

# HIOKI

## 9675

### CLAMP ON LEAK SENSOR

#### INSTRUCTION MANUAL

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9675A981-04 06-09H

#### Introduction

Thank you for purchasing the HIOKI "Model 9675 CLAMP ON LEAK SENSOR." To obtain maximum performance from the product, please read this manual first, and keep it handy for future reference.

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## Overview

The Model 9675 CLAMP ON LEAK SENSOR provides voltage output corresponding to sensed currents up to 10A AC. The high-permeability magnetic material of the sensor's core and magnetic shield enables high-precision measurement of very weak currents.

## Inspection and Maintenance

#### 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.

#### 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. Pack the product so that it will not sustain damage during shipping, and include a description of existing damage. We cannot accept responsibility for damage incurred during shipping.
- Use the original packing materials when transporting the product, if possible.

## Safety

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

#### **⚠ 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 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 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.

	<b>DANGER</b> Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
	<b>WARNING</b> Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
	<b>CAUTION</b> Indicates that incorrect operation presents a possibility of injury to the user or damage to the device.
	<b>NOTE</b> Indicates that incorrect operation presents a possibility of injury to the user or damage to the device.

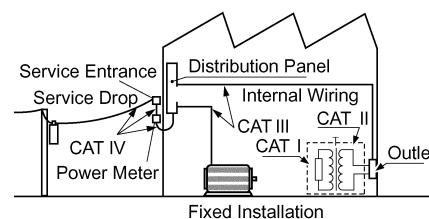
#### Measurement categories (Overvoltage categories)

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 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.



## Usage Notes

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

#### **⚠ DANGER**

Connect the Clamp on leak sensor to the product first, and then to the active lines to be measured. Observe the following to avoid electric shock and short circuits.



- 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 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 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 product to a circuit that operates at more than 300 V rms.
- 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.
- When the clamp sensor is opened, do not allow the metal part of the clamp to touch any exposed metal, or to short between two lines.
- To avoid electric shock, do not touch the portion beyond the protective barrier during use.

#### **⚠ 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 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.
- Do not use the product where it may be exposed to corrosive or combustible gases. The product may be damaged or cause an explosion.

#### **⚠ 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.

#### **⚠ CAUTION**

- To avoid damage to the product, protect it from vibration or shock during transport and handling, and be especially careful to avoid dropping.
- Be careful to avoid dropping the product 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.
- Keep the clamp closed when not in use, to avoid accumulating dust or dirt on the mating core surfaces, which could interfere with clamp performance.
- Measurements are degraded by dirt on the mating surfaces of the clamp-on sensor, so keep the surfaces clean by gently wiping with a soft cloth.
- 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°C to 50°C.
- This product should be installed and operated indoors only, between 0°C and 50°C and 80% RH or less
- 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.
- To avoid damaging the sensor cable, do not bend or pull the cable.
- Note that the product may be damaged if current exceeding the selected measurement range is applied for a long time.

#### **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.

## Specifications

Accuracy guaranteed for one year at 23 ± 5°C (73 ± 9°F), 80%RH or less (Opening and Closing of the Sensor: Maximum 10000 times).

Rated primary current	10 A AC
Output voltage	100 mV AC/A
Amplitude accuracy	± 1.0% rdg. ± 0.005% f.s. (f.s.: 10 A at the clamp core center, 45 to 66 Hz)
Phase accuracy	within ± 5° (at 50 Hz or 60 Hz)
Amplitude frequency characteristics	Within ± 5% at 40 Hz to 5 kHz (deviation from accuracy)
Maximum input current	10 A continuous at 45 Hz to 66 Hz (Ambient temperature: 50°C)
Effect of conductor position	within ± 0.1% (deviation from center)
Effect of external magnetic fields	Max. 7.5 mA (400 A AC/m corresponds)
Remaining electric current character	1 mA or less (10 A AC, 50/60 Hz on forward and return lines with 10 mm or less line spacing)
Dielectric strength	2210 Vrms for 1 minute (between electric circuit and core, core and case)
Maximum rated voltage to earth	300 Vrms or less
Operating temperature and humidity range	0 to 50°C (32 to 122°F) 80%RH or less (no condensation)
Storage temperature and humidity range	-10 to 60°C (14 to 140°F) 80%RH or less (no condensation)
Location for use	Altitude up to 2000 m (6562 feet), Indoors

Standards applying	(Safety) EN61010-2-032:2002 Type B current sensor Measurement Category III, Pollution Degree 2 (anticipated transient over-voltage 2210 V)
	(EMC) EN61326:1997+A1:1998+A2:2001+A3:2003
Diameter of measurable conductor	30 mm (1.18") or less
Cable length	Isolated BNC, Approx. 3 m (118.11")
External dimensions	Approx. 60W x 112.5H x 23.6D mm (2.36"W x 4.43"H x 0.93"D, excluding protrusions)
Mass	Approx. 160 g (5.6 oz.)
Accessories	Instruction manual (1)

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

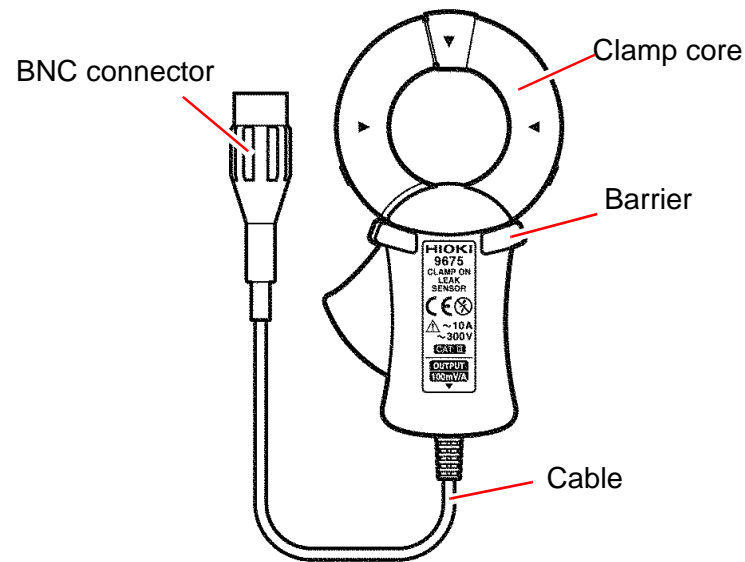
**f.s. (maximum display value or scale length)**

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 product.

## Parts Names



**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: 9675

The above mentioned product conforms to the following product specifications:  
 Safety: EN61010-2-032:2002  
 EMC: EN61326:1997+A1:1998+A2:2001+A3:2003  
 Class B equipment  
 Equipment intended for use in industrial location

Supplementary Information:  
 The product herewith complies 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  
  
 Tatsuyoshi Yoshiike  
 President  
 9675A999-02

## Measurement Procedure

### Preliminary Checks

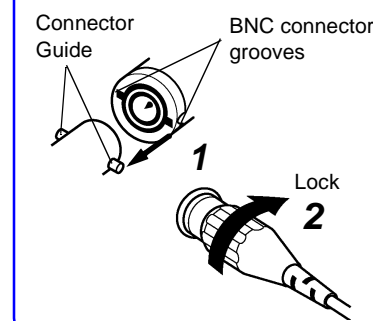
- Before using the product the first time, verify that it operates normally to ensure that no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.
- Before using the product, make sure that the insulation on the cables is undamaged and that 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.

### Connecting the BNC Connector

**CAUTION**

- When disconnecting the BNC connector, be sure to release the lock before pulling off the connector. Forcibly pulling the connector without releasing the lock, or pulling on the cable, can damage the connector.
- To prevent damage to the product and sensor, never connect or disconnect a sensor while the power is on, or while the sensor is clamped around a conductor.

#### Connect the BNC connector.

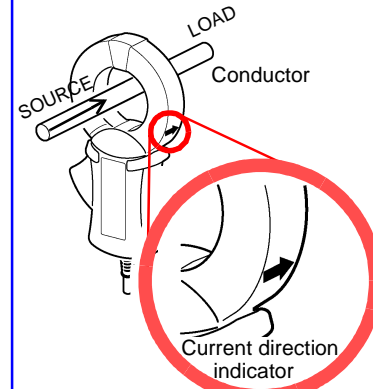


1. Engage the BNC connector grooves with the connector guide projections, and turn the connector clockwise to lock the components.
2. Clockwise to lock the components.

To remove the BNC connector, turn the connector counterclockwise and pull it out.

### Load Current Measurement

#### Clamp the conductor.

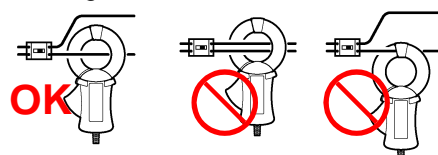


Position the clamp with the current direction indicator pointing toward the load side. (If installed in the opposite direction, the phase deviates 180 degrees.)

1. Open the clamp core. Orient the current direction indicator to the load side and clamp one conductor at the center of the clamp core.
2. Confirm that the clamp core is fully closed.

**NOTE**

Attach the clamp around only one conductor. Single-phase (2-wire) or three-phase (3-wire) cables clamped together will not produce any reading.

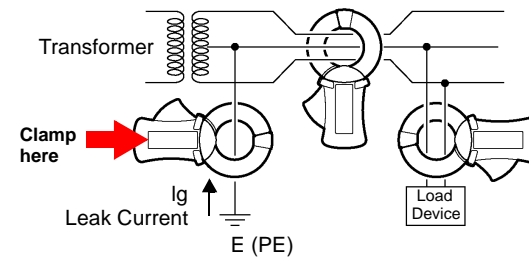


## Leak Current Measurement

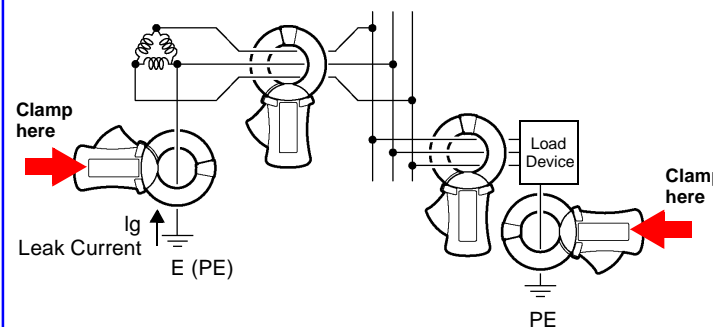
### Ground Conductor Measurement

Attach the clamp around only one conductor.

#### Single-phase 3-lead circuits



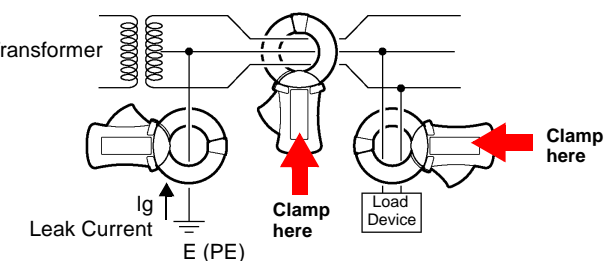
#### Three-phase 3-lead circuits



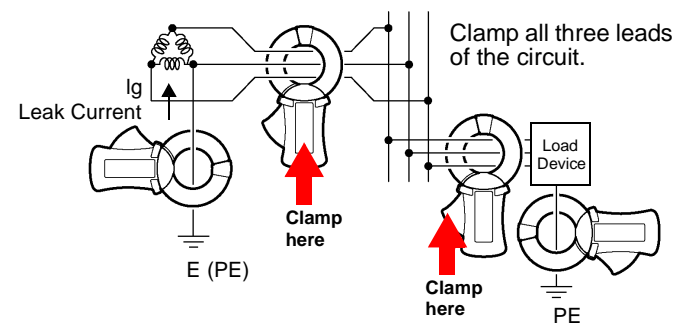
### Bundle Measurement

Circuit conductors are bundled and clamped in the middle. See "Load Current Measurement".

#### Single-phase 3-lead circuits



#### Three-phase 3-lead circuits



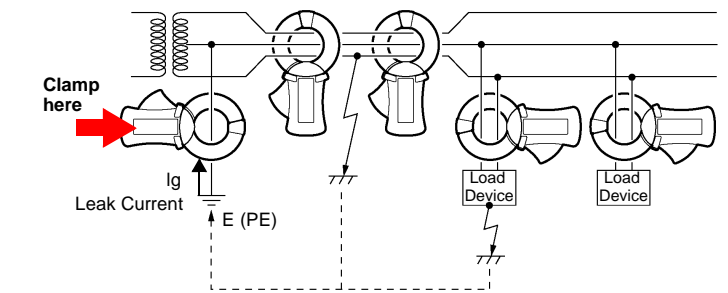
**NOTE**

- 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.

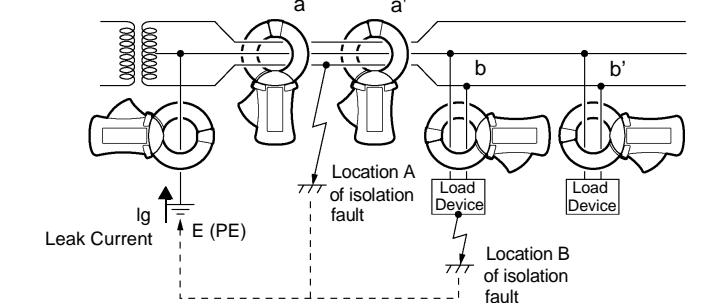
## Checking for insulation faults

1. Measure overall circuit leakage current and determine leakage conditions based upon measurement discrepancies. Normally measured on the ground line of an E (PE) transformer.

#### Single-phase 3-lead circuits



2. If current leakage is detected, further bundled measurements (clamping around bundled conductors) is employed to search from the source to the load side.



- If an insulation fault in the wiring has occurred at position "A" in the illustration, leak current will be detected at position "a" using overall measurement, but not at position "a".
- If an insulation fault in the load equipment has occurred at position "B" in the illustration, leak current will be detected at position "b" using overall measurement, but not at position "b".

**NOTE**

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.