



## 3159 INSULATION / WITHSTANDING HiTESTER

Safety Standards Measuring Instruments



## Improved Efficiency for Electrical Safety Testing

The 3159 INSULATION / WITHSTANDING HiTESTER is a combination insulation resistance as well as voltage endurance tester. It continuously performs insulation testing and voltage endurance testing of electrical equipment and parts, doing both tests in a simpler and more efficient way. This instrument implements all the applicable safety standards, and is small, light, and inexpensive. It also comes standard with external I/O for automating production lines.



**ISO14001**  
JQA-E-90091



<http://www.hioki.co.jp/>

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# One Unit Serves Two Functions -- Continuous Testing of Insulation and of Voltage Endurance

## ● Continuous Testing of Insulation and Voltage Endurance

In automatic testing mode, the 3159 continuously tests either insulation followed by voltage endurance (the ability to "withstand" voltage) (I→W), or voltage endurance followed by insulation (W→I). In manual mode it separately performs insulation testing or voltage endurance testing.

## ● Stores up to 10 Sets of Test Conditions

Stores up to 10 sets of test conditions for each of voltage endurance mode and insulation mode, and can quickly switch among the test conditions. (Save/Load)

## ● Standards Testing

Contains on-board comparator and timer functions for determining compliance, thus simplify the testing of all applicable safety standards.

## ● Interlock Function

Based on inputs such as a starter signal, enters a state where output is blocked and testing is impossible, to guarantee safety such as during automated testing.

### Analog Voltmeter

The test voltage can be verified not only from the digital display but also in analog form. (Only for voltage endurance testing.)

### Danger Light

The warning light flashes during testing and whenever there is a high voltage between the terminals.

### External Switch

Start/stop may be controlled with the 9613 or the 9614.

(The 9613 and 9614 are options.)



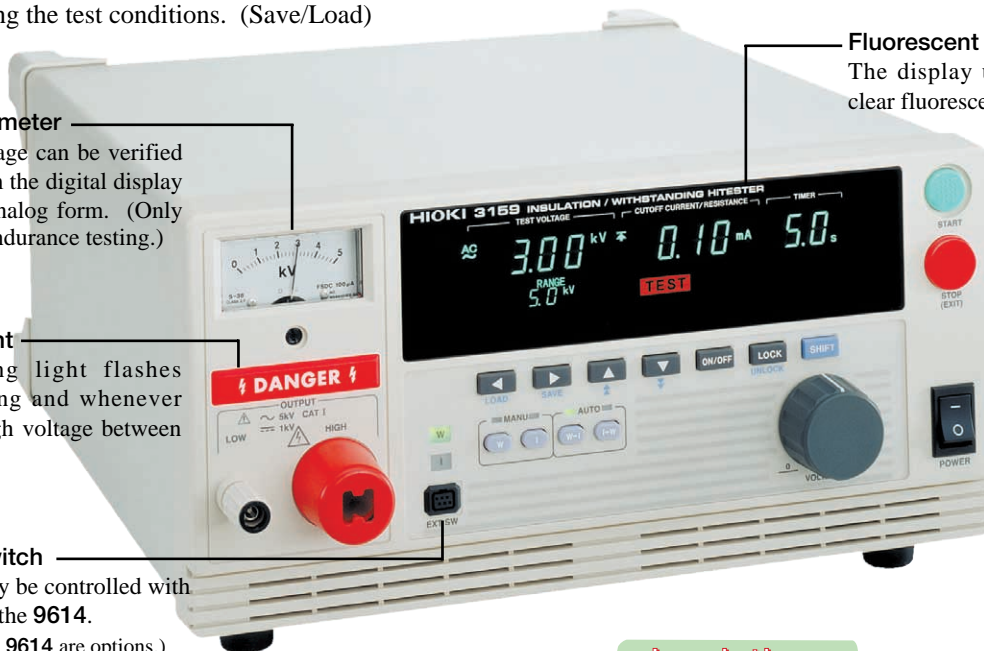
9613



9614

### Fluorescent Display Tube

The display uses a bright and clear fluorescent tube.



## Insulation Testing

Two Rated Measurement Voltages:  
DC 500 or 1000 V

Measurement Range:  
0.5 MΩ to 2000 MΩ

## ● Discharge Feature

The charge on the object being tested is discharged within the tester. This discharge function avoids impacting the next test process.

## Voltage Endurance Testing

Transformer Capacity : 500VA

Two Test Voltage Ranges :  
AC 0 to 2.5 or 5.0 kV

## ● Voltage Comparator

In order to prevent test voltage errors, the timer is only activated after the voltage rises to the specified test voltage  $\pm 5\%$  (or  $\pm 50V$ , whichever is larger).

(Depending on options, it may be possible to change the voltage check just before test completion.)

# Functions for Handling a Wide Range of Situations

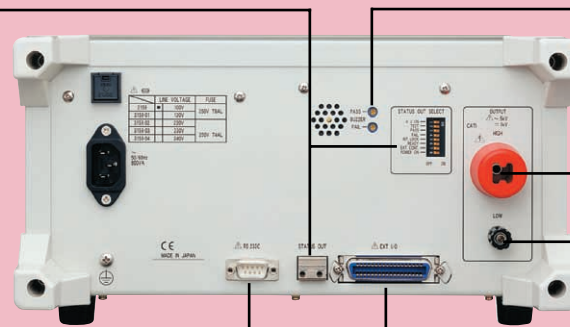
Automatically

This tester comes standard with features for automating EXT I/O, RS-232C, and status out (relay contact output), as well as data management features.

## Status Out

When the output conditions set up by the dip switches are satisfied (OR condition), there is relay contact output.

1. H.V.ON	Output voltage generation
2. TEST	Testing in progress
3. PASS	Passed
4. FAIL	Failed
5. INT.LOCK	Interlocked
6. READY	Ready
7. EXT.CONT.	Under external control
8. POWER ON	Powers the 3159 on



**Buzzer Volume Adjustment**

To indicate "pass" or "fail".

**Rear Panel Voltage Output Terminals**

These are normally connected to the front terminals.

EXT I/O (Open Collector, Photocoupler Insulation)

RS-232C

Allows automatic testing and reading of test results from a personal computer.

## EXT I/O Input Signals

Pin Number	Signal Name	Function
7	EXT-E	When LO, the external I/O input signal is effect.
8	START	When LO, it functions as a "Start" key.
9	STOP	When LO, it functions as a "Stop" key.
10	INT.LOCK	Interlocked when open.
15 to 18	ISO.COM	Ground inputs for external devices.

## EXT I/O Output Signals

Pin Number	Signal Name	Function
1	READY	LO when in "ready state"
2	L-FAIL	LO when in "fail state" for the lower bound
3	U-FAIL	LO when in "fail state" for the upper bound
4	PASS	LO when in "pass state"
5	TEST	LO when in "test state"
6	H.V.ON	LO when a voltage is being generated to the output terminals
11	W-MODE	LO during voltage endurance ("withstanding") testing
12	I-MODE	LO during insulation testing
13	W-FAIL	LO when in "fail state" for voltage endurance testing
14	I-FAIL	LO when in "fail state" for insulation testing
33 to 36	ISO.DCV	15 V (0.1 A) outputs

## Wide Range of Functions

### 1. Pass Hold Function (0: No Hold, 1: Hold)

The pass state is held when it occurs. This is convenient for verifying the decision value.

### 2. Fail Hold Function (0: No Hold, 1: Hold)

The fail state is held when it occurs. This is convenient for temporarily stopping the test process.

### 3. Hold State (0: No Hold, 1: Hold)

This saves the state when the stop key is pressed during a test in order to unconditionally end the test.

### 4. Momentary Out (0: Not Specified, 1: Specified)

This function outputs a voltage only when the start key is being pressed. The start key is effective both as EXT SW and external I/O.

### 5. Double Action (0: Not Specified, 1: Specified)

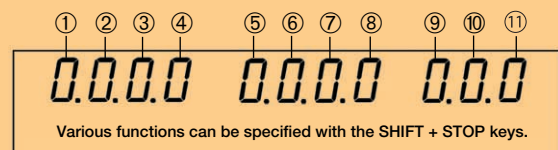
This function starts the test if the start key is pressed less than about 0.5 seconds after the stop key.

### 6. Fail Mode (0: Not Specified, 1: Specified)

This function means that hold state can be released only by the stop key on the main body.

### 7. RS Command "START" (0: Not Specified, 1: Specified)

This specifies whether the RS command "START" should be effective.



### 8. Interlock Function (0: Not Specified, 1: Specified)

This specifies whether the interlock terminal for external I/O should be effective.

### 9. Voltage Comparison Time (0: Start of Test, 1: End of Test)

When the voltage comparator is on during voltage endurance testing, this specifies whether the comparison should be done at the start or the end of the test.

### 10. Insulation Resistance Measurement Range

(0: Fixed Range, 1: Automatic Range)

This specifies whether the measurement range for the insulation resistance test should be a fixed range or an automatic range.

### 11. Insulation Resistance Test End Mode

0 : Test for the specified time

1 : Stop when "pass" is determined

2 : Stop when "fail" is determined

This specifies the method of ending the insulation resistance test.

## 3159 Specifications

### ■ Voltage Endurance Testing

#### [ Test Voltage ]

<b>Output voltage</b>	: Two ranges: AC 0 to 2.5 or 5.0 kV
<b>Voltage output method</b>	: Zero input switch
<b>Transformer capacity</b>	: 500 VA (rating: 30 minutes)
<b>Voltage adjustment method</b>	: Manual adjustment
<b>Voltmeter</b>	: Average value rectified root-mean-square display Digital: AC 0.00 kV to 5.00 kV (full scale) Accuracy: $\pm 1.5\%$ f.s. Analog: AC 0 to 5 kV (full scale) Accuracy: $\pm 5\%$ f.s.
<b>Waveform</b>	: Same as the power supply waveform
<b>Frequency</b>	: Same as the power supply frequency

#### [ Current Detection ]

<b>Current measurement range</b>	: 0.01 mA to 120 mA
<b>Indicated value range</b>	: Average value rectified root-mean-square display (digital)
<b>Measurement resolution</b>	: 0.01 mA (2 mA or 8 mA range) 0.1 mA (32 mA range) 1 mA (120 mA range)
<b>Measurement accuracy</b>	: ( $\pm 3\%$ f.s. + 20 $\mu$ A) over the entire range (Assumes a power supply waveform distortion ratio of 5% maximum.)

### ■ Insulation Resistance Testing

#### [ Test Voltage and Measurement Range ]

<b>Rated voltage</b>	: DC 500 V or 1000 V
<b>Unloaded voltage</b>	: From 1 to 1.2 times the rated voltage
<b>Rated measured current</b>	: 1 mA to 1.2 mA
<b>Short circuit current</b>	: 4 mA to 5 mA (500 V) / 2 mA to 3 mA (1000 V)
<b>Measurement range and accuracy</b>	: 0.5 M $\Omega$ to 999 M $\Omega$ (500 V), 1 M $\Omega$ to 999 M $\Omega$ (1000 V) / $\pm 4\%$ rdg. 1000 M $\Omega$ to 2000 M $\Omega$ / $\pm 8\%$ rdg.
<b>Measured resistance range</b>	: 2 M $\Omega$ , 20 M $\Omega$ , 200 M $\Omega$ , 2000 M $\Omega$ (500 V) 4 M $\Omega$ , 40 M $\Omega$ , 400 M $\Omega$ , 2000 M $\Omega$ (1000 V)

### ■ General Specifications

<b>Display</b>	: Fluorescent display tube (digital display)
<b>Monitor functions</b>	: Output voltage, detected current, measured resistance
<b>Monitor period</b>	: 2 times/sec. minimum
<b>Operating temperature range</b>	: 0 °C to 40 °C, 80% rh maximum (no condensation)
<b>Storage temperature range</b>	: -10 °C to 50 °C, 90% rh maximum (no condensation)
<b>Temperature and humidity range for assured accuracy</b>	: 23 °C $\pm$ 5 °C, 80% rh maximum (no condensation), after warming up for at least 5 minutes
<b>Operating locations</b>	: Indoor, altitude 2000 m maximum
<b>Power supply voltage</b>	: AC 100 V (3159), AC 120 V (3159-01), AC 220 V (3159-02), AC 230 V (3159-03), AC 240 V (3159-04),
<b>Power supply frequency</b>	: 50 Hz to 60 Hz

### ■ Decision Function

<b>Decision method</b>	: Window comparison method (digital specification).
<b>Decision results</b>	: UPPER-FAIL: The measured current (insulation resistance value) exceeded the specified upper bound. PASS: The measured current (insulation resistance value) was between the specified upper and lower bounds and the specified time elapsed LOWER-FAIL: The measured current (insulation resistance value) was less than the specified lower bound.
<b>Decision processing</b>	: For each decision result, output the display portion, the buzzer sound, and EXT I/O signal
<b>Specification ranges</b>	: Voltage endurance testing : 0.1 mA to 120 mA (upper bound) / 0.1 mA to 119 mA (lower bound) Insulation testing : 0.2 M $\Omega$ to 2000 M $\Omega$ (same for the upper and lower bounds).
<b>Specification resolution</b>	: Voltage endurance testing : 0.1 mA (0.1 mA to 9.9 mA) / 1 mA (10 to 120 mA) Insulation testing : 0.01 M $\Omega$ (0.2 M $\Omega$ to 2 M $\Omega$ ), 0.1 M $\Omega$ (2.1 M $\Omega$ to 20 M $\Omega$ ) 1 M $\Omega$ (21 M $\Omega$ to 200 M $\Omega$ ), 10 M $\Omega$ (210 M $\Omega$ to 2000 M $\Omega$ )

### ■ Timer

<b>Specification range</b>	: 0.5 to 999 sec
<b>Action</b>	: When ON is specified: After starting, a countdown from the specified time is displayed When OFF is specified: Displays the elapsed time since the start.
<b>Specification resolution and accuracy</b>	: 0.1 sec. (0.5 to 99.9 sec.) $\pm$ 50 msec 1 sec. (100 to 999 sec.) $\pm$ 0.5 sec
<b>Nondeterministic interval</b>	: 0.5 sec. (Mask time until the determination begins during insulation resistance testing.)

### ■ Interfaces

<b>EXT I/O</b>	: Output signal: Open collector output Maximum loaded voltage DC 30 V Maximum output current DC 100 mA / 1 signal Input signal: Active low input / maximum applied voltage DC 30 V
<b>EXT SW</b>	: Input signal (contact point input) START, STOP, SW.EN (front terminal switch is effective)
<b>RS-232C</b>	: Start-stop synchronization, full duplex, 9600 bps

<b>Voltage endurance</b>	: AC 1.35 kV, 10 mA, for one minute, between power supply and chassis
<b>Maximum rated power</b>	: 800 VA
<b>Dimensions</b>	: Approx. 320 (W) $\times$ 155 (H) $\times$ 330 (D) mm (not including protrusions.)
<b>Mass</b>	: Approx. 18 kg (3159), Approx. 20.5 kg (3159-01), Approx. 21.5 kg (3159-02 to 3159-04)
<b>Applicable standards</b>	: EMC: EN 61326-1:1997 + A1:1998 class A Safety: EN 61010-1:1993 + A1:1995 Contamination level 2, overvoltage category (expected overvoltage category 2500V)
<b>Standard accessories</b>	: 9615 H.V. test lead (high voltage side and return, one each), power cord, extra fuse
<b>Options</b>	: 9613 REMOTE CONTROL BOX (SINGLE), 9614 REMOTE CONTROL BOX (DUAL), 9616 WARNING LAMP

### 3159 INSULATION / WITHSTANDING HIESTER (100V)

### 3159-01 INSULATION / WITHSTANDING HIESTER (120V)

### 3159-02 INSULATION / WITHSTANDING HIESTER (220V)

### 3159-03 INSULATION / WITHSTANDING HIESTER (230V)

### 3159-04 INSULATION / WITHSTANDING HIESTER (240V)

### ■ Options

#### 9613 REMOTE CONTROL BOX (SINGLE)

#### 9614 REMOTE CONTROL BOX (DUAL)

#### 9616 WARNING LAMP

#### 9637 RS-232C CABLE (1.8 m) (9pin-9pin/Cross)

#### 9638 RS-232C CABLE (1.8 m) (9pin-25pin/Cross)

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DISTRIBUTED BY

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