9277, 9278

UNIVERSAL

CLAMP ON CT

INSTRUCTION MANUAL

Contents

Introduction

Thank you for purchasing the HIOKI "9277,9278 UNIVERSAL CLAMP ON CT". 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. In particular, check the accessories. 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.

Safety Notes

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.

Safety symbols

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.

- 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 both DC (Direct Current) and 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	Advisory items related to performance or correct operation of the product.

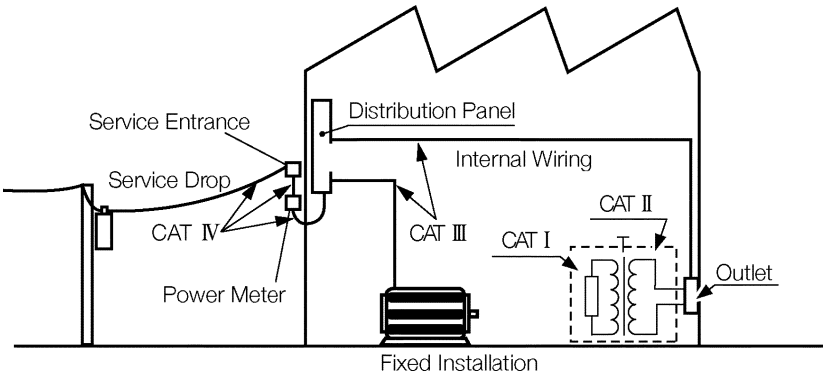
Measurement categories (Overvoltage categories)

This product complies with CATII (600V), CATIII (300V) 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.



Accuracy

We define measurement tolerances in terms of f.s. (full scale), rdg. (reading) and dgt. (digit) 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.

Notes on Use

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

DANGER

- **To avoid short circuits and potentially life-threatening hazards, never attach the UNIVERSAL CLAMP ON CT to a circuit that operates at more than the 600 VAC(CATII) or 300 VAC(CATIII), or over bare conductors.**
- **UNIVERSAL CLAMP ON CT 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.**

⚠ CAUTION

- Note that the product may be damaged if current exceeding the selected measurement range is applied for a long time.
- 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 instrument 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.
- Measurements are degraded by dirt on the mating surfaces of the clamp-on CT, so keep the surfaces clean by gently wiping with a soft cloth.

⚠ 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.
- To avoid damaging the cables,do not bend or pull the cables.
- This product is designed for indoor use, and operates reliably from 0℃ to 40℃.
- When measuring the high-frequency large current, over-heating of the core may occur. Note that the input never exceed the maximum permissible input range. See the figures in Chapter 3,"Specifications".

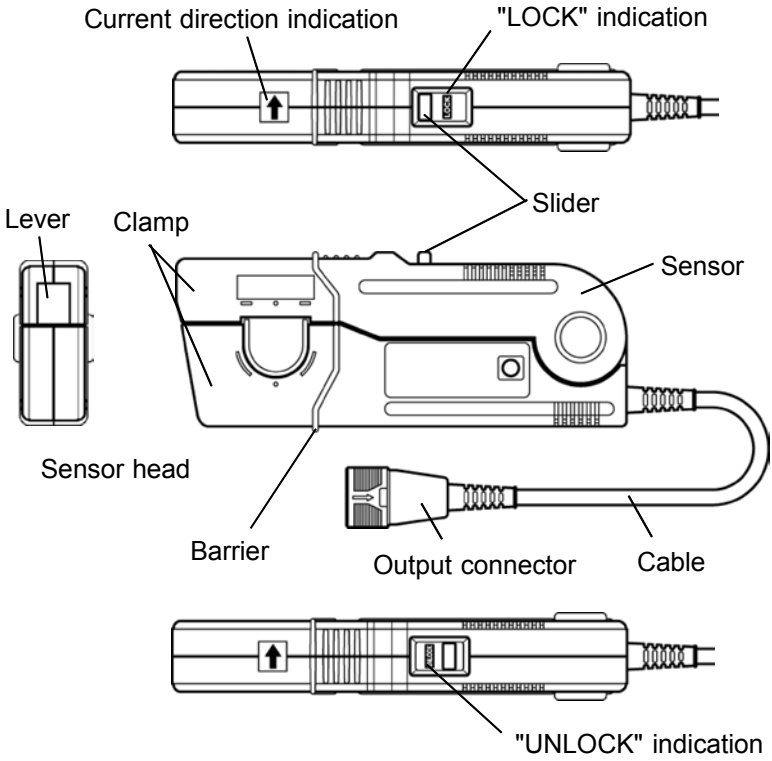
NOTE Accurate measurement may be impossible in the presence of strong magnetic fields, such as near transformers and high-current conductors, or in the presence of strong electromagnetic fields such as near radio transmitters.

Chapter 1
Overview

1.1 Product Overview

The 9277, 9278 was developed for to provide a 20 A (9277), 200 A (9278) clamp sensor corresponding to AC/DC current.
The 9277, 9278 makes it possible to measure AC/DC current in live power lines without cutting into the lines. The sensor features good frequency response (amplitude and phase), good temperature response (sensitivity and offset), and dielectric strength and is easy to connect and use. Its versatility will find application in a wide variety of fields dealing with current and power measurement.

1.2 Names of Parts



Chapter 2
Measurement Procedure

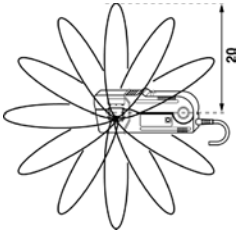
2.1 Measurement Procedure

⚠ CAUTION

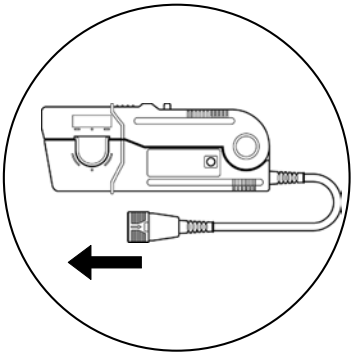
- To avoid damaging the output cable, grasp the connector, not the cable, when unplugging the cable.
- To prevent damage to the product and sensor, never connect or disconnect a sensor while the power is on.
- The maximum continuous input range is based on heat that is internally generated during measurement. Never input current in excess of this level. Exceeding the rated level may result in damage to the cable.
- The maximum continuous input range varies according to the frequency of the current being measured. See the figures in Chapter 3, "Specifications"

NOTE

- To measure small current levels, multiple windings may be used to increase the relative sensitivity. 10 windings multiplies the measured current by about a factor of 10. However, in this case the diameter of the winding should be 20 cm or more, and radial.



- This product has a resistance in series with the signal output circuits. Therefore, if measuring an output signal directly, ensure that the input resistance of the measuring instrument is sufficiently high.

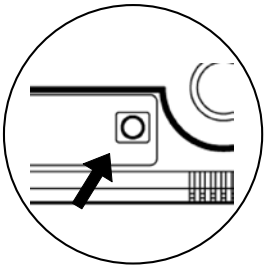


1. Close the clamp jaws when the clamp jaws are opened.

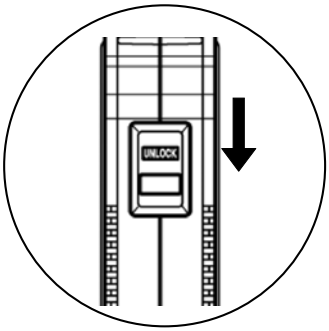
2. Make sure that the unit's power switch is OFF.

3. Connect the clamp-on CT connector to the unit.

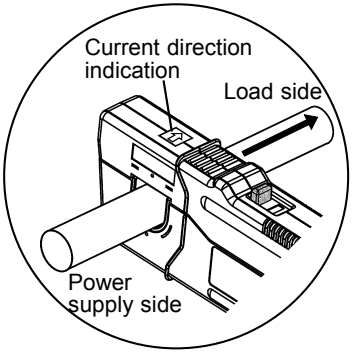
4. Turning the power on the unit.



5. Press the DMAG switch to magnetize.
(See 2.2 Demagnetizing (DMAG))

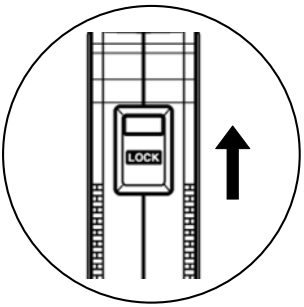


6. Pull the sensor slider, so that the clamp opens.



7. Align the sensor so that the current direction indication corresponds to the direction of current flow through the conductor to be measured, and clamp so that the conductor is in the center of the sensor aperture.

NOTE Make sure that only one conductor is in the core. Single-phase (2-wire) and three-phase (3-wire) lines clamped together will not produce reading.



8. Press the slider on the sensor head and hold it until LOCK appears, and check that the lever is firmly locked.

2.2 Demagnetizing (DMAG)

After measuring rush current or similar of AC or DC current measurement, micro voltage is output even if there is no input on the clamp. This is caused by the core characteristic using the clamp and magnetic is remained in the core. This remanent cause measuring error, but it can be removed by pressing DMAG with no input onto the clamp.

NOTE

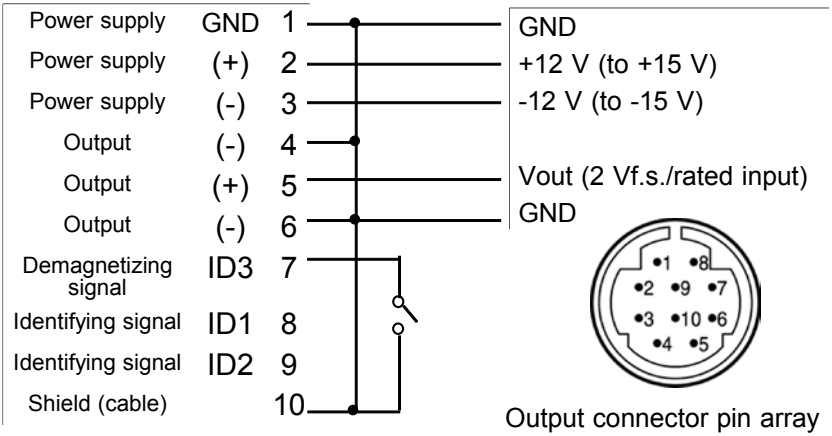
- After powering on, press DMAG.
- It is possible to magnetize even if pressing DMAG during input.
- Always make sure that the clamp jaws are completely closed during demagnetising.
- Demagnetization occurs for about 3 seconds.
- If an excessive amount of current was input so that one attempt at demagnetization does not completely rid of the remanence, open the clamp jaws and press DMAG, then close the clamps, and press DMAG again.
- In case of closing the clamp and if the facing surface of the core is subjected to shock, offset maybe output. In this case, press the DMAG switch with no input on the clamp.
- When measuring DC current and applying exceed continuous the maximum permissible input, the malfunction may occur. Press the DMAG switch with no input on the clamp, to return to normal.
- If it does not return to normal condition, or even pressing DMAG, the magnetic is remained in the core, contact your dealer or Hioki representative.

Chapter 3 Specification

Model	9277	9278
Rated current (AC/DC)	20 A f.s.	200 A f.s.
Output voltage (AC/DC)	2 V/20 A	2 V/200 A
The maximum permissible input range (DC to 3 kHz)	50 Arms (75 Apeak)	350 Arms (500 Apeak)
Input resistance (DC)	Max. 0.05 mΩ	Max. 0.002 mΩ
Output resistance	50 Ω	
Basic accuracy 23±3ºC (73±5˚F)	DC and 45 Hz to 66 Hz, 30 min or more warming-up after degaussing Amplitude: ±0.5% rdg. ±0.05% f.s. Phase: within ±0.2˚ (DC has no provision)	
Period of guaranteed accuracy	1 year	
Amplitude-frequency characteristic (deviation from accuracy)	DC to 1 kHz within ±1.0% 1 k to 50 kHz within ±2.5% 50 k to 100 kHz within ±5.0%	
Phase-frequency characteristic	DC to 1 kHz within ±0.5˚ 1 k to 50 kHz within ±2.5˚ 50 k to 100 kHz within ±5.0˚	
Temperature coefficient	Sensitivity: within ±0.05% rdg. /ºC Offset: within ±0.005% f.s. /ºC	
Operating temperature and humidity range	0 to 40ºC (32 to 104˚F), Max. 80%RH (no condensation)	
Storage temperature and humidity range	-10 to 50ºC (14 to 122˚F), Max. 80%RH (no condensation)	
Effect of conductor position	Within ±0.5% (DC, 55 Hz)	Within ±1.5% (DC, 55 Hz)

Model	9277	9278
Effect of external magnetic field (400 A/m, 55 Hz and DC)	Max. 0.2 A	Max. 1 A
Dielectric strength	3536 VrmsAC for 15 seconds. (between case and clamp sensor (aperture)) (between electric circuit and case, between electric circuit and core, between electric circuit and clamp sensor (aperture)	
Maximum rated voltage to earth	600 V (CATII), 300 V (CATIII)	
Operating environment	Indoor, <Height 2000 m (6562 feet) ASL	
Diameter of measurable conductors	20 mm (0.79") or less	
Supply voltage	±12 V to ±15 V (with accuracy guaranty but tracking)	
Power supply capacity	±150 mA (with rated input)	±250 mA (with rated input)
Supply consumption	Max. 3.6 W (with rated input)	Max. 7.2 W (with rated input)
Dimensions and mass	Approx. 176W×69H×27D mm (6.93"W×2.72"H×1.06"D)(excluding projections) Approx. 470 g (16.6 oz.)	
Cord length	Approx. 3 m (9.84 feet)	
Accessories	9375 CARRYING CASE 1 Instruction manual 1 Markband 6 (3 set)	
Standards Safety: EMC:	EN61010-2-032:2002 Type B current sensor Measurement category II, III, Pollution Degree 2 (4000 V expected transient Overvoltage) EN61326:1997+A1:1998+A2:2001 +A3:2003	

Output connector pin array



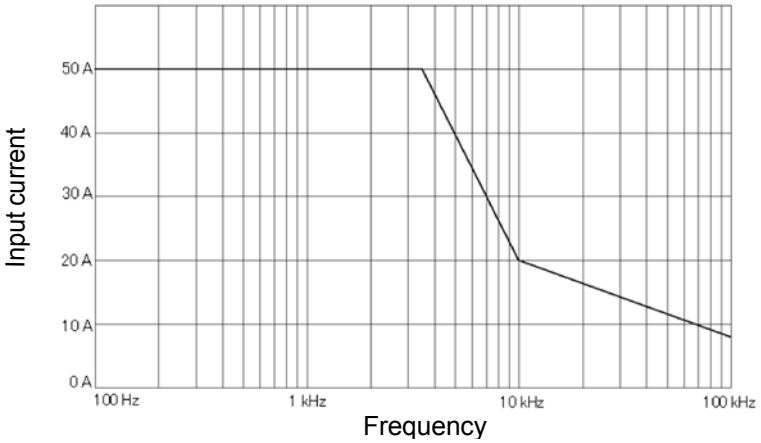
Output connector pin array

	9277	9278
ID1	Connect to GND	Connect to GND
ID2	N.C	Connect to GND

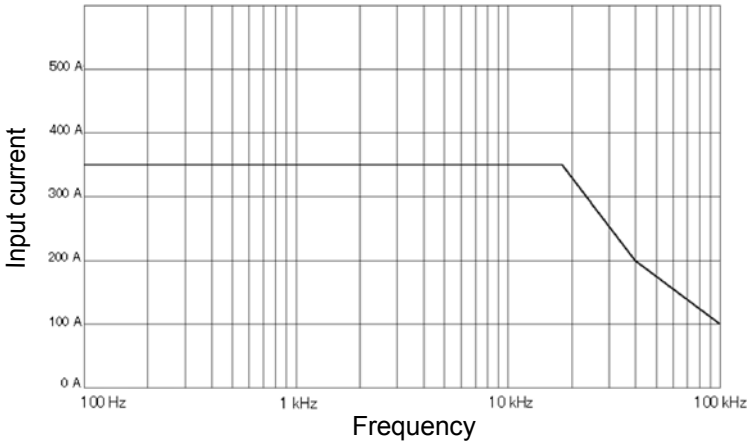
Mating receptacle
RM515ERB-10SD (HIROSE)

⚠ CAUTION

- Be careful to avoid connecting voltage improperly, as the internal circuitry may be destroyed.
- The capacity of the power supply is at least ±0.5 A.
- Demagnetization occurs after pin 7 is shorted to ground and then opened.



9277 The maximum permissible input range (continuous)



9278 The maximum permissible input range (continuous)

Chapter 4 Maintenance and Service

4.1 Maintenance

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.

4.2 Service

- If the instrument seems to be malfunctioning, contact your dealer or Hioki representative.
- Pack the product 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: UNIVERSAL CLAMP ON CT

Model Number: 9277, 9278

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
Minimum immunity test requirement

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. Yoshiike

Tatsuyoshi Yoshiike

President

9277A999-04

HIOKI 9277, 9278 UNIVERSAL CLAMP ON CT

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