

Power Safety Tester Series

3158 AC WITHSTANDING VOLTAGE HiTESTER

3157-01 AC GROUNDING HiTESTER

3155-01 LEAK CURRENT HiTESTER

3451•3452 MΩ HiTESTER

3453 DIGITAL MΩ HiTESTER

3283 CLAMP ON LEAK HiTESTER



Voltage Endurance, Protective Grounding, Current Leakage, Insulation Testers Preventing current leakage, fire and electric shock

Faults in electrical equipment can present hazards resulting in accidents such as electric shock, current leakage and fire, necessitating strict safety standards. For this reason, safety testers are required to test products and components in various ways, using testing methods and standard values determined by various safety standards. HIOKI presents this line-up of power safety testers compatible with a multitude of safety standards to guarantee the safety of a wide range of electronic products.



ISO14001
JQA-E-90091



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To ensure the safety of electric and electronic equipment

3158 AC WITHSTANDING VOLTAGE HiTESTER



CE

RS-232C

Combining safety, operability and reliability

The 3158 is a voltage endurance tester with built-in pass/fail comparator and timer functions designed to test for compliance with many safety standards. In addition to emphasis on safe testing with such functions as a power interlock and key lock, the 3158 provides superb voltage comparator functions, test condition storage and operability. External I/O and RS-232C interfaces are provided to facilitate easy automatic testing.

Major Features

●Testing for various safety standards

The 3158 simplifies testing in conformance with various safety standards, providing voltage comparator and timer functions to make pass/fail decisions.

●Up to 20 test conditions can be saved

Storage of up to 20 test conditions allows quick switching between test conditions for different standards. Also, test conditions for production lines or periodic calibration can be saved in memory. Settings are retained if power is interrupted, and automatically restored.

●Voltage comparator

Testing begins only when voltage is within $\pm 5\%$ of the preset value. The voltage comparator prevents inadvertent testing with incorrect voltage settings.

(Even though voltage is generated, testing does not start until voltage falls within $\pm 5\%$ of a preset value.)

●Zero-Toggle Switch

This function ensures that the test voltage can be toggled on and off only at a sine wave zero crossings, to prevent damage to the device under test if it happens to be faulty.

●Automatic Testing Support

External I/O and RS-232C interfaces are provided to simplify automatic testing and control from a personal computer. This feature can also be used for product quality data management.

●Interlock Function

To ensure safety during automatic testing, this feature disables testing by disabling output when a signal is received from an external device, such as a starter circuit.

●Remote Control

Start/Stop control can be provided by the 9613 REMOTE CONTROL BOX (SINGLE) or by the 9614 REMOTE CONTROL BOX (DUAL).

Standards Supported by the 3158

●IEC60065

Safety requirements for mains-operated electronic and related apparatus for household and similar general use

●IEC60204-1

Electrical equipment of industrial machines: Part 1, General requirements

●IEC60335-1

Safety of household and similar electrical appliances: Part 1, General requirements

●IEC60601-1

Medical electrical equipment: Part 1, General requirements for safety

●IEC60950

Safety of data processing equipment, including office equipment

●IEC61010-1

Safety requirements for measurement, control and laboratory electrical equipment

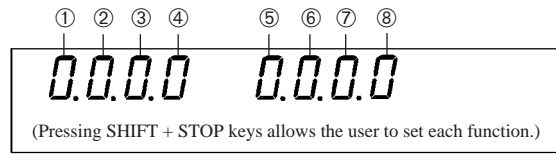
●UL standard

UL1012, UL1410, UL1950, UL3101-1, etc.

Pursuing Safe Operation and Automation

■ A multitude of functions

- ① **Pass Hold Function (0: Disabled/1: Enabled)**
Enable this function to hold the Pass state when detected, to facilitate confirmation.
- ② **Fail Hold Function (0: Disabled/1: Enabled)**
Enable this function to hold the Fail state when detected, to facilitate confirmation.
- ③ **Hold Function (0: Disabled/1: Enabled)**
Enable this function to hold the current state when testing is interrupted by the STOP key.
- ④ **Momentary Output (0: Disabled/1: Enabled)**
This function allows current output only when the START key is pressed. The START key on the remote control or the START signal via external I/O has the same effect.



- ⑤ **Double Action (0: Disabled/1: Enabled)**
Enable this function to allow testing to start only when the START key is pressed within about 0.5 seconds after the STOP key.
- ⑥ **FAIL Mode (0: Disabled/1: Enabled)**
Enable this function to restrict hold release to the STOP key on the main unit.
- ⑦ **RS Command [Start] (0: Disabled/1: Enabled)**
Turn this function on to enable the RS-232C START Command.
- ⑧ **Interlock Function (0: Disabled/1: Enabled)**
Enable this function to activate the external I/O interlock terminals.

Analog Voltage Measurement
The meter indicates whenever voltage is present, even when power is off.

Flourescent Tube Display (VFD)
The fluorecent tube provides a bright, easy-to-read display.

Warning Lamp
This lamp lights to warn that voltage is present between the terminals during testing.

External Switch Socket (for remote control)

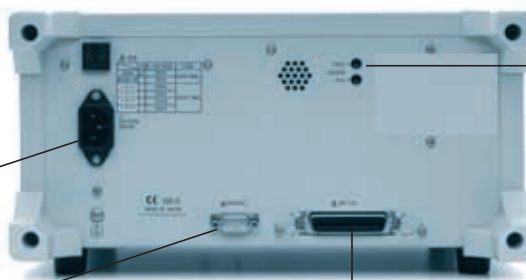


9613
REMOTE CONTROL BOX (SINGLE) (option)

9614
REMOTE CONTROL BOX (DUAL) (option)

The 9613 remote control box is designed for single-handed use, while the 9614 is designed to be held with both hands.

Range Selection Switch (2.5/5 kV AC)



Beeper volume adjustments

Mains Power Connector

- 3158-01 (120V AC)
- 3158-03 (220V AC)
- 3158-04 (230V AC)
- 3158-05 (240V AC)

RS-232C Terminal for remote control

External I/O Connector (photocoupler isolated)

READY	OUT	Low during Ready state
L-FAIL	OUT	Low after Fail occurs at the Lower level value
U-FAIL	OUT	Low after Fail occurs at the Upper level value
PASS	OUT	Low during Pass state
TEST	OUT	Low during Test state
H.V.ON	OUT	Low when voltage is present at the output terminals
START	IN	Same function as the START key. Low = key pressed.
STOP	IN	Same function as the STOP key. Low = key pressed.
INT.LOCK	IN	Open when Interlock engaged.
ISO.COM	IN	Signal ground for external devices
ISO.DCV	OUT	+15 V (0.1 A) auxiliary power output

■ 3158 Specifications

● Basic Specifications

[Test Voltages]

Voltage	: 0 - 2.5 kV / 0 - 5.0 kV AC, dual-range configuration
Voltage testing method	: Zero-toggle switch
Transformer capacity	: 500VA (maximum 30 min)
Voltage adjustment method	: Manually adjusted slidac
Voltage measurement	: Average value rectified effective value display
Digital	: 0.00 - 5.00 kV AC (full-scale)
Accuracy	: $\pm 1.5\%$ f.s.
Analog	: 0-5kV (full-scale)
Accuracy	: $\pm 5\%$ f.s.
Waveform	: Mains waveform
Frequency	: Mains synchronous

[Current Detection Section]

Current measurement range	: 0.01 - 120 mA
Designated value	: Average value rectified effective value display(digital)
Measurement resolution	: 0.01 mA (2- and 8-mA ranges) 0.1 mA (32-mA range) 1 mA (120-mA range)
Measurement accuracy	: $\pm 3\%$ f.s. +20 μ A . . for all ranges (power waveform distortion is less than 5%)

[Decision Function]

Decision method	: Window comparator method (digital setting)
Decision contents	: UPPER-FAIL; when measured current exceeds the max. setting PASS; when measured current remains between the max./min. settings for the set time LOWER-FAIL; when the measured current is below the min. setting
Decision process	: Output to the display, beeper sound, signals to EXT I/O for each decision result
Setting range	: 0.1 - 120 mA (both max. and min. values)
Setting resolution	: 0.1 mA (0.1 - 9.9 mA) 1 mA (10 - 120 mA)

[Timer Section]

Setting ON	: Counts down time from start to preset time
Setting OFF	: Shows elapsed time from start
Setting range	: 0.5 - 999 s
Setting resolution	: 0.1 s (0.5 - 99.9 s) \pm 50ms
Accuracy	: 1 s (100 - 999 s) \pm 5s

[Interfaces]

EXT I/O (Rear panel)	: Output signals Open collector output Max. load: 30 V DC Max. output current: 100 mA DC per signal Output saturation voltage: 1.5 V DC or less
	: Input signals Active low input Max testing voltage: 30 V DC HIGH level voltage : 15 V DC or more, or open LOW level voltage : 5 V DC or less (-6 mA typ.)
EXT SW (front socket)	: Input signal (contact input) START/STOP/SW.EN (front socket SW enable)
	: Output signal LED light signal (40 mA max. load current)
RS-232C	: Duplex asynchronous with start/stop flow control Transfer speed 9600 bps, 8 data bits, No parity, 1 stop bit, X-on/X-off flow control (no hardware flow control) Receiving delimiter : CR, CR+LF Transmitted delimiter : CR+LF
START signal priority	: RS-232C>EXT.SW>EXT I/O>panel START key (only with RS-232C START command enabled)

● General Specifications

Display	: Fluorescent tube display (digital display)	Dimensions	: Approx. 320(W) \times 155(H) \times 263(D) mm Approx. 12.60" (W) \times 6.10" (H) \times 10.73" (D) (not including protrusions)
Monitor function	: Output voltage/detection current	Mass	: Approx. 16 kg. (564.4oz)(3158-01) Approx. 18 kg. (634.9oz)(3158-03 to -05)
Monitor cycle	: 2 Hz or faster	Fuse	: 250 V T8AL (3158-01) 250 V T4AL (3158-03 to -05)
Ambient operating conditions	: 0 to 40°C (32 to 104°F), 20 to 80% RH (no condensation)	Compatible standards	: EMC EN55011: 1991+A1:1997+A2:1996 Group 1 CLASS A EN50082-1:1992
Ambient storage conditions	: -10 to 50°C (14 to 122°F), less than 90% RH (no condensation)		: Safety EN61010-1:1993+A1:1995
Ambient conditions for assured accuracy	: 23 \pm 5°C (73°F \pm 9°F), 20 to 80% RH (no condensation) after 5-minute minimum warm-up	Standard accessories	: Contamination 2 Overvoltage category II (expected overvoltage category 2500 V) : 9615 H.V. test lead (high voltage side and return, 1 each), power cord, spare fuse
Suitable environment	: Indoors, altitude up to 2000 m		
Power supply	: 120 V AC \pm 10% (3158-01) 220 V AC \pm 10% (3158-03) 230 V AC \pm 10% (3158-04) 240 V AC \pm 10% (3158-05)		
Power line frequency	: 50 - 60 Hz		
Withstand voltage	: 1.35 kV AC 10 mA for 1 min. between power supply and chassis		
Maximum rated power	: 800 VA		

Accurate testing of grounding between equipment enclosures and ground terminals

3157-01 AC GROUNDING HiTESTER



The 3157-01 AC GROUNDING HiTESTER is designed to ensure sufficiently low resistance between the metal enclosure and the ground terminal of electrical equipment. It can also be used to ensure sufficiently low resistance between ground connections in large-scale electrical installations.

- Protective grounding checks of medical and general electrical equipment
- Ground connection tracing of machine tools and wiring panels
- Safeguard and equal-potential connection checks of medical installations
- Evaluation of connections in high-current cables and connectors

Major Features

■ Compliant with a multitude of standards

The 3157-01 allows measurement as prescribed by most major safety standards. Using the 4-terminal method to measure the voltage drop for a high current, the unit offers evaluation features and a timer function to allow efficient standard compliance testing.

■ Constant-current testing (max. 31.0 A) with feedback control

The output current is controlled by a feedback loop to achieve stability, regardless of fluctuations in the load impedance.

■ Test data count function

For installations with many test points, the unit can automatically count the number of tests, to ensure that no points are missed.

■ Setting value store function

Up to 20 settings can be stored, allowing quick switching between the various setups for different standards and legal requirements.

■ SOFT START function

The unit checks whether the probe is connected to the measurement object, and raises the output current to the preset value when a connection is detected. This serves to prevent sparks caused by connecting a live probe to a measurement object, thereby guarding against equipment damage and ensuring operator safety.

■ Fluorescent tube display (VFD)

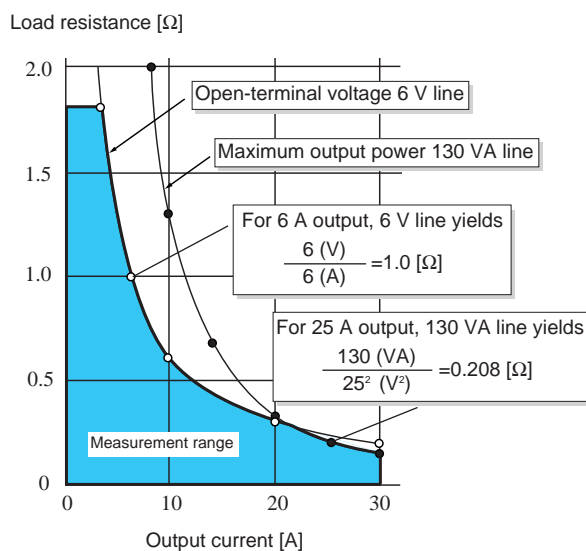
The display uses an easy to read fluorescent tube. Compared to conventional meters, the digital indication allows effortless reading of the data.

■ Light weight and compact dimensions

Whereas conventional testing equipment required a trolley for transport, the 3157-01 can be easily carried with one hand. Its small dimensions, light weight, and ease of maintenance make it ideal for use in the field.

320 (W) × 90 (H) × 263 (D) mm
12.6" (W) × 3.56" (H) × 10.40" (D)
7 kg(247.2 oz)

■ Measurement Range



Standards Supported by the 3157

- IEC60065
Safety requirements for mains-operated electronic and related apparatus for household and similar general use
- IEC60204-1
Electrical equipment of industrial machines: Part 1, General requirements
- IEC60335-1
Safety of household and similar electrical appliances: Part 1, General requirements
- IEC60601-1
Medical electrical equipment: Part 1, General requirements for safety
- IEC60950
Safety of data processing equipment, including office equipment
- IEC61010-1
Safety requirements for measurement, control and laboratory electrical equipment
- UL standard
UL1012, UL1410, UL1950, UL3101-1, etc.

One easy-to-use tool measures leakage current in many applications, from medical electrical equipment and hospital installations to general electrical equipment

3155-01 LEAK CURRENT HiTESTER

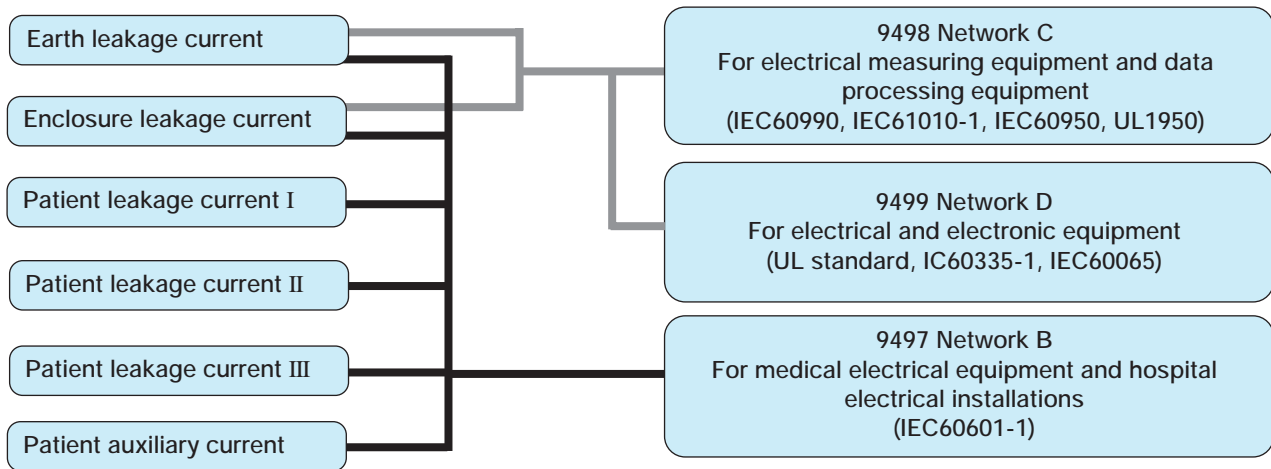


Leakage current can have serious effects on the human body, so many standards specify test methods, tester characteristics, and limit values for leakage current. Using the appropriate measurement network selection, the 3155 LEAK CURRENT HiTESTER makes standard-compliance measurement possible in a single unit for a range of electrical devices, from general electrical equipment to medical electrical equipment and hospital electrical installations.

- Inspection, repair, maintenance and testing of medical electrical equipment
- Work in progress in operating rooms, intensive care units and coronary care units
- Type testing of general electrical equipment
- Equipment maintenance
- Inspection during manufacturing
- Design and evaluation of equipment

■ Measurement Network Types and Applications

Measurement networks are determined by different standards. The appropriate network must be used when measuring.



Major Features

■ Measurement standards

This unit meets IEC and UL standards for measuring leakage currents.

■ Automatic measurement

Measurement in a single-fault condition, such as a power supply line break, a grounding line break, or power supply polarity error, can be carried out automatically, and the maximum value displayed. An arbitrary delay time (0 to 99 s) can be set for measurement.

■ Simple interactive operating interface

The unit uses a matrix touch panel: simply touch the required item on the panel to select it. Operation is extremely straightforward.

■ Data storage for 100 units

The tester holds 100 sets of data, including device number, model, grounding class, and measurement data.

■ Built-in RS-232C interface

Measurement results can be transferred to a computer, or the RS-232C interface can be used for complete remote control of the unit, for production line and other automatic testing applications.

■ Data printing

The built-in printer can provide hard copy of measurement data and stored values.

Compact Instruments for Insulation Resistance Measurement

3451•3452 MΩ HiTESTER

The simple, single-range 3451 MΩ HiTESTER is available in five versions, according to measurement voltage. Similarly, the triple-range 3452 MΩ HiTESTER is available in three versions, providing a wide range of choices for the most appropriate MΩ HiTESTER to meet your needs.

- Insulation resistance measurement for three circuit voltages in one unit (3452)
- Compact size, weighing only 420 g
- Brightness adjustment for easy reading even in dark places
- Conforms to safety standard IEC61010
- AC-circuit voltage measurement function included
- Battery condition indicator included
- Function to discharge electrical charges when measuring
- Designed to save energy using 4 R6P batteries



- Single-range versions
- 3451-11(125V/20MΩ)
 - 3451-12(250V/50MΩ)
 - 3451-13(500V/100MΩ)
 - 3451-14(500V/1000MΩ)
 - 3451-15(1000V/2000MΩ)
- Triple-range versions
- 3452-11(25V/10M, 50V/10M, 100V/20MΩ)
 - 3452-12(125V/20M, 250V/50M, 500V/100MΩ)
 - 3452-13(250V/50M, 500V/100M, 1000V/2000MΩ)

Efficient insulation diagnostics

3453 DIGITAL MΩ HiTESTER

125 V/ 40MΩ
 250 V/2000 MΩ
 500 V/2000 MΩ
 1000 V/4000 MΩ

4 ranges



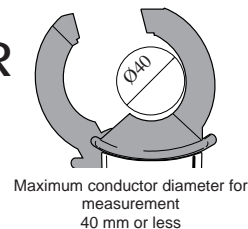
- **Multiple functions**
- Logarithmic bar graph display Analog sensor
- Moving average display processing Stable measurement
- Comparative decisions/memory functions Effective maintenance management
- Backlight Ideal for use in dark places
- Automatic display of value for one minute after measurement Captures fluctuations in resistance

- Attention to safety and prevention of incorrect measurement
- Electrical surges or discharges in the measurement object can be confirmed on a bar graph (voltage level). A surge warning lamp lights if the surge is more than about 40V.

Clamp-on probe provides easy ground leakage current measurement

3283 CLAMP ON LEAK HiTESTER

- High sensitivity (10-μA resolution) and high accuracy (±1%)
- Filter function useful for true effective values and analysis to handle high-frequency leakage currents
- Analog and monitor output selection



Accessories and Options

3158-01 AC WITHSTANDING VOLTAGE HiTESTER(120V AC)
 3158-03 AC WITHSTANDING VOLTAGE HiTESTER(220V AC)
 3158-04 AC WITHSTANDING VOLTAGE HiTESTER(230V AC)
 3158-05 AC WITHSTANDING VOLTAGE HiTESTER(240V AC)

●Accessories

9615 H.V. test leads (high-voltage side and return, one each), power cord, spare fuse

3157-01 AC GROUNDING HiTESTER

* Two 9296 cables, or one each 9296 and 9297 cable are required for measuring.

●Accessories

Power cord, spare fuse (integrated with socket), shorting bar × 2 (current output - voltage sensing terminal)

■Options

9296 CURRENT PROBE
 9297 CURRENT APPLY PROBE
 9518-02 GP-IB INTERFACE
 9593-02 RS-232C INTERFACE

■Options

9613 REMOTE CONTROL BOX(SINGLE)
 9614 REMOTE CONTROL BOX(DUAL)

9442 PRINTER

1196 RECORDING PAPER(25m, 10 rolls)
 9443-02 AC ADAPTER(for printer, EU)
 9443-03 AC ADAPTER(for printer, America)
 9446 CONNECTION CABLE(for printer)
 9613 REMOTE CONTROL BOX(SINGLE)
 9614 REMOTE CONTROL BOX(DUAL)



* Models 9296/9297 use two-conductor wires up to the probe tip.

3155-01 LEAK CURRENT HiTESTER

* Measurement is not possible with the 3155 unit alone: a network unit is required and is sold separately.

●Accessories

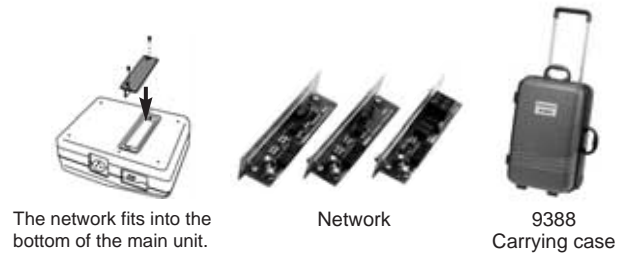
Power cord, 9170 test lead, 9195 enclosure probe, spare fuse, 9233 recording paper (1 roll), alligator clips (1 red, 1 black), 9399 carrying case for accessories, outlet plug.

■Options

9497 NETWORK B (for IEC 60601-1)
 9498 NETWORK C (for IEC 60990)
 9499 NETWORK D (for UL, IEC60335-1, and IEC60065)
 9196 APPLY UNIT
 (for measurement of patient leakage currents II and III)

9190 VOLTAGE APPLY PROBE (supplied with 9196)
 9233 RECORDING PAPER (10 m, 10 rolls)
 9461 PIN TYPE LEADS (for low resistance measurement)
 * 9287 CLIP TYPE LEADS (for low resistance measurement)
 9388 CARRYING CASE (with casters)

*Not applicable for CE marking



The network fits into the bottom of the main unit.

Network

9388 Carrying case

3451 MΩ HiTESTER

3452 MΩ HiTESTER

●Accessories

9292 test probe, 9384 carrying case

■Options

* 9288 BREAKER PIN
 9293 PIN-TYPE EARTH PROBE

*Not applicable for CE marking

3453 DIGITAL MΩ HiTESTER

●Accessories

9294 test lead, display cover, carrying strap

■Options

* 9288 BREAKER PIN
 9185 TEST LEADS

*Not applicable for CE marking

3283 CLAMP ON LEAK HiTESTER

●Accessories

9399 Carrying case, hand strap

■Options

9445 AC ADAPTER(UL type)
 9445 -01 AC ADAPTER(EU type)
 * 9094 OUTPUT CORD

*Not applicable for CE marking

HIOKI

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