HIOKI

# 9754

Instruction Manual

# CLAMP ON NOISE SENSOR

EN

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# Contents

# Introduction

Thank you for purchasing the HIOKI "Model 9754 CLAMP ON NOISE SENSOR." To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

This device is a sensor for use with a 3145-20 NOISE HiLOGGER. Please carefully read the instruction manual included with the NOISE HiLOGGER and follow all safety precautions.

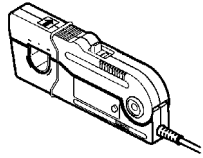
The 9754 CLAMP ON NOISE SENSOR can also be connected to other waveform measuring equipment and used to monitor waveforms and current. Be sure to read and follow all safety precautions included in the instruction manual of whichever measuring instrument you use.

# Verifying Package Contents

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.

## Package Contents

Model 9754 CLAMP ON NOISE SENSOR ..... 1



Instruction Manual .....1

# Safety Information

**⚠WARNING** 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. 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

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.

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 that only insulated conductors suited to the voltage of the circuit under test can be measured.

Indicates AC (Alternating Current).

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 instrument. |
| NOTE | Indicates advisory items related to performance or correct operation of the instrument. |

## Symbols for various standards

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

| | |
|---|---|
| CE | This symbol indicates that the product conforms to regulations set out by the EC Directive. |
|  | Indicates the Waste Electrical and Electronic Equipment Directive (WEEE Directive) in EU member states. |

## Other Symbols

| | |
|---|---|
|  | Indicates a prohibited action. |
| (⇒ p. ) | Indicates the location of reference information. |
| * | Indicates that descriptive information is provided below. |

# Operating Precautions

## Preliminary Checks

Before using the instrument 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.

## Operating Environment

Operating temperature and humidity: 0 to 40°C (32 to 104°F), 80%RH or less (no condensation)
Accuracy guarantee for temperature and humidity: 23 ± 5°C (73 ± 9°F), 80%RH or less (no condensation)

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
Near electromagnetic radiators

Exposed to high levels of particulate dust

Subject to vibration

## Handling the Instrument

⚠CAUTION

- To avoid damage to the instrument, protect it from physical shock when transporting and handling. Be especially careful to avoid physical shock from dropping.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.
- 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.
- To avoid breaking the cables, do not bend or pull them.

# Overview Chapter 1

## 1.1 Product Overview

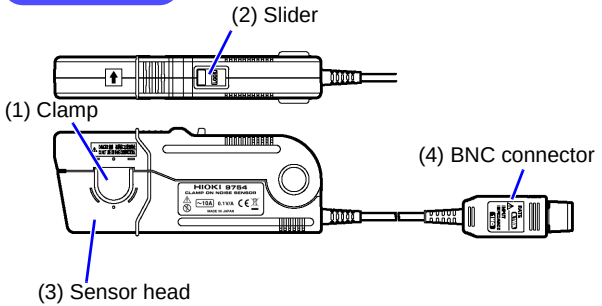
This device is a current sensor for use with the 3145-20 NOISE HiLOGGER. By simply clamping onto the conductor to be measured one can easily monitor noise current levels.
It can also be connected to the measuring instruments of other waveform measuring equipment to monitor waveforms and current levels.

### Features

- Easy noise current measurement with a clamp
- Broad frequency bandwidth 1 kHz to 100 MHz (-3 dB)

# 1.2 Names and Functions of Parts

## Front Panel




| | |
|---|---|
| (1) Clamp | Clamps around the conductor to be measured. |
| (2) Slider | Used to open and close the clamp. Always use this slider when opening and closing the clamp. When closing, push the slider all the way until it clicks shut. This will lock the clamp and keep it from opening. |
| (3) Sensor head | This clamps the conductor being measured and carries out the actual current measurement. It is a precision assembled component, including a molded section and ferrite core. It may be damaged if subjected to sudden changes in ambient temperature, or mechanical strain or shock, and therefore great care should be exercised in handling it. |
| (4) BNC Connector | Outputs the current waveform of the conductor being measured at a constant rate (0.1V/A). Connect to the input terminal of the 3145-20 NOISE HiLOGGER. |

# Measurement Chapter 2

This device cannot be used with exposed conductors, so please use it with insulated conductors. Insulation must meet the requirements of the measurement category, working voltage, and pollution degree of the circuit being tested.

**⚠ DANGER**

- To avoid electrical shock, be careful not to damage the insulation of the conductor being measured.
- Do not measure around a bare conductor. Doing so may result in short-circuit or electric shock. Take measurements at a location on an insulated wire where there is sufficient insulation for the circuit voltage.

**⚠ WARNING**

To avoid electric shock when measuring live lines, wear appropriate protective gear, such as insulated rubber gloves, boots and a safety helmet.

**⚠ CAUTION**

To avoid damaging the unit, do not apply current that exceeds the maximum continuous input range. (⇒ p.17)

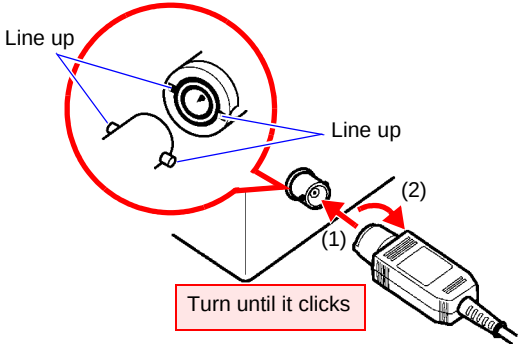
* Maximum continuous input range:
  This range is based on heat that is internally generated during sine wave input at a prescribed frequency at room temperature. It varies according to the frequency of the measured current. (Use the 9754 CLAMP ON NOISE SENSOR at the highest effective value within the maximum continuous input range.) In addition to the maximum continuous input range, there is also the "maximum peak current value 15 Apeak" product specification. This indicates an upper waveform response limit of 15 Apeak.

NOTE

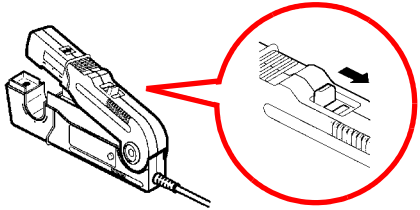
- Acoustic resonance may occur depending on the level and frequency of the measured current, but this will not affect measurement unless a foreign substance such as dust is present on the contact surfaces of the sensor head.
- If there are high frequency elements included in the measured current, it will generate high heat. When taking measurements be cautious of the sensor heating up.
- The output of this device is terminated internally. When connecting with a waveform measuring instrument, use an instrument with an input resistance of 1 MΩ or higher. Accurate measurement cannot be made at 50 Ω input resistance.
- When monitoring high frequency waveform current elements superimposed on direct current or commercial frequency current, it is necessary to pay attention to the following. Attenuation characteristics in the low frequency area are affected by direct current or commercial frequency current levels. As the current level increases, magnetic saturation of the sensor magnetic core causes a decrease in amplitude and can generate waveform distortion. For example, with a sine wave input of 15 Apeak, 15 kHz, product specifications will not be met if the superimposed DC current exceeds approximately 8 A. Input current levels must be in accordance with " Derating according to frequency" (⇒ p.19).
- When clamping together on the round-trip conductors of a commercial circuit, position the two conductors as close together as possible. The output value is influenced by the position of the conductors in the clamp opening. Even if the round-trip current levels are equal, the clamp sensor output value may not equal zero. If two approximately ϕ10 mm conductors are measured in the round-trip state, and the current flowing in the conductors is 100 A (55 Hz), the clamp output value may be approximately 50 mA.

## 2.1 Measurement Procedure

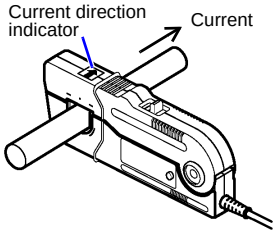
1. Turn on the power of the instrument being connected to the 9754 CLAMP ON NOISE SENSOR.
2. Connect the BNC connector of the 9754 CLAMP ON NOISE SENSOR to the input terminal of the instrument being connected to.




3. Measurement settings are made on the instrument being connected to.
   Check the settings of the instrument being connected to.
4. Pull the slider on the sensor to open the clamp.

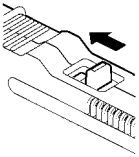


**5.** Clamp the conductor to be measured and close the clamp.




Make sure that the current direction indicator arrow matches the direction of current flow on the conductor being measured. Make sure also that the conductor is clamped in the center of the clamp opening.

**6.** Press on the slider until it clicks to lock shut.

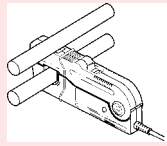


Press the sensor slider until the "UNLOCK" message disappears and "LOCK" is displayed, and confirm that the slider is firmly locked and the clamp securely closed.

**7.** Monitor noise current.

The output rate of this device is 0.1 V/A. When using a general purpose waveform monitoring instrument, derive the current sensitivity from the voltage sensitivity. For example, if the waveform measurement instrument's voltage sensitivity is 100 mV/division, the current sensitivity is 1 A/division.

⚠CAUTION



Do not place any unclamped conductor with an electric current of a frequency of 10 kHz or more near the sensor head. Current flowing in the conductor nearby may heat up the sensor head and cause its temperature to rise, leading to damage to the sensor. For example, when one side of a go-and-return conductor is clamped and the other side is also placed near the sensor head as shown in the diagram, even if the electric current is lower than the consecutive maximum current, electric currents in both sides will heat up the wires and raise the temperature, thereby causing damage to the sensor.

## 2.2 Disconnecting the NOISE SENSOR

⚠CAUTION

- To avoid damaging the device, always open the clamp by using the slider.
- 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.

1. Pull the sensor slider to open the clamp.
2. Remove the 9754 CLAMP ON NOISE SENSOR from the conductor being measured.
3. Turn off the power on the instrument being connected to.

# 2.3 When Connecting to Instruments other than the 3145-20

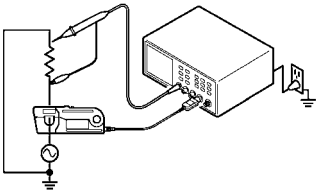
The 9754 CLAMP ON NOISE SENSOR can be connected to waveform measuring equipment other than the 3145-20 NOISE HiLOGGER and used to monitor current waveforms. Please carefully read the instruction manual included with whichever instrument you connect to and follow all safety precautions.

**⚠ DANGER** To avoid electrical shock, follow the precautions below to ensure no dangerous voltage from the power of the instrument being connected to or its other measuring terminals (those not connected to this device) is impressed upon the 9754 CLAMP ON NOISE SENSOR. If dangerous voltage is impressed upon this device, dangerous voltage will be generated in its BNC connector and inner circuitry, presenting an extreme hazard.

- Only connect to instruments which are constructed with double insulation and use a protective earth.
- Confirm that basic insulation which meets the measurement category, working voltage and pollution degree of the circuit being tested, is used to isolate the other measurement terminals of the instrument being connected to.
  If you are not sure basic insulation is used between the terminals of the measurement device, do not input voltage which exceeds the Separated Extra-Low Voltage Earthed (SELV-E) level into the other terminals of the instrument.
- Observe all safety precautions of the instrument you are using.
  Refer to the following standards regarding the meanings of underlined terms.
  IEC 61010-1
  IEC 61010-031
  IEC 61010-2-032

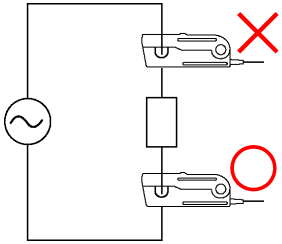
## <Examples>

- If connecting the 9754 CLAMP ON NOISE SENSOR to a measuring instrument that does not provide isolation between its input terminals and chassis or other input terminals, connect the ground terminal to a ground potential. If it is connected to a non-ground potential, voltage will be applied to the ground-side terminal and chassis, and to the 9754 CLAMP ON NOISE SENSOR, and can cause electrical shock, short circuits, or damage.



NOTE

- If using BNC-banana plug or other adapters to connect to input terminals other than BNC connectors, make sure the polarity is correct.
- At high frequencies, common mode noise may affect measurements taken on the high voltage side of circuits. As necessary, either limit the frequency range of the waveform measuring instrument, or clamp onto the low-voltage side of the circuit.



# Specifications Chapter 3

## Accuracy

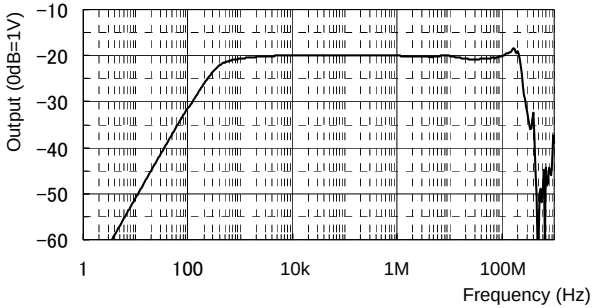
We define measurement tolerances in terms of rdg. (reading) values, with the following meanings:

rdg. (reading or displayed value)

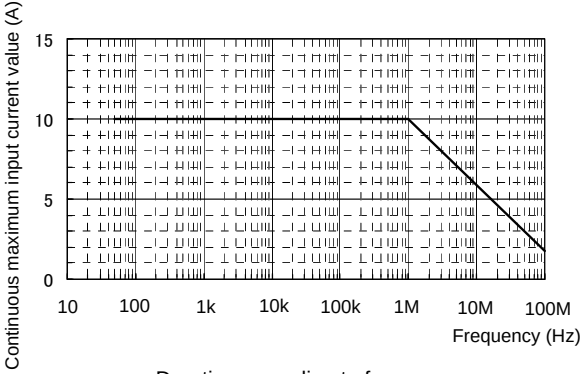
The value currently being measured and indicated on the measuring instrument.

| | |
|---|---|
| Accuracy guarantee for temperature and humidity | 23 ± 5 °C (73 ± 9°F), 80%RH or less |
| Bandwidth | 1 k to 100 MHz (-3 dB)<br>(In the center of the clamp opening)<br>" Frequency characteristics (typical characteristics)" (⇒ p.19) |
| Maximum rated current | AC10 A<br>" Derating according to frequency" (⇒ p.19)<br>(Under typical conditions. Varies according to sine wave input) |
| Maximum peak current value | 15 Apeak |
| Output voltage rate | 0.1 V/A |
| Amplitude accuracy | ± 3.0%rdg. ± 0.001% f.s.<br>(With an f.s. of 10 A)<br>(Where f = 15 kHz, in the center of the clamp opening, 1 mA or greater, input is maximum peak current value or less) |
| Guaranteed accuracy period | One year<br>(opening/closing up to 10000 times) |
| Temperature coefficient for sensitivity | Within ± 2% (Deviation from normal at 0 to 40°C or 32 to 104°F, f = 15 kHz, 10 A sine wave input) |

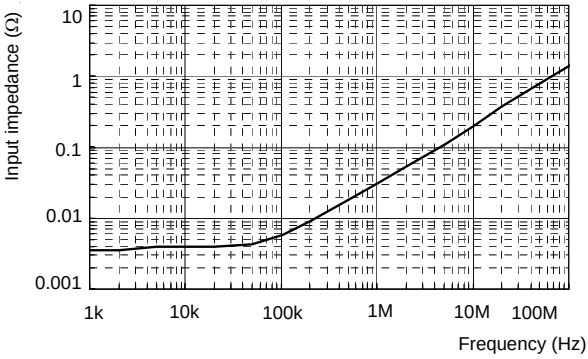
| | |
|---|---|
| Influence of conductor position | ± 0.4% or less<br>(Based on f=15 kHz 10 A sine wave input, in the center of the clamp opening) |
| Residual current characteristic | 40 mA or less<br>(At f=15 kHz, 10 A, lead wire with 18 mm or less round-trip distance between lines) |
| Input impedance | " Input impedance (typical characteristics)" (⇒ p.20) |
| Operating temperature and humidity | 0 to 40°C (32 to 104°F),<br>80%RH or less (no condensation) |
| Storage temperature and humidity | -10 to 50°C (14 to 122°F),<br>80%RH or less (no condensation) |
| Operating environment | Indoor, altitude up to 2000 m (6562 feet) |
| Diameter of measurable conductors | 20 mm (0.79") or less |
| Measurable conductor | Insulated conductor |
| Cable length | Sensor cable approx. 2 m (6.56 feet) |
| Dimensions | • Sensor<br>Approx. 176W×69H×27D mm<br>(6.93"W×2.72"H×1.06"D)<br>• Termination<br>Approx. 27×55H×19D mm<br>(0.27"W×0.11"H×0.04"D) |
| Mass | Approx. 450 g (15.9 oz.) |
| Applicable standards<br>Safety<br>EMC | <br>EN61010<br>EN61326 |
| Accessory | Instruction Manual |




Frequency characteristics (typical characteristics)




Derating according to frequency




Input impedance (typical characteristics)

# Maintenance and Service Chapter 4

⚠CAUTION Never modify the instrument. Only Hioki service engineers should disassemble or repair the instrument. Failure to observe these precautions may result in fire, electric shock, or injury.

## 4.1 Cleaning

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.

NOTE 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.

# 4.2 Troubleshooting

If the instrument seems to be malfunctioning, confirm that the cables are not open circuited before contacting your dealer or Hioki representative.

NOTE Pack the instrument 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.

# Warranty Certificate

| Model | Serial No. | Warranty period<br>One (1) year from date of purchase (___ / ___) |
|---|---|---|

This product passed a rigorous inspection process at Hioki before being shipped.

In the unlikely event that you experience an issue during use, please contact the distributor from which you purchased the product, which will be repaired free of charge subject to the provisions of this Warranty Certificate. This warranty is valid for a period of one (1) year from the date of purchase. If the date of purchase is unknown, the warranty is considered valid for a period of one (1) year from the product's date of manufacture. Please present this Warranty Certificate when contacting the distributor.
Accuracy is guaranteed for the duration of the separately indicated guaranteed accuracy period.

1. Malfunctions occurring during the warranty period under conditions of normal use in conformity with the Instruction Manual, product labeling (including stamped markings), and other precautionary information will be repaired free of charge, up to the original purchase price. Hioki reserves the right to decline to offer repair, calibration, and other services for reasons that include, but are not limited to, passage of time since the product's manufacture, discontinuation of production of parts, or unforeseen circumstances.
2. Malfunctions that are determined by Hioki to have occurred under one or more of the following conditions are considered to be outside the scope of warranty coverage, even if the event in question occurs during the warranty period:
   a. Damage to objects under measurement or other secondary or tertiary damage caused by use of the product or its measurement results
   b. Malfunctions caused by improper handling or use of the product in a manner that does not conform with the provisions of the Instruction Manual
   c. Malfunctions or damage caused by repair, adjustment, or modification of the product by a company, organization, or individual not approved by Hioki
   d. Consumption of product parts, including as described in the Instruction Manual
   e. Malfunctions or damage caused by transport, dropping, or other handling of the product after purchase
   f. Changes in the product's appearance (scratches on its enclosure, etc.)
   g. Malfunctions or damage caused by fire, wind or flood damage, earthquakes, lightning, power supply anomalies (including voltage, frequency, etc.), war or civil disturbances, radioactive contamination, or other acts of God
   h. Damage caused by connecting the product to a network
   i. Failure to present this Warranty Certificate
   j. Failure to notify Hioki in advance if used in special embedded applications (space equipment, aviation equipment, nuclear power equipment, life-critical medical equipment or vehicle control equipment, etc.)
   k. Other malfunctions for which Hioki is not deemed to be responsible

*Requests
- Hioki is not able to reissue this Warranty Certificate, so please store it carefully.
- Please fill in the model, serial number, and date of purchase on this form.

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- Please visit our website at www.hioki.com for the following:
  - Regional contact information
  - The latest revisions of instruction manuals and manuals in other languages.
  - Declarations of Conformity for instruments that comply with CE mark requirements.
- All reasonable care has been taken in the production of this manual, but if you find any points which are unclear or in error, please contact your supplier or the International Sales and Marketing Department at Hioki headquarters.
- In the interests of product development, the contents of this manual are subject to revision without prior notice.
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