⚠ WARNING

Before using the product, make sure that the insulation on the cable 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.

Measurement Procedure

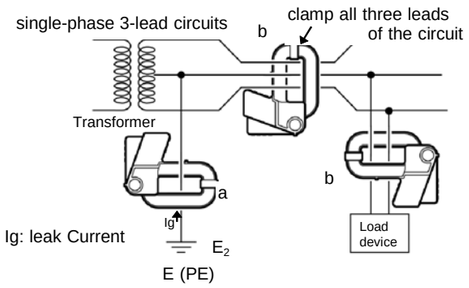
⚠ CAUTION

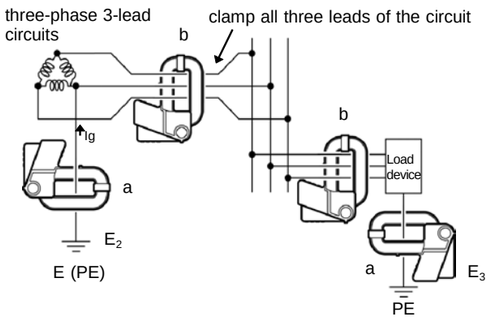
When unplugging the cable from the product, grasp the output connector, not the cable, in order to avoid damaging the cable.

1. Connect the output connector to the clamp terminal of the product.
2. Open the jaws, then clamp the conductor.
3. Make sure that the tips of jaws are fully closed.

Connections method

Clamp the tester on the conductor, so that the conductor passes through the center of the clamp core. For measurement of grounded leads, clamp the tester on one lead only (see a). For overall measurements, clamp the tester on the entire circuit path (see b).





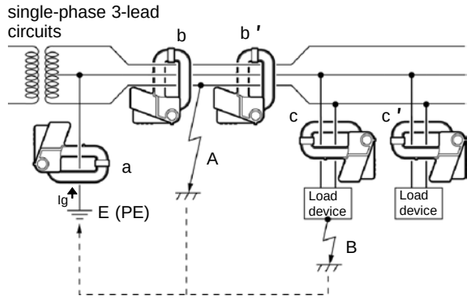
NOTE

- For measurement of single-phase 2-lead circuits, clamp both leads of the circuit.
- For measurement of three-phase 4-lead circuits, clamp all four leads of the circuit. If this is not possible, the measurement can also be carried out on the ground lead of the equipment.
- If a strong current (on the order of 100 A) is flowing in an adjacent circuit, accurate measurement may not be possible. Perform the measurement at a sufficient distance from other current-carrying conductors.
- The frequency of special waveforms such as at the secondary side of an inverter may not be indicated correctly.
- Do not input a current which exceeds the maximum permissible input.

Checking for insulation faults

Normally, for an E (PE) grounding installation of a transformer, the measurement will first be made to check for overall circuit leak current in the ground lead (a). Current changes can be used to diagnose the leak current condition.
When leak current has been detected, the measurement should proceed from the power source towards the load, using overall measurement.

1. If an insulation fault in the wiring has occurred at position A in the illustration, leak current will be detected at position b using overall measurement, but not at position b'.
2. If an insulation fault in the load equipment has occurred at position B in the illustration, leak current will be detected at position c using overall measurement, but not at position c'.
3. For detection of intermittent leak current conditions (such as only when a certain piece of equipment is operating), the use of a level recorder will be helpful.



Specifications

Accuracy is guaranteed at 23±5℃ (73±9℉) and 80% RH max for one year, or opening and closing of the clamp sensor 10,000 times, whichever comes first.

Rated current	1.0 AAC (f.s.)
Output voltage	25 mVAC/A
Amplitude accuracy	±3.5% rdg.±12μV (45 to 66 Hz) (Regarding the accuracy: refer to the specification of the each product that you use with this clamp on sensor)
Maximum input current	30 A continuous at 45 to 66 Hz
Effect of conductor position	within ±0.4% (in any direction from sensor center)
Effect of external magnetic fields	400 AAC/m corresponds to 5 mA, max. 7.5 mA
Remaining electric current character	1 mA max. (in 10 A go and return electric wire)
Dielectric strength	2224 VrmsAC for 15 seconds (between electric circuit and case)
Maximum rated voltage to earth	Within 150 Vrms (Insulation conductor)
Operating temperature and humidity	0 to 50℃ (32 to 122℉), within 80%RH (no condensation)
Storage temperature and humidity	-10 to 60℃ (14 to 140℉), within 80%RH (no condensation)
Location for use	Altitude up to 2000 m (6562 feet), Indoors
Standards applying EMC Safety	 EN 61326 EN 61010 Measrement Category III, Pollution Degree 2 (anticipated transient overvoltage 2500 V)
Diameter of measurable conductor	Within 10 mm x 28 mm (0.39" x 1.10")
Cable length	Approx. 3 m (118.11")
External dimensions	Approx. 65W x 52H x 18D mm (2.56"W x 2.05"H x 0.71"D) (excluding protrusions)
Mass	Approx. 100 g (3.5 oz.)
Accessories	Instruction manual

Maintenance and Service

Cleaning the product

Gently wipe dirt from the surface of the product with a soft cloth moistened with a small amount of water or mild detergent.
Do not try to clean the product using cleaners containing organic solvents such as benzine, alcohol, acetone, ether, ketones, thinners, or gasoline. They may cause discoloration or damage.

Service

If the product is not functioning properly, check the probe. If a problem is found, contact your dealer or HIOKI representative.
Pack the product 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.