

# HIOKI

9657

## CLAMP ON LEAK SENSOR

INSTRUCTION MANUAL



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9657A981-05 06-09H

### Introduction

Thank you for purchasing the HIOKI "9657 CLAMP ON LEAK SENSOR." To obtain maximum performance from the device, please read this manual first, and keep it handy for future reference.

### Overview

The 9657 is a voltage output type clamp on sensor compatible to 1A AC measurements. The instrument can be relied upon to measure subtle current with great accuracy due to the high magnetic permeability material used for the jaws and magnetic shield.

### Inspection

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

### Safety

#### ⚠ DANGER

This device 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 device. 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 device defects.

#### Safety symbols

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

⚠	<ul style="list-style-type: none"> <li>• The ⚠ symbol printed on the device indicates that the user should refer to a corresponding topic in the manual (marked with the ⚠ symbol) before using the relevant function.</li> <li>• In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the device.</li> </ul>
~	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 device.
NOTE	Indicates advisory items related to performance or correct operation of the device.

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 the full length of the scale. This is usually the maximum value of the currently selected range.

#### rdg. (reading or displayed value)

The value currently being measured and indicated on the measuring instrument.

### 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 that are connected to a wall outlet through a transformer or similar device.

CAT II: Primary electrical circuits in equipment connected to a wall outlet via a power cord (portable tools, household appliances, etc.)

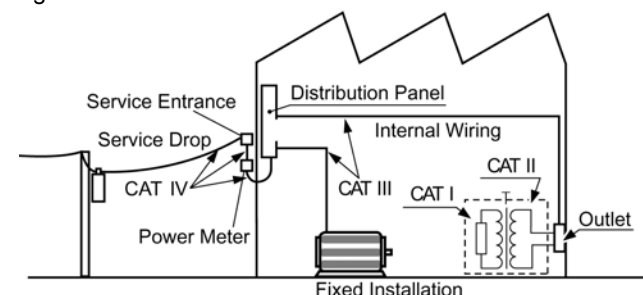
CAT III: Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders between the distribution panel and outlets.

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

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.



### 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 300 V, to prevent short circuits and electric shock while the clamp jaws is open, make sure that conductors to be measured are insulated with material conforming to (1) Measurement Category III, (2) Pollution Degree 2, and (3) Basic Insulation Requirements for Working Voltages of 300 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 device to a circuit that operates at more than the 300Vrms, or over bare conductors.
- The device 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 device 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.
- To avoid electric shock when measuring the ground conductor on a transformer E (PE) 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.

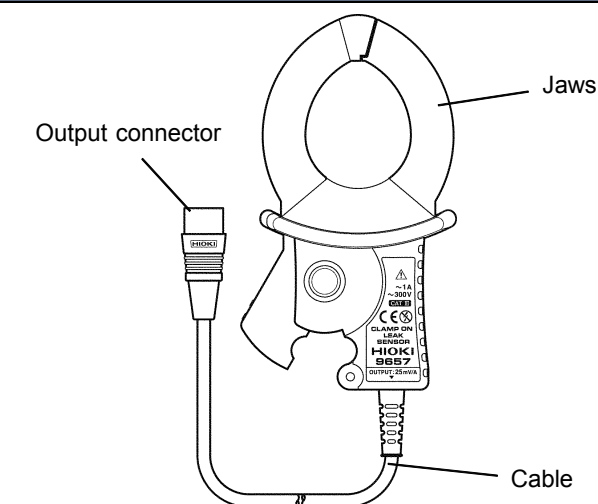
#### ⚠ CAUTION

- Note that the device may be damaged if current exceeding the selected measurement range is applied for a long time.
- 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.
- Do not store or use the device where it could be exposed to direct sunlight, high temperature or humidity, or condensation. Under such conditions, the device may be damaged and insulation may deteriorate so that it no longer meets specifications.
- To avoid damage to the device, protect it from physical shock when transporting and handling. Be especially careful to avoid physical shock from dropping.
- Keep the clamp jaws and core slits free from foreign objects, which could interfere with clamping action.
- This device is not designed to be entirely water- or dust-proof. Do not use it in an especially dusty environment, nor where it might be splashed with liquid. This may cause damage.
- This device is designed for use indoors. It can be operated at temperatures between 0°C and 50°C without degrading safety.
- 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.

### Part Names



## Measurement Procedure

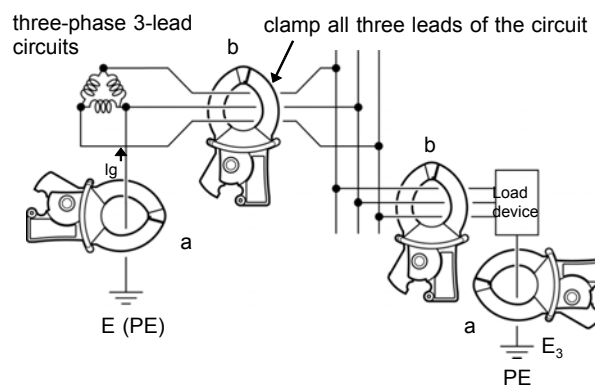
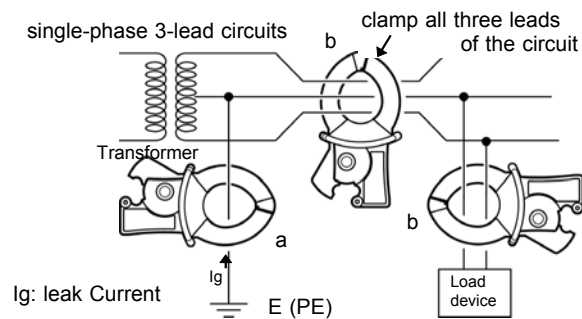
### CAUTION

- To avoid damaging the output cable, grasp the connector, not the cable, when unplugging the cable.
- To prevent damage to the instrument and sensor, never connect or disconnect a sensor while the power is on, or while the sensor is clamped around a conductor.

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

### Connections method

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



### NOTE

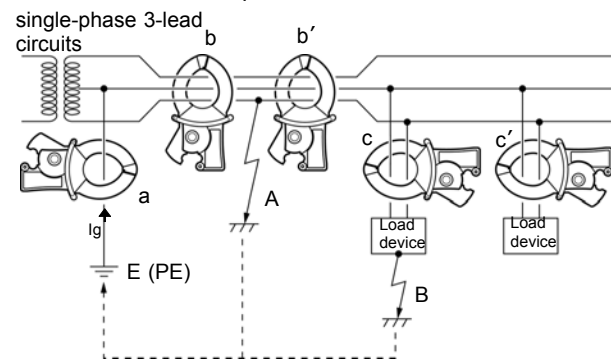
- For measurement of single-phase 2-lead circuits, clamp both leads of the circuit.
- For measurement of three-phase 4-lead circuits, clamp all four leads of the circuit. If this is not possible, the measurement can also be carried out on the ground lead of the equipment.
- If a strong current (on the 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 rated current.

### Checking for insulation faults

Normally, for a 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 for one year at  $23 \pm 5^\circ\text{C}$  ( $73 \pm 9^\circ\text{F}$ ) and Max. 80% RH. (Opening and Closing of the Sensor: Maximum 10000 times)

Rated current	1.0 AAC (f.s.)
Output voltage	25 mVAC/A
Amplitude accuracy	$\pm 1.0\%$ rdg. $\pm 12\mu\text{V}$ (45 to 66 Hz, at the clamp jaws center) (Regarding the accuracy: refer to the specification of the each instrument that you use with this device)
Maximum input current	60 A continuous at 45 to 66 Hz
Effect of conductor position	within $\pm 0.1\%$ (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	Max. 5 mA (in 100 A go and return electric wire)
Dielectric strength	3536 Vrms for 15 seconds (between clamp window and case)
Maximum rated voltage to earth	Max. 300 Vrms
Operating temperature and humidity range	0 to $50^\circ\text{C}$ ( $32$ to $122^\circ\text{F}$ ), Max. 80%RH (no condensation)
Storage temperature and humidity range	$-10$ to $60^\circ\text{C}$ ( $14$ to $140^\circ\text{F}$ ), Max. 80%RH (no condensation)
Location for use	Altitude up to 2000 m (6562 feet), Indoors
Standards applying	EMC EN 61326:1997+A1:1998+A2:2001+A3:2003 Safety EN 61010-2-032:2002 Type B current sensor Measurement Category III, Pollution Degree 2 (anticipated transient overvoltage 4000 V)
Diameter of measurable conductor	Within $\phi 40$ mm (1.57")
cable length	Approx. 3 m (118.11")
External dimensions	Approx. 74W x 145H x 42D mm (2.91"W x 5.71"H x 1.65"D) (excluding protrusions)
Mass	Approx. 340 g (12.0 oz.)
Accessories	Instruction manual

## Maintenance and Service

### Cleaning the device

To clean the device, 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.

### Service

- If the device seems to be malfunctioning, contact your dealer or Hioki representative.
- When sending the device for repair, pack the device carefully so that it will not be damaged during shipment, and include a detailed written description of the problem. Hioki cannot be responsible for damage that occurs during shipment.

## 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 LEAK SENSOR  
 Model Number: 9657, 9657-10

The above mentioned products conform to the following product specifications:

Safety: EN61010-2-032:2002  
 EMC: EN61326:1997+A1:1998+A2:2001+A3:2003  
 ClassB equipment  
 Portable test and measurement equipment

Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

HIOKI E.E. CORPORATION

15 September 2006

T. Yoshikawa  
 Tatsuyoshi Yoshiike  
 President

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## HIOKI

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