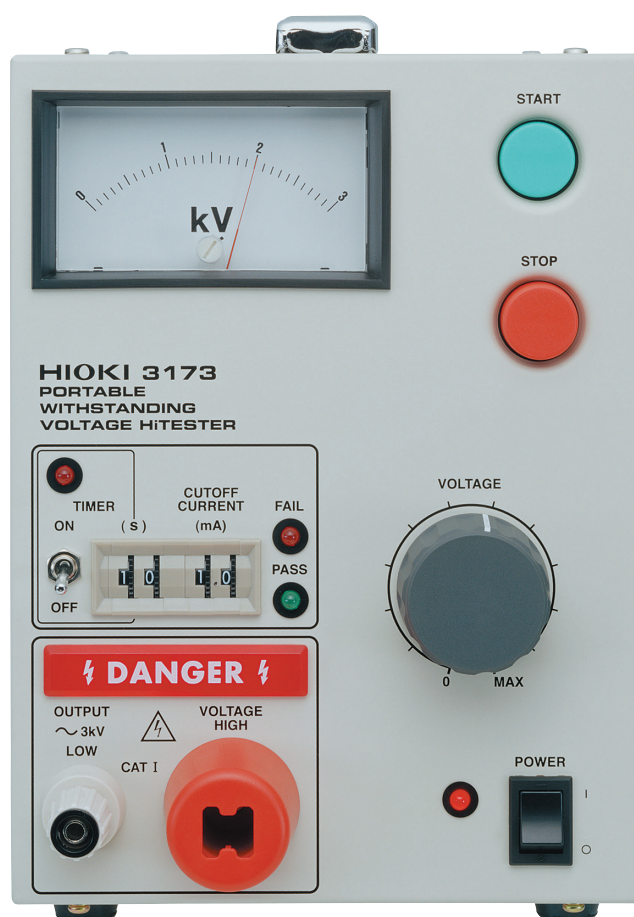


HIOKI

3173

Instruction Manual

PORTABLE WITHSTANDING VOLTAGE HiTESTER



EN

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Introduction

Thank you for purchasing the HIOKI 3173 PORTABLE WITHSTANDING VOLTAGE HiTESTER. To obtain maximum performance from the product, please read this manual first, and keep it handy for future reference.

Warranty

HIOKI cannot be responsible for losses caused either directly or indirectly by the use of the 3173 with other equipment, or if ownership is transferred to a third party.

Inspection

When you receive the product, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the connectors and accessories. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Accessories

9615 H.V.TEST LEAD (HIGH/LOW)	1 each
Power cord	1
Spare fuse	1
Instruction Manual	1

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.

Use the original packing materials when reshipping the product, if possible.



Before using the product, make sure that the insulation on the test leads is undamaged and that no bare conductors are improperly exposed. Using the product under such conditions could result in electrocution. Replace the test leads specified by Hioki .

Safety Notes



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.

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.

Safety Symbols

	<ul style="list-style-type: none"> 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 that dangerous voltage may be present at this terminal.
	Indicates AC (Alternating Current).
	Indicates a fuse.
	Indicates a protective conductor terminal.
	Indicates the ON side of the power switch.
	Indicates the OFF side of the power switch.

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

	Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
	Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
	Indicates that incorrect operation presents a possibility of injury to the user or damage to the product.
	Advisory items related to performance or correct operation of the product.

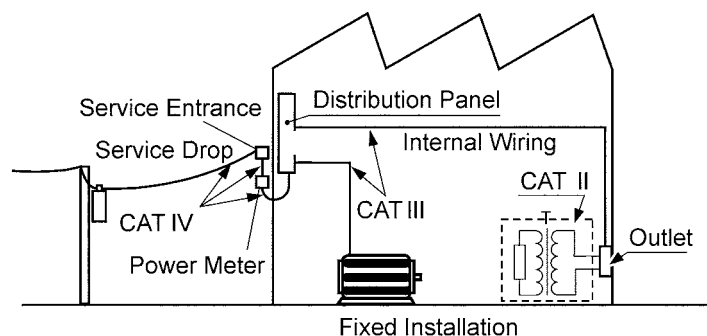
Measurement categories

To ensure safe operation of measuring instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT II to CAT IV, and called measurement categories.



- **Using a measuring instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.**
- **Never use a measuring instrument that lacks category labeling in a CAT II to CAT IV measurement environment. Doing so could result in a serious accident.**

CAT II	When directly measuring the electrical outlet receptacles of the primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.)
CAT III	When measuring the primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets
CAT IV	When measuring the circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection device (distribution panel)



Accuracy

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.

Notes on Use

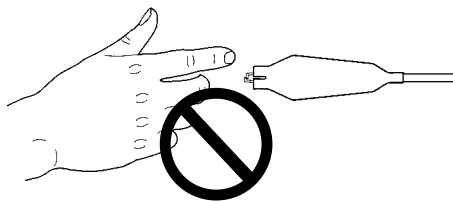


Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.



Observe the following precautions to avoid electric shock.

- **Do not remove the product's case. The internal components of the product carry high voltages and may become very hot during operation.**
- **Do not touch the alligator clip while high voltage is being generated. The vinyl sheath on the alligator clip of the 9615 H.V.TEST LEAD does not have an insulation withstand voltage.**



- **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, connect the protective ground terminal to a grounded conductor before making any other connections.**
- **Before turning the product on, make sure the source voltage matches that indicated on the product's power connector. Connection to an improper supply voltage may damage the product and present an electrical hazard.**
- **Replace the fuse only with one of the specified characteristics and voltage and current ratings. Using a non-specified fuse or shorting the fuse holder may cause a life-threatening hazard.**
Fuse type: 250VT1AL (3173, 3173-01), 250VT0.5AL (3173-02, 3173-03, 3173-04)
- **To avoid electrocution, turn off the power to all devices before plugging or unplugging any of the interface connectors.**



- To avoid damaging the power cord, grasp the plug, not the cord, when unplugging the cord from the power outlet.
- To avoid damaging the test leads, do not bend or pull the 9615 H.V. TEST LEADS.
- To avoid damage to the product, protect it from vibration or shock during transport and handling, and be especially careful to avoid dropping.
- Do not use the product near a device that generates a strong electromagnetic field or electrostatic charge, as these may cause erroneous measurements.
- To avoid electric shock, do not exceed the lower of the ratings shown on the instrument and test leads.



This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.

Chapter Summary

Chapter 1 Overview

Describes an overview, features, and the names and functions of the parts of the product.

Chapter 2 Testing Arrangements

Describes particulars of testing arrangements.

Chapter 3 Testing Method

Describes procedures for setting, testing, and test results judgment.

Chapter 4 External Interface

Describes use of the external I/O terminal.

Chapter 5 Specifications

Describes the product specifications.

Chapter 6 Maintenance and Service

Describes the maintenance and inspection, fuse replacement, and ultimate disposal.

Chapter 1

Overview

1.1 Product Overview

(1) Simple design with a streamlined set of core functions.

Simple, clean design with a streamlined set of essential functions - highly portable and perfectly suited to inspections on the production line.

(2) Test timer

The test timer can set test times between 1 and 99 seconds in increments of 1 second.

(3) Analog voltmeter

The test voltage is monitored using the analog voltmeter.

(4) External I/O

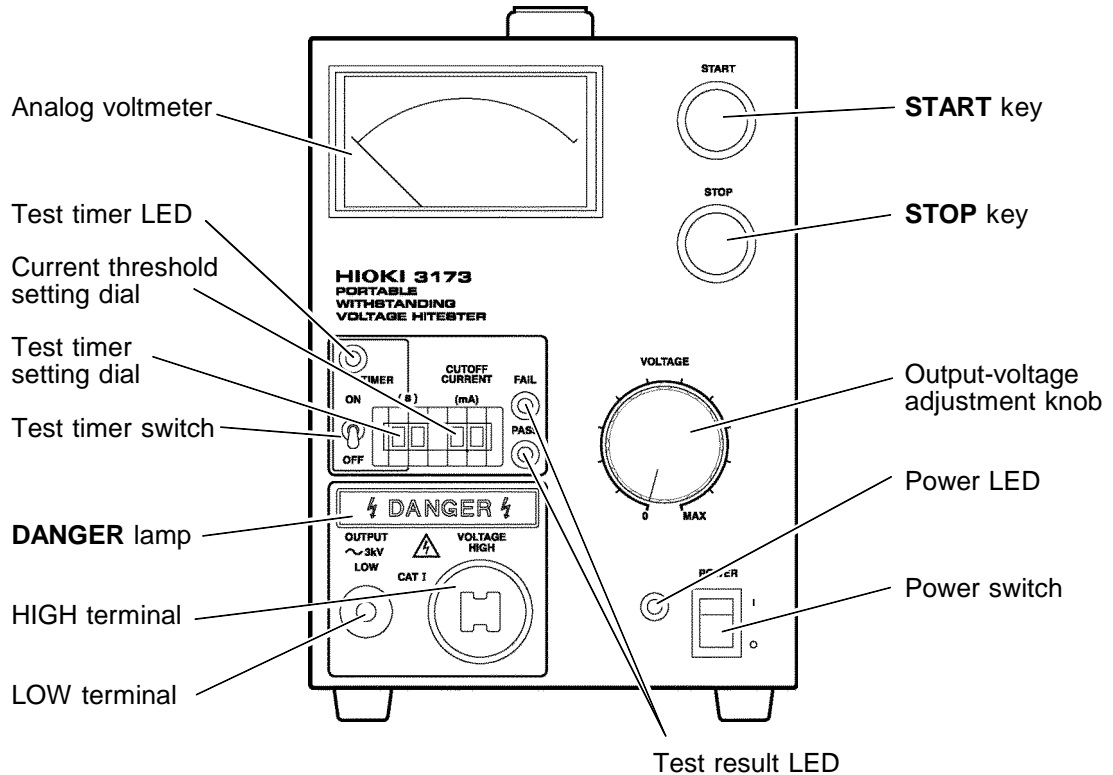
The tester has external I/O terminals on its rear panel, which are used to output various status signals and to input test start and stop signals.

1.2 Names and Functions of Parts

1.2.1 Front panel



To avoid electric shock, never touch the output-voltage terminals (HIGH and LOW), high-voltage test leads or the device being tested while high voltage is being applied.

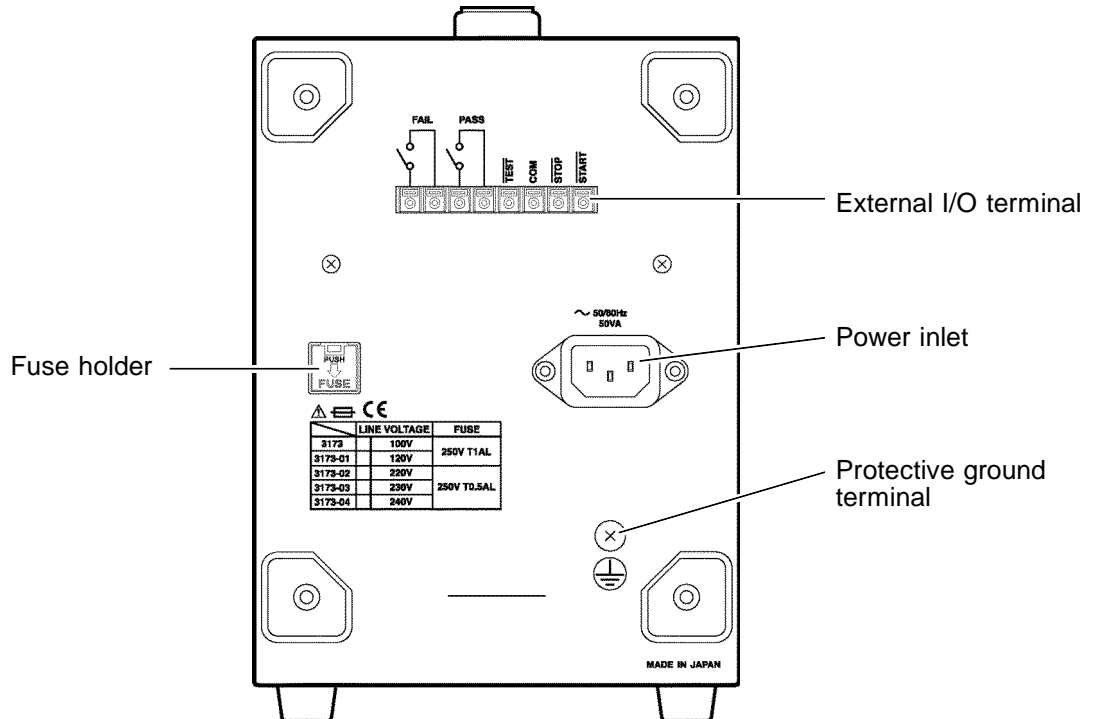


Analog voltmeter	Indicates output-voltage when testing withstand voltage.
Test timer LED	The LED lights up during testing when the timer is set to ON.
Current threshold setting dial	Sets the current threshold. (0.1 to 9.9 mA, resolution of 0.1 mA)
Test timer setting dial	Sets the timer (test time). (1 to 99 s, resolution of 1 s)
Test timer switch	Turns ON/OFF the test timer.
DANGER lamp	This lamp lights to warn that voltage is present between the terminals during testing.
HIGH terminal	The HIGH terminal is a high-voltage terminal for voltage outputs.
LOW terminal	The LOW terminal is a low-voltage terminal for voltage outputs. It has the same electric potential as the unit body.
Output-voltage adjustment knob	Sets the output-voltage.
Test result LED	One of the two LEDs will light, depending on the test result.
START key	Used to start a test.
STOP key	Normally used to terminate a test.
Power switch	Powers the 3173 on or off. The LED lights up when power is turned ON.

1.2.2 Rear panel



To avoid electric shock, never touch the output-voltage terminals (HIGH and LOW), high-voltage test leads or the device being tested while high voltage is being applied.

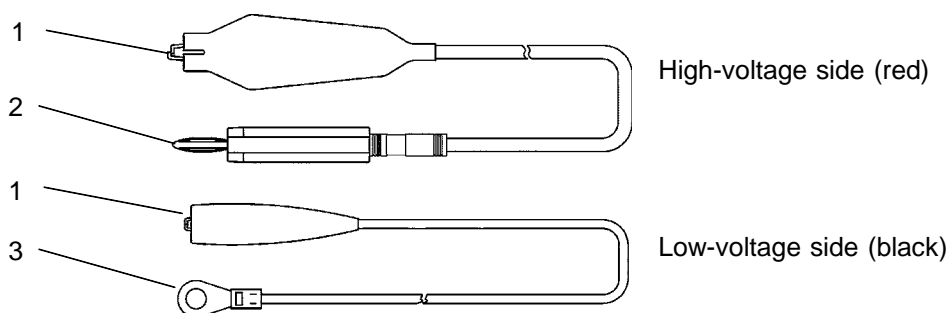
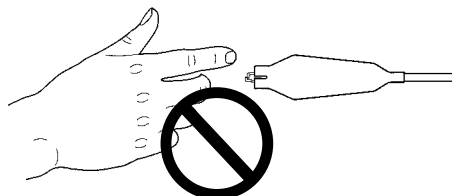


Fuse holder	Contains a power fuse.
External I/O terminal	Each signal is output by ON/OFF of the relay depending on the test result. Terminals for start and stop input signals are also available.
Power inlet	Connect the grounded three-core power cord supplied here.
Protective ground terminal	Used to earth a protective ground wire. Be sure to make grounding connections before starting a test.

1.2.3 9615 H.V. TEST LEAD

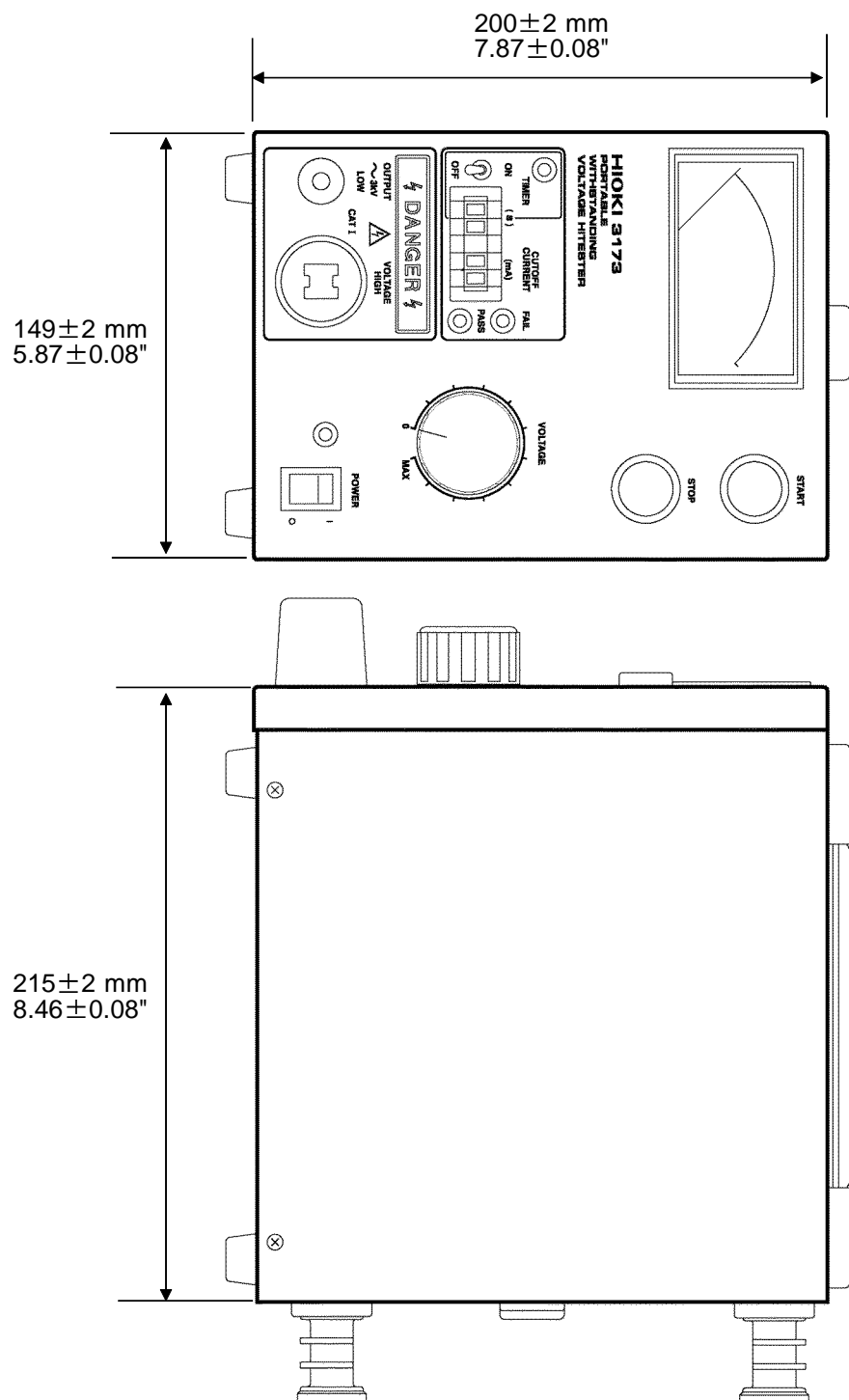


To avoid electric shock, do not touch the alligator clip while high voltage is being generated. The vinyl sheath on the alligator clip of the 9615 H.V. TEST LEAD does not have an insulation withstand voltage.



1	Alligator clip	Attach to the test point on the device being measured.
2	High-voltage output plug	Connect to the HIGH terminal on the unit.
3	Low-voltage output plug	Connect to the LOW terminal on the unit.

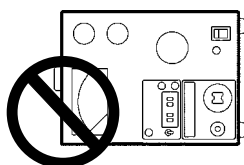
1.3 External Dimensions



Chapter 2

Testing Arrangements

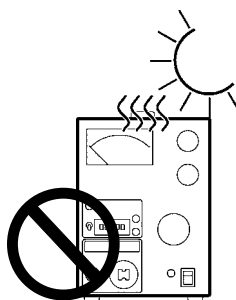
2.1 Installation of the Unit



Temperature: 0 to 40°C (32 to 104°F)

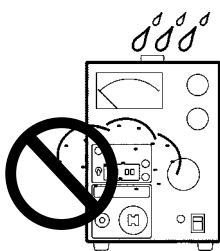
Humidity: 80% RH or less (no condensation)

Do not place the tester upside down. Be sure to place the tester with its bottom side down.

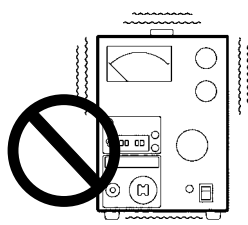


Avoid the following locations:

- Subject to direct sunlight.
- Having poor air circulation.



- Subject to high levels of dust, steam, or corrosive gases (Avoid using the equipment in an environment containing corrosive gases (e.g., H₂S, SO₂, NI₂, and Cl₂) or substances that generate harmful gasses (e.g., organic silicones, cyanides, and formalins)).



- Subject to vibrations.
- In the vicinity of equipment generating strong electromagnetic fields.



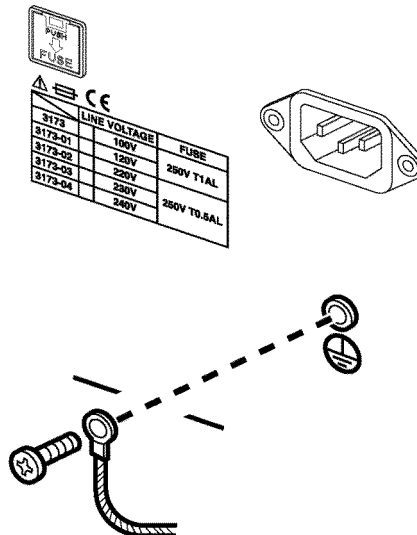
The noise generated by this unit may affect equipment located around the unit.

2.2 Connecting the Protective Ground Terminal



- To avoid electric shock, be sure to connect the protective ground terminal to a grounded conductor.
- To avoid electric shock, connect the protective ground terminal to a grounded conductor before making any other connections.

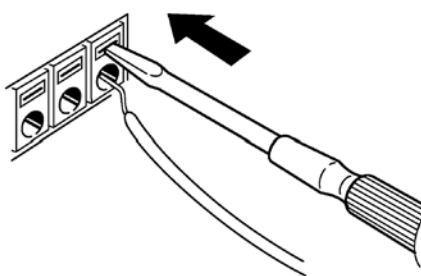
1. Using a Phillips-head screwdriver, remove the screw of the protective ground terminal from the rear of the unit.
2. Connect an electric wire with a sufficient current capacity to the protective ground terminal, and secure the wire using a Phillips-head screwdriver.
3. Ground the other end of the wire.



2.3 Connecting the External I/O Terminal

Connect the external I/O terminal before turning on the power. If the external I/O terminal is installed or removed following startup, malfunction may result.

1. Press and hold the button on the terminal block using a flathead screwdriver.
2. While holding the button, insert a signal cable with insulation removed from the end into the hole.
3. Release the button to secure the cable to the terminal.



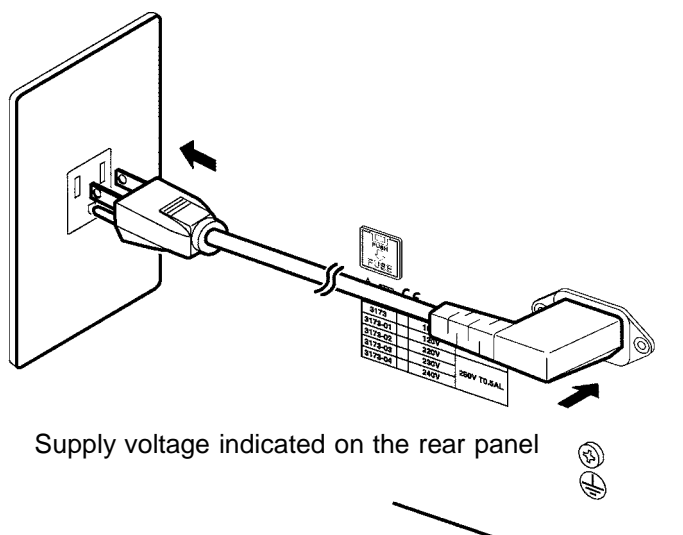
For the specifications of the external I/O terminal, see Section 4.1.

2.4 Power Cord Connection



Before turning the product on, make sure the source voltage matches that indicated on the product's power connector. Connection to an improper supply voltage may damage the product and present an electrical hazard.

1. Be sure that the power switch is turned to OFF.
2. Connect the grounded three-core power cord provided to the power inlet on the back of the unit.
3. Insert the plug into the grounded outlet.



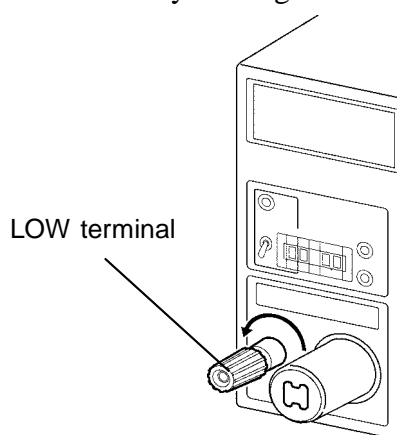
2.5 Connecting the 9615 H.V. TEST LEAD



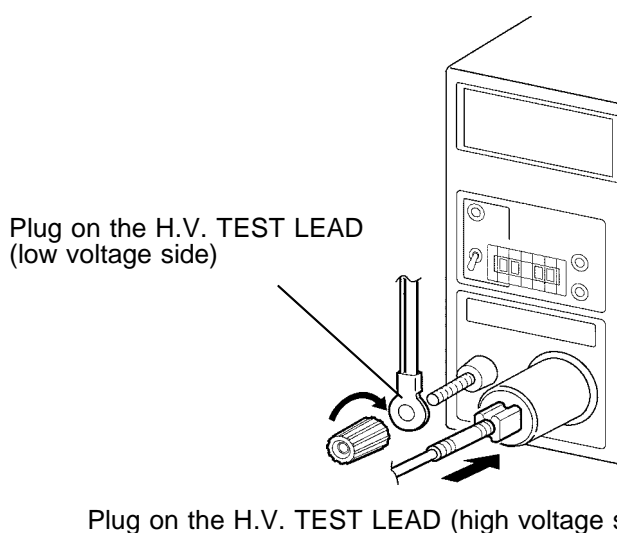
Observe the following precautions to avoid electric shock.

- Turn off the power unit and tested object, make sure that there is no high voltage being applied to the output, confirm the following items, and connect the 9615 H.V. TEST LEAD.
 - (1) The analog voltmeter reads 0 kV.
 - (2) The DANGER lamp is OFF.
- Make sure the 9615 H.V. TEST LEAD is securely connected before starting a test, as a loose test lead can cause a hazard when a voltage is output.
- Before using the product, make sure that the insulation on the test leads is undamaged and that no bare conductors are improperly exposed. Using the product under such conditions could result in electrocution. Replace the test leads specified by Hioki .

1. Remove the LOW terminal by turning it counterclockwise.



2. As shown in the figure, insert the plug on the H.V. TEST LEAD (low voltage side).
3. Secure the LOW terminal by turning it clockwise.
4. Connect the plug on the H.V. TEST LEAD (high voltage side) to the HIGH terminal.



2.6 Connection to the Measured Equipment



Observe the following precautions to avoid electric shock.

- Turn off the power unit and tested object, make sure that there is no high voltage being applied to the output, confirm the following items, and connect the 9615 H.V. TEST LEAD.
 - (1) The analog voltmeter reads 0 kV.
 - (2) The DANGER lamp is OFF.
 - Make sure that no high voltage is being applied between the output-voltage terminals (HIGH and LOW), before touching the output-voltage terminals, H.V. TEST LEAD, or tested object. Even following a test, there may be a residual voltage at the output-voltage terminals.
-

1. Make sure the analog voltmeter is at 0 kV and the **DANGER** lamp is OFF.
2. Connect the LOW terminal probe to the tested object. Fasten the probe securely to prevent it from loosening during a test.
3. Following the procedure described above, connect the HIGH terminal probe to the tested object.



If the test lead touches to other metallic parts, it may cause an increase in leakage current. Prevent the test lead from coming into contact with other parts as much as possible.

Do not the test lead and the EXT/IO cable arranged closely to each other. Doing so may lead to a malfunction of the external control due to a noise.

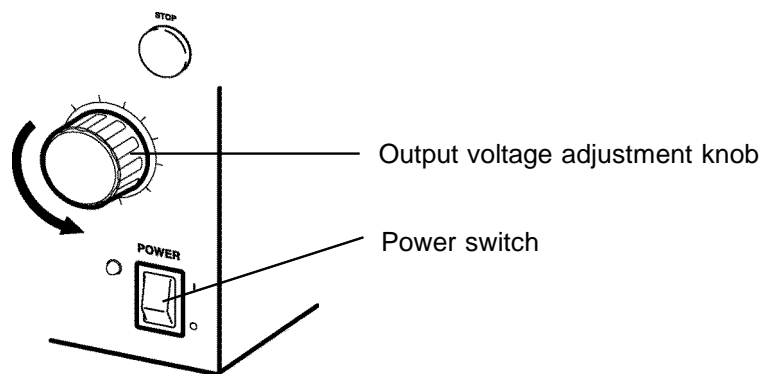
2.7 Powering On and Off the 3173



Before turning on the power, make sure that the voltage of the power supply being used matches the supply voltage indicated on the rear panel of the unit. If an attempt is made to use an improper supply voltage, there is danger of damage to this unit and of life-threatening risk to the operator. Apply a voltage within the acceptable power-voltage range. Otherwise, damage to the unit or electrical accidents may result.



Allow 10 minutes warming up after powering on.



(1) Powering on the unit

1. Make sure that the voltage adjusting knob is turned counter-clockwise as far as possible.
2. Turn the power switch to ON (I).

(2) Powering off the unit

1. Following a test, make sure the analog voltmeter is at 0 kV and the **DANGER** lamp is OFF.
2. Turn the output voltage adjustment knob counterclockwise until the output reaches 0 kV.
3. Turn the power switch to OFF (O).

2.8 Startup Inspection

To ensure safe testing, check the following before starting operation:

(1) Breaking current

1. Calculate the resistance based on the output-voltage set for withstand voltage testing and the upper test value, and prepare a resistor corresponding to the calculation result.
Note the power rating of the resistor.
(Output voltage / test upper limit (interrupting current) = resistance)
(The 2nd power of output voltage / resistance = power consumption < power rating of resistor)
A high-voltage resistor is recommended.
Example high-voltage resistor:
KOA Corp.'s GS Series High Voltage High Resistance Thick Film Resistor
2. Set an upper-limit value.
3. Connect the resistor to the H.V. TEST LEAD.
4. Increase the output voltage beyond the set value, and make sure the current is cut off (i.e., make sure the unit is in the FAIL state).

(2) Analog voltmeter

1. Before turning on the power, make sure the analog voltmeter is at 0 kV.
2. If the voltage reading is not at zero, adjust the value to zero using a slotted screwdriver.

(3) Key inspection

1. Turn off the power, and unplug the power cord from the power outlet.
2. For both the START and STOP keys on the front panel of the unit, press the center of the key, and make sure you feel it click. The click is less noticeable when the edges of the keys are pressed.
*Clicking
When a key is pressed slowly, there is a moment of slight resistance and a feeling that the key cannot be pressed any further. When the key is pressed further after this point, a clicking sensation can be felt.
3. If you do not feel a click, the key may be broken.

Chapter 3

Withstand Voltage Testing Method

This chapter describes how to set withstand voltage test conditions and the proper testing procedure.

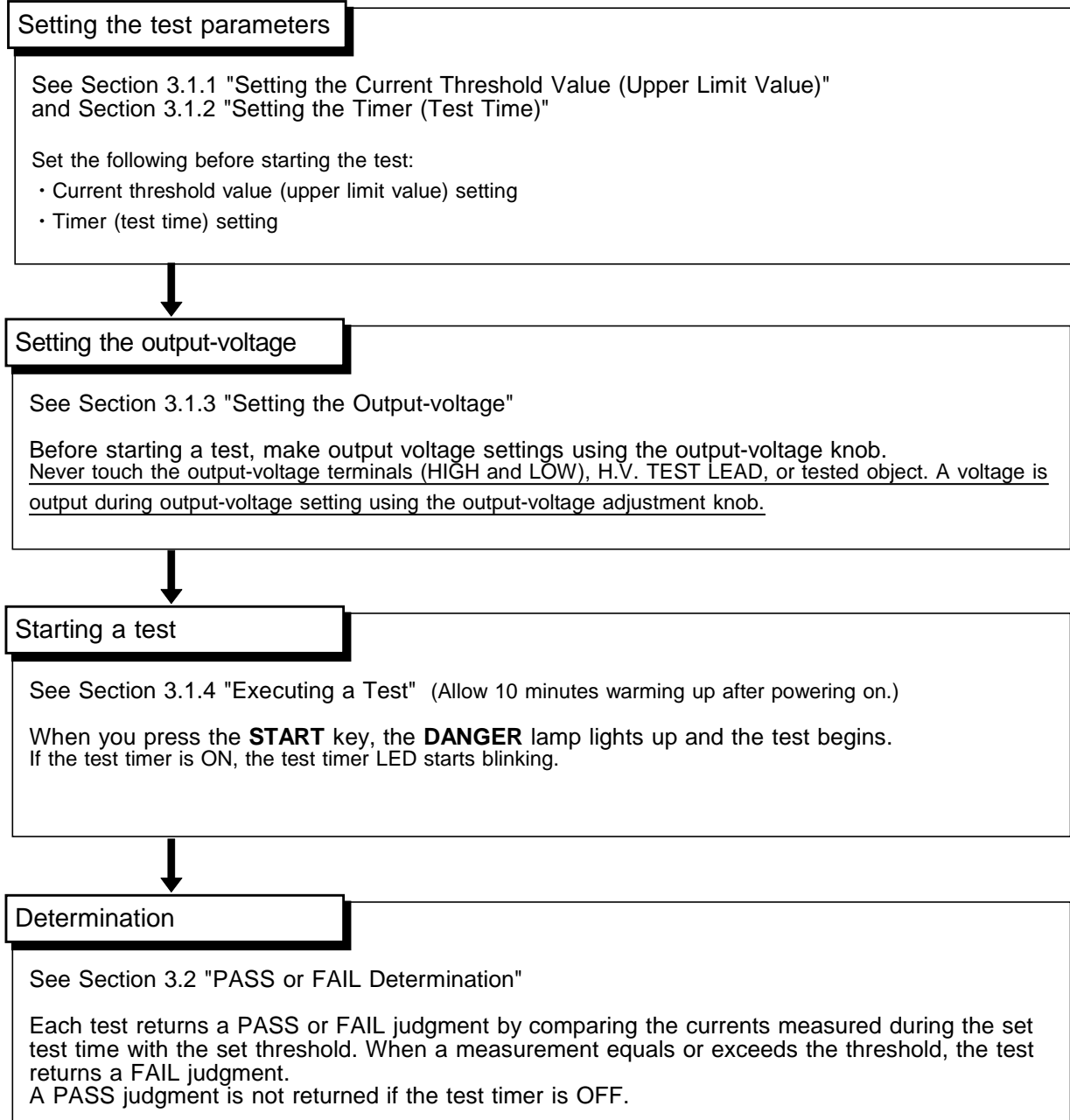
Read Chapter 2, and make the necessary preparations for testing.

NOTE

- Note that the output waveform may be distorted when conducting an AC withstand voltage test for a voltage-dependent device or object (e.g., ceramic capacitor). Excessively large distortion may damage the device or tested object.
 - When the device or tested object is a capacitive load, resonance may occur (when conducting an AC withstand voltage test) with the coil inductance of the output high-voltage transformer, depending on the capacitance value. This condition may generate several tens of volts at the voltage output terminal before the test is started. If the START key is disabled, reset the output voltage adjustment knob to zero, then set it back to the desired voltage after starting the test.
-

3.1 Starting a Test

The flowchart below explains how a test is carried out.

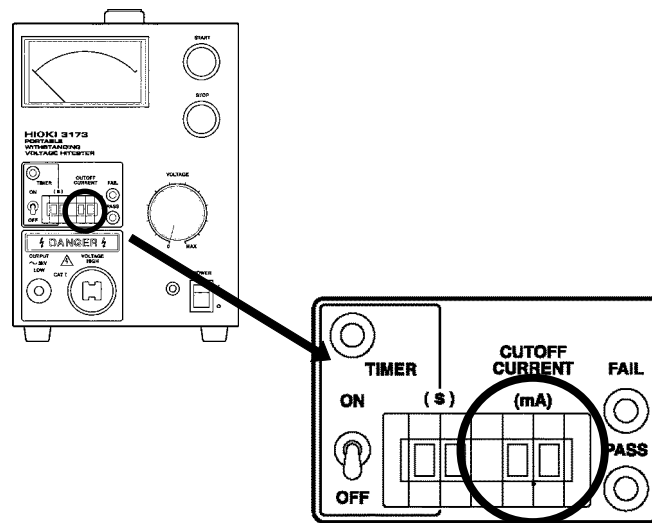


3.1.1 Setting the Current Threshold Value (Upper Limit Value)

1. Make sure the analog voltmeter is at 0 kV and the **DANGER** lamp is OFF.
2. Turn the current threshold setting dial to set the threshold to the desired level.

NOTE

- The current threshold value (upper limit value) can be set from 0.1 to 9.9 mA (setting resolution: 0.1 mA).
- To prevent malfunctions, during testing avoid changing the test current threshold setting.

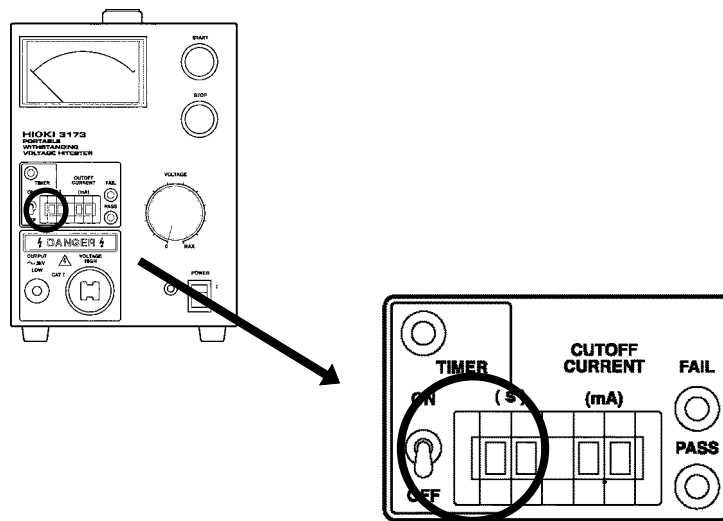


3.1.2 Setting the Timer (Test Time)

1. Make sure the analog voltmeter is at 0 kV and the **DANGER** lamp is OFF.
2. Turn the test timer setting dial to set the timer (test time).
3. Turn the test timer switch ON.

NOTE

- The timer (test time) can be set from 1 to 99 s (setting resolution: 1 s).
- If the test time doesn't need to be set, turn the test timer switch OFF. This will disable test timer setting.
- To prevent malfunctions, during testing avoid turning the test timer switch ON/OFF or changing timer settings.



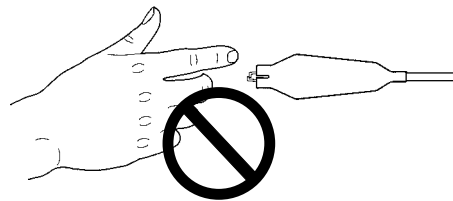
3.1.3 Setting the Output-voltage

Before starting a test, make output-voltage settings using the output-voltage adjustment knob.



Observe the following precautions to avoid electric shock.

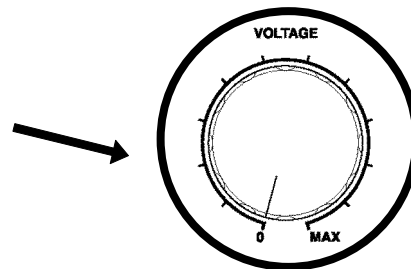
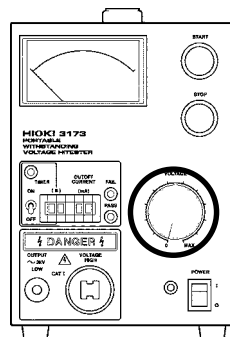
- Make sure that no high voltage is being applied to the output, confirm the following items, and connect the H.V. TEST LEAD.
 - (1) The analog voltmeter reads 0 kV.
 - (2) The DANGER lamp is OFF.
- Never touch the output-voltage terminals (HIGH and LOW), H.V. TEST LEAD, or tested object. A voltage is output during output-voltage setting using the output-voltage adjustment knob.
- Do not touch the alligator clip while high voltage is being generated. The vinyl sheath on the alligator clip of the 9615 H.V. TEST LEAD does not have an insulation withstand voltage.



1. Make sure the analog voltmeter is at 0 kV and the **DANGER** lamp is OFF.
2. Connect the high voltage test leads to the device to be tested.
(See Section 2.6 "Connection to the Measured Equipment")
3. Press the **START** key. **DANGER** lamp will light up and a voltage will be output.
4. Set an output-voltage using the output-voltage adjustment knob.

NOTE

- The output-voltage knob increases the output-voltage when turned clockwise, and decreases the voltage when turned counterclockwise.
(The maximum value: 3.0 kV)
 - The output-voltage is displayed on the analog voltmeter.
5. Press the **STOP** key to stop the output.



Output-voltage adjustment knob

NOTE

When adjusting the output voltage, make sure that the test timer is OFF and that the current threshold is set sufficiently high. Since PASS/FAIL judgments are made even during adjustment, the output may be halted by a PASS or FAIL judgment.

3.1.4 Executing a Test



Observe the following precautions to avoid electric shock.

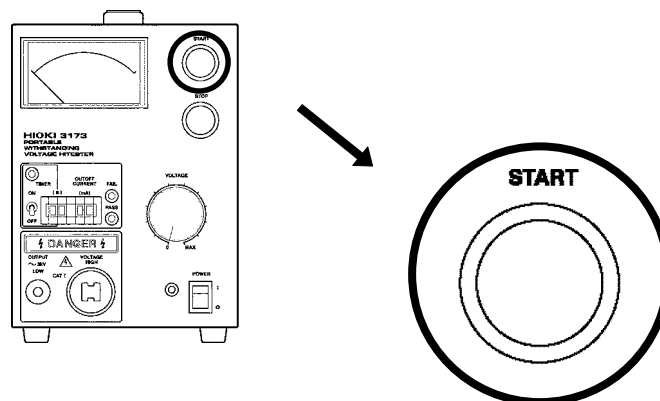
- Make sure that no high voltage is being applied to the output, confirm the following items, and output-voltage.
 - (1) The analog voltmeter reads 0 kV.
 - (2) The DANGER lamp is OFF.
- Never touch the output-voltage terminals (HIGH and LOW), H.V. TEST LEAD, or tested object. A voltage is output during output-voltage setting using the output-voltage adjustment knob.
- Avoid testing grounded devices. If you must test a grounded device, be sure to connect the alligator clip of the LOW (black) 9615 H.V. TEST LEAD to the grounded side of the device. Connecting the HIGH (red) test lead to the grounded side may lead to electric shock or damage to the tester.



- For output, the unit uses a high-voltage transformer that boosts the power voltage. If an unstable power voltage is used to operate the unit, the tested object may be damaged by the distortion of the output-voltage waveform and by the output of a voltage higher than the preset voltage.
- If a capacity load is applied to the tested object, the output-voltage may exceed the preset voltage, thereby damaging the equipment.
- Continuous output of a high voltage may heat the bottom of the unit. Take special care when handling the unit (e.g. transporting the unit).



- The **START** key and **STOP** key are connected with the START external input signal and STOP external input signal, respectively, as OR gates. The signal works in the same way as the key. Check the level of the external input signals if the test fails to start or stop properly.
- Allow 10 minutes warming up after powering on.



Pressing the **START** key starts testing. When a voltage is output, the **DANGER** lamp goes on.

To interrupt testing, press the **STOP** key. The tester immediately halts voltage output and does not return a PASS/FAIL judgment.

3.2 PASS or FAIL Determination

3.2.1 "PASS" State



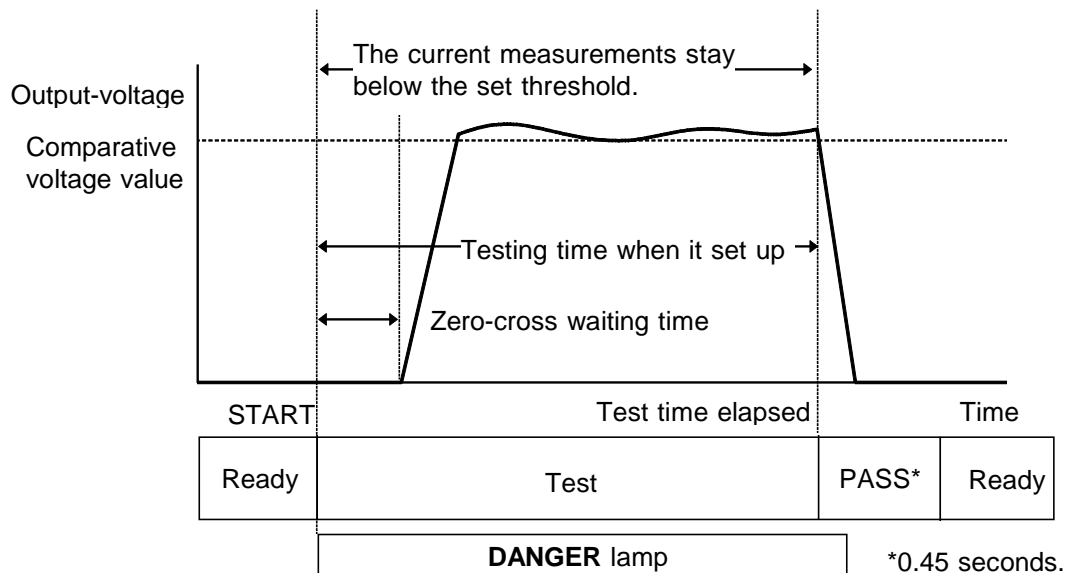
Confirm the following items, before touching the output-voltage terminals (HIGH and LOW), H.V. TEST LEAD, or tested object. Even when a test has been terminated, there may still be voltage in the output-voltage terminals.

- (1) The analog voltmeter reads 0 kV.
- (2) The DANGER lamp is OFF.

When the preset test time has elapsed, the unit switches to the PASS state and immediately stops outputting a voltage.

If the test time has not been set, PASS screening is not performed. To the test, press the **STOP** key, which will forcibly terminate the test.

Flow of PASS determination



1. Press the **START** key to begin testing.
The output is synchronized with the supply voltage waveform. The tester will not output a voltage until the supply voltage waveform becomes 0 V after the **START** key is pressed.
Since the output is not stabilized, the output voltage will fluctuate with the load current.
Set the output voltage with the tester connected to the device to be tested.
2. The tester continues to output voltage until the set test time has elapsed.
If a current measurement equals or exceeds the set threshold during the test time, the tester enters the "FAIL state" and halts output.
3. After the test time has elapsed, the tester enters the "PASS state" and halts voltage output.
In the "PASS state," the green LED and the PASS relay for the external I/O output are both ON.
4. After the "PASS state (which lasts for about 1 second)", the tester returns to the ready state.

3.2.2 "FAIL" State



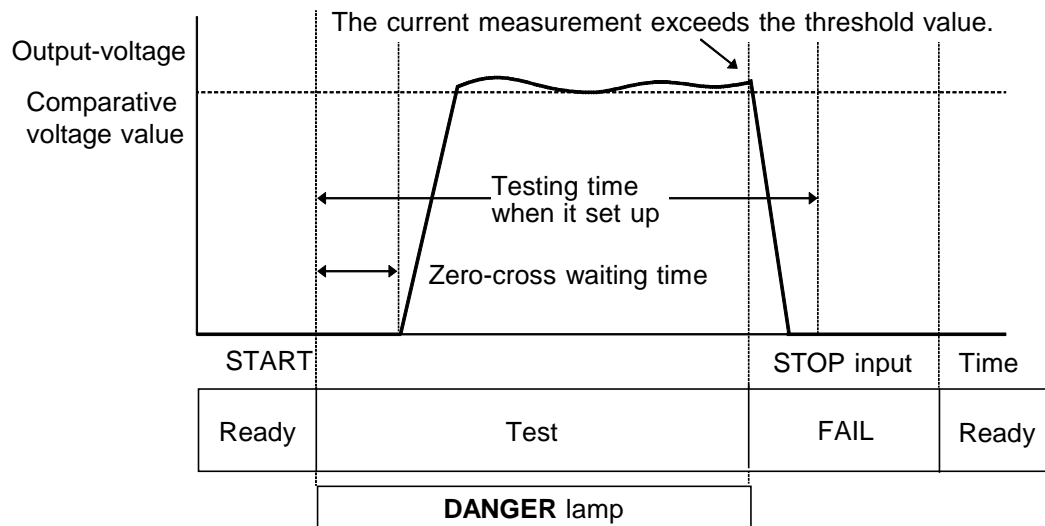
Confirm the following items, before touching the output-voltage terminals (HIGH and LOW), H.V. TEST LEAD, or tested object. Even when a test has been terminated, there may still be voltage in the output-voltage terminals.

- (1) The analog voltmeter reads 0 kV.
- (2) The DANGER lamp is OFF.

If a current measurement equals or exceeds the tests upper limits during the test, the tester enters the "FAIL state."

The unit switches to the FAIL state and immediately stops outputting a voltage.

Flow of FAIL determination



1. Press the **START** key to begin testing.
The output is synchronized with the supply voltage waveform. The tester will not output a voltage until the supply voltage waveform becomes 0 V after the **START** key is pressed.
Since the output is not stabilized, the output voltage will fluctuate with the load current.
Set the output voltage with the tester connected to the device to be tested.
2. The tester continues to output voltage until the set test time has elapsed.
If a current measurement equals or exceeds the set threshold during the test time, the tester enters the "FAIL state" and halts output.
3. The buzzer sounds and the red LED lights. The FAIL relay for the external I/O output is turned ON. The tester remains in the "FAIL state" until the next STOP input.

Chapter 4

External Interface

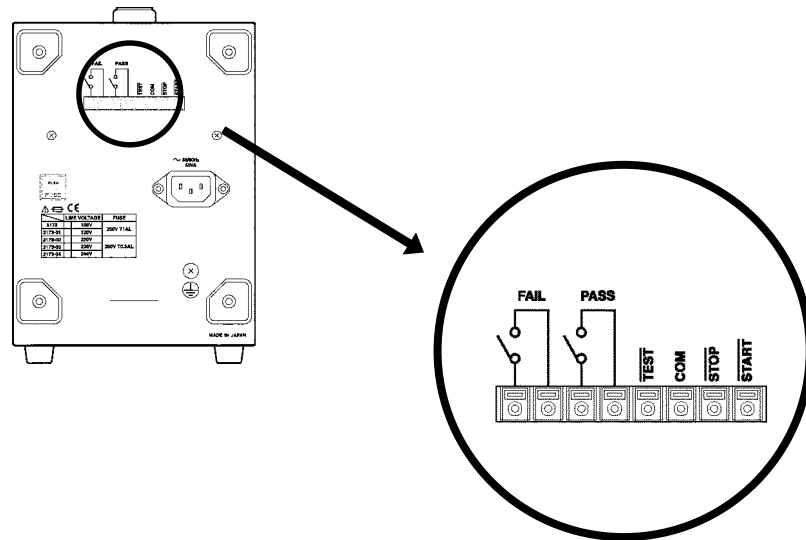
4.1 External I/O Terminal

This tester has five external control signal terminals on its rear panel: PASS and FAIL (relay contact output), TEST (open collector output without pull-up), START and STOP (input, 5 V pull-up).



The **START** key and **STOP** key are connected with the START external input signal and STOP external input signal, respectively, as OR gates. Key input is equivalent to external signal input. START and STOP signals are internally pulled up to 5V.

4.1.1 Signal Line



Input Signals

- (1) **START** (Wired "OR" connection with **START** key: Low active)
Measurement begins when this signal becomes low at the specified timing. (This is equivalent to pressing the **START** key.) This terminal is connected with **START** key input as a wired OR gate. When the **START** key is pressed, the input signal becomes low. It is internally pulled up to 5V.
- (2) **STOP** (Wired "OR" connection with **STOP** key: Low active)
Measurement is halted when this signal becomes low at the specified timing. (This is equivalent to pressing the **STOP** key.) This terminal is connected with **STOP** key input as a wired OR gate. When the **STOP** key is pressed, the input signal becomes low. It is internally pulled up to 5V.



When the **START** or **STOP** key is pressed, the **START** or **STOP** input signal becomes low respectively. When using a gate IC, connect it via a transistor, or take other similar measures. If an IC is connected directly to the terminals, the external IC may be short-circuited with GND, damaging the IC.
(See "4.2.1 Example of Input Signal Connection.")

Output Signals

(1) PASS (Relay contact output)

This signal is turned ON when the tester returns a PASS judgment.

(2) FAIL (Relay contact output)

This signal is turned ON when the tester returns a FAIL judgment.

(3) TEST (Open collector output: Low active)

Indicates that the tester is outputting a high voltage. This signal stays low while the high voltage is output. A pull-up resistor is not connected internally.



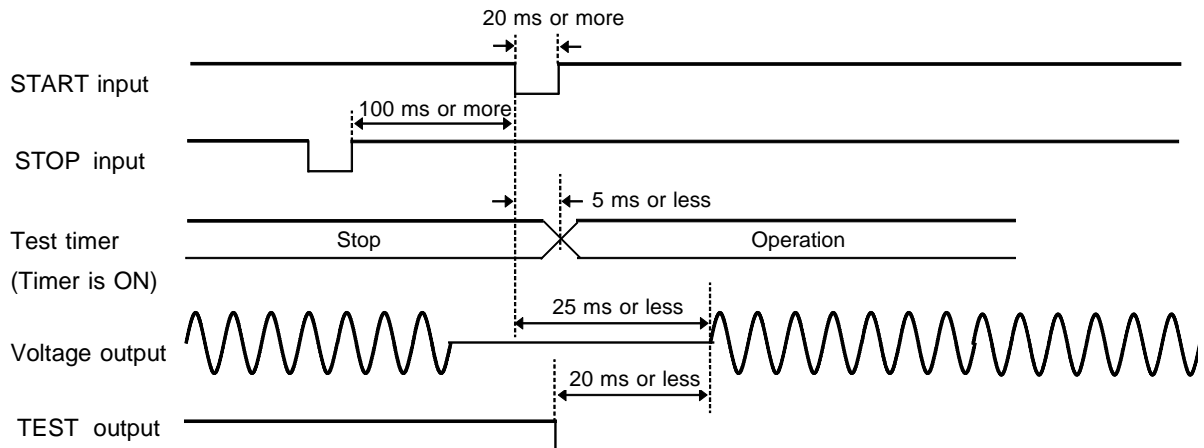
When using START and STOP relay contacts, check the power rating of the relays. Remain alert for chattering caused by relay ON/OFF.

4.1.2 Timing Chart of External I/O Terminal

(1) Timing chart at time of start of testing

The figure below shows a timing chart after a START signal is input and a test is begun.

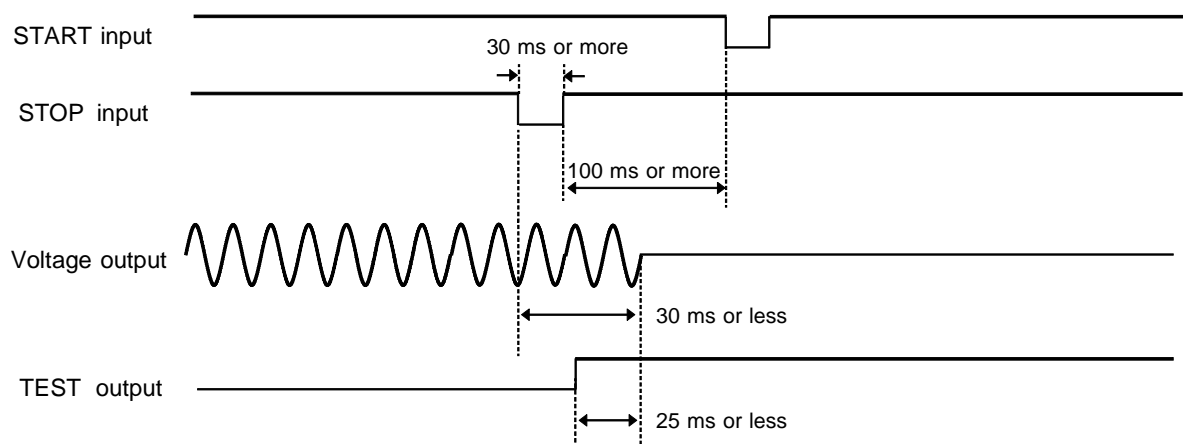
If the **START** key (START signal) and **STOP** key (STOP signal) are pressed simultaneously, the **STOP** key (STOP signal) overrides the **START** key (START signal).



(2) Timing chart at time of termination of testing

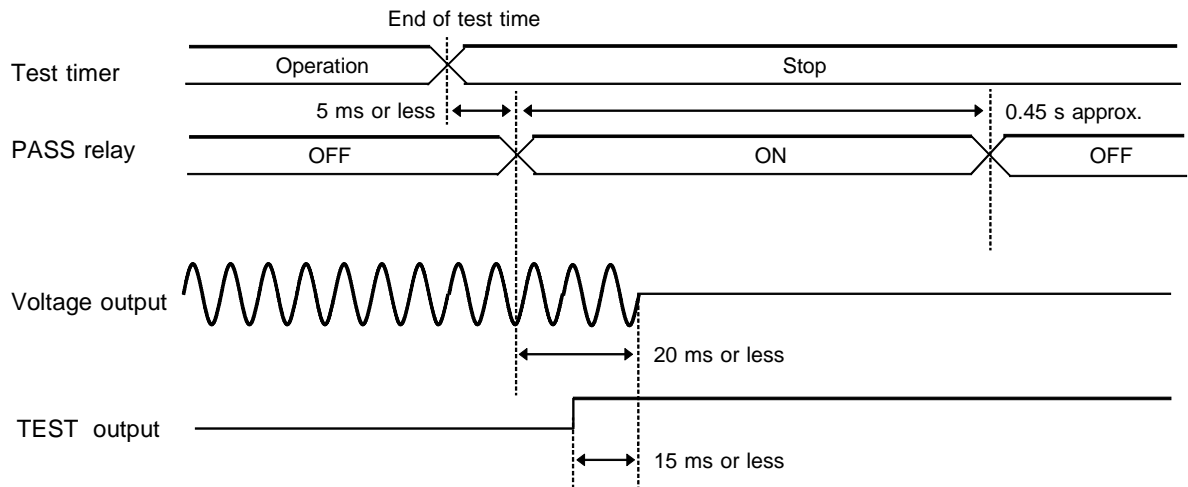
The figure below shows a timing chart after a STOP signal is input and a test is sto.

If the **START** key (START signal) and **STOP** key (STOP signal) are pressed simultaneously, the **STOP** key (STOP signal) overrides the **START** key (START signal).



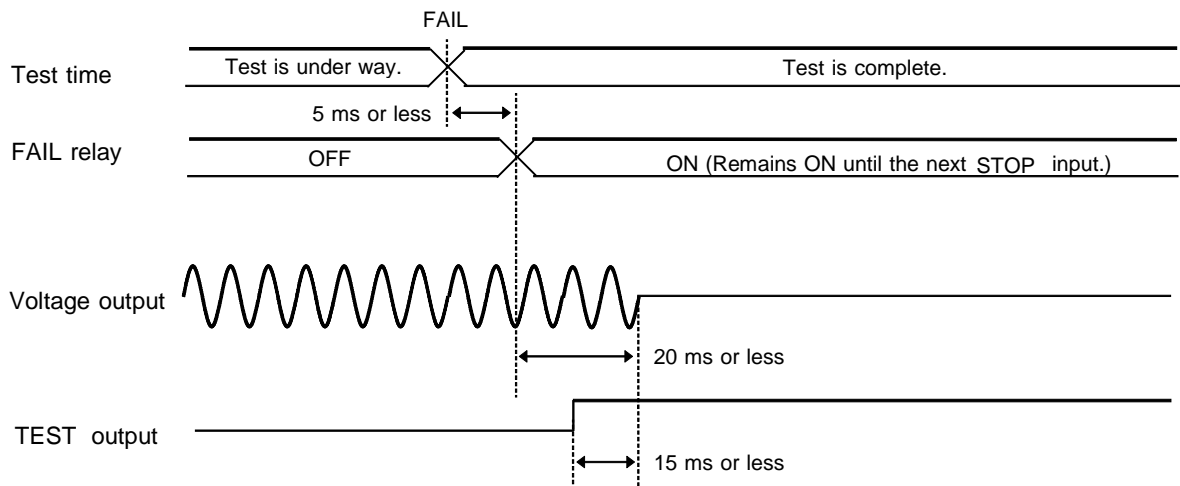
(3) PASS Judgment Timing Chart

The figure below shows a timing chart for when the set test time has elapsed and the test returns a PASS judgment.



(4) Test Judgment Timing Chart

The figure below shows a timing chart if a current measurement exceeds the threshold during test and the test returns a FAIL judgment.



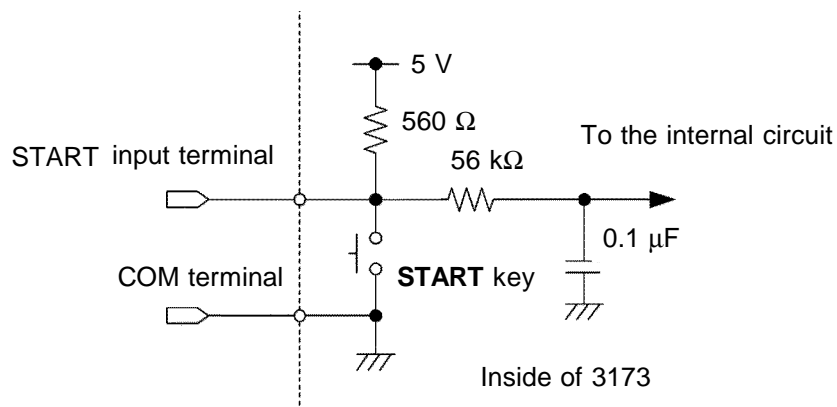
4.2 Example of External I/O Terminal

4.2.1 Example of Input Signal Connection

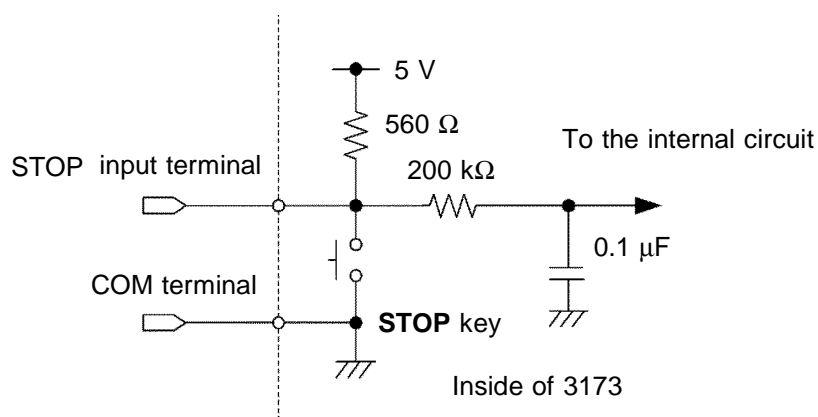
The unit can be controlled externally using the external I/O input signal.

EXT I/O Input Signals Specifications

Input signals	Active low input (not isolated)
Maximum input voltage	5.5 V DC
HIGH level voltage	H_{\max} : 5.5 V DC, H_{\min} : 4.5 V DC
LOW level voltage	H_{\max} : 1.0 V DC, H_{\min} : -0.5 V DC
Signal names	START : Measurement start STOP : Measurement stop Each signal is internally pulled up to 5 V with a 560 Ω resistor.



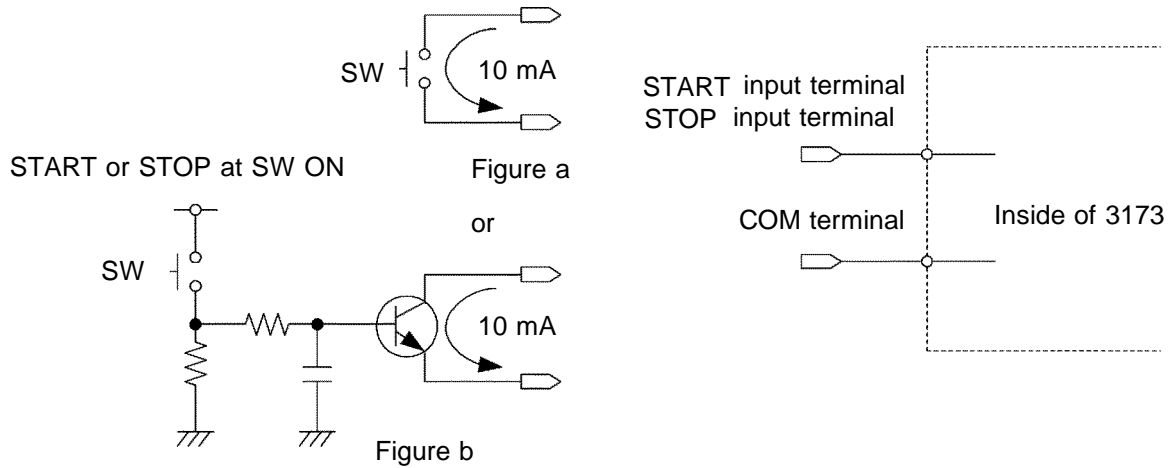
START input terminal



STOP input terminal

(1) To Control with External Switch

When controlling START and STOP signals using a relay or switch, connect them as shown below. To prevent switch or relay chattering, we recommend using the connection shown in Figure b. For this connection, implement the circuit so that a current of 10 mA flows to the transistor.

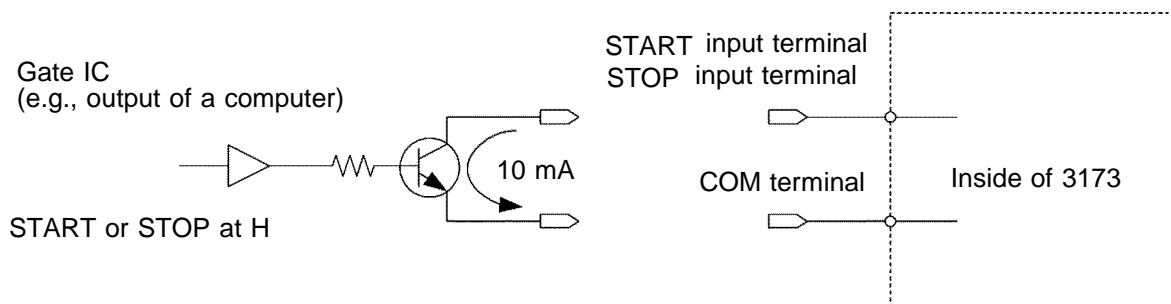


NOTE

For connection to the input signal, provide a circuit that protects the relay and switch from chattering to prevent malfunctioning.

(2) To Control with External IC or Computer

When controlling START and STOP signals using an external IC or computer, connect them as shown below. Design the circuit so that a current of 10 mA flows to each signal terminal. (See the note in "4.1.1 Signal Line.")



4.2.2 Example of Output Signal Connection

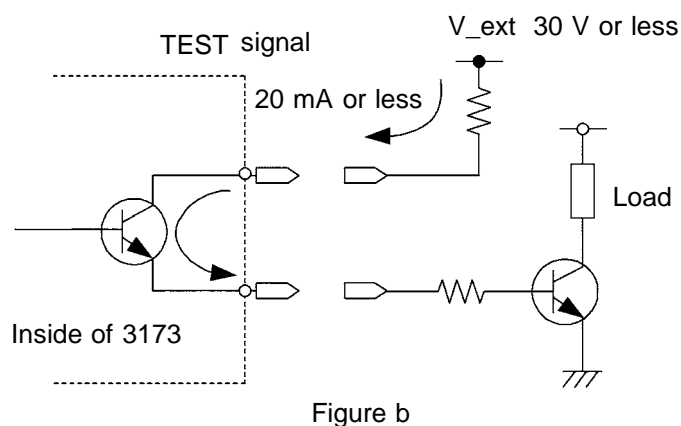
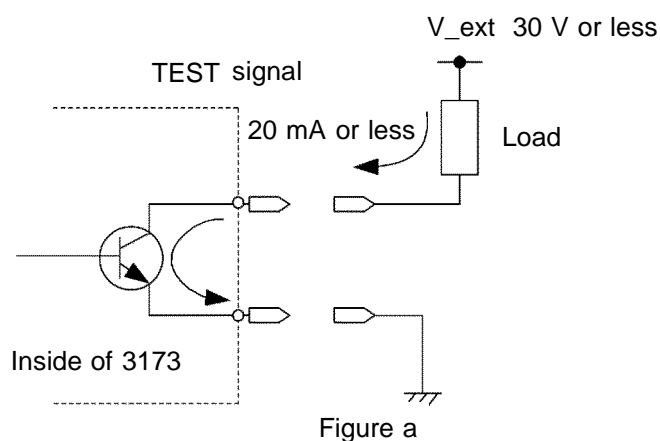
The external I/O terminals are used to output various tester state signals. For output examples, see "4.1.2 Timing Chart of External I/O Terminal."

External I/O Output Signal Specification

Output signals	Relay contact (PASS and FAIL) Open collector output (TEST)
Maximum load voltage	250 V AC 30 V DC (PASS and FAIL) 30 V DC (No internal pull-up, TEST)
Maximum output current	1 A / 1 signal (PASS, FAIL), 20 mA (TEST)
Output saturated voltage	0.5 V DC or less (TEST)
Signal name	PASS : The test returns a PASS judgment. FAIL : The test returns a FAIL judgment. TEST : Test is under way.

(1) To Drive a Load

To interlock with an external device by controlling a load (e.g., relay), connect as shown below.



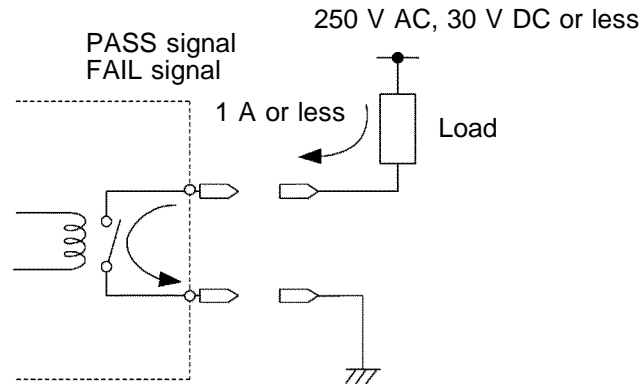


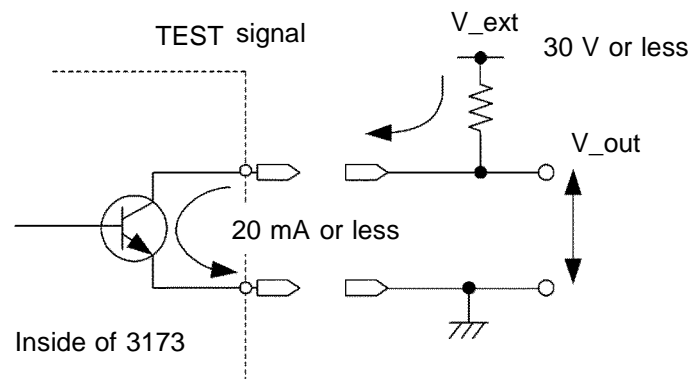
Figure c

NOTE

- The maximum current that can be directed to the TEST signal terminal is 20 mA. For larger currents, use a transistor or similar device for amplification, as shown in Figure b.
- When connecting a relay or other inductive load to the terminals, connect the diode in parallel with the coil.
- When connecting a load to the output relay for PASS or FAIL, check the power rating of the relay.

(2) To Generate Signal Levels

To generate signal levels, connect the terminals as shown below. Note the output current.



	Maximum	Minimum
V_outH	V_ext	V_ext-1.5
V_outL	0.5	

NOTE

- The output signal status upon power-on may be undetermined. Care should be taken in the operation of equipment connected to the external I/O.

Chapter 5

Specifications

5.1 Basic Specifications

Voltage Generator

Voltage	0 to 3.0 kV AC (Single range)
Voltage testing method	Zero-toggle switch
Transformer capacity	30 VA
Voltage adjustment method	Manually adjusted
Voltage measurement	Analog, 0 to 3 kV AC f.s., Accuracy: $\pm 5\%$ f.s.
Waveform	Mains waveform
Frequency	Mains synchronous

Current Detection Section

Interrupting current setting range	0.1 to 9.9 mA
Resolution for setting	0.1 mA, , using a digital switch
Interrupting current accuracy	$\pm(5\% + 0.05 \text{ mA})$ of the set level

Decision Function

Decision method	Analog comparator method (digital setting)
Judgment	<p>PASS : The current measurements remain below the set threshold value until the set time has elapsed (only when the test timer is set).</p> <p>FAIL : A current measurement exceeds or equals the set threshold.</p>
Decision process	Output to the display, beeper sound, signals to EXT I/O for each decision result

Timer Section

Setting range	1 to 99 s
Operation	ON : Test continues until the set time elapses. OFF: Test continues until STOP input or FAIL judgment.
Setting resolution and accuracy	1 s (1 to 99 s), $\pm(1\% + 50 \text{ ms})$ of the set level

Interface

EXT I/O Input Signals

Input signals	Active low input (not isolated) (Wired "OR" connection with START/STOP key) Pulled up to 5 V with 560 Ω .
Maximum input voltage	5.5 V DC
HIGH limit voltage	H_{\max} : 5.5 V DC, H_{\min} : 4.5 V DC
LOW limit voltage	L_{\max} : 1.0 V DC, L_{\min} : -0.5 V DC
Signal names	START : Measurement start STOP : Measurement stop

EXT I/O Output Signals

Output signals	Relay contact (PASS and FAIL) Open collector output (TEST, without pull-up and insulation)
Max. load	Relay contact 250 V AC / 30 V DC, 1A TEST signal 30 V DC, 20 mA Output saturated voltage 0.5 V or below
Signal names	TEST : Test is under way. PASS : The relay is turned ON when the test returns a PASS judgment. (Only when the test timer is used.) FAIL : The relay is turned ON when the test returns a FAIL judgment.

5.2 General Specifications

Display	Analog meter (voltage only)	
Operating temperature and humidity	0 to 40°C (32 to 104°F), 80%RH or less (no condensation)	
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 90%RH or less (no condensation)	
Operating temperature and humidity for guaranteed accuracy	23°C±5°C (73°F±9°F), 80%RH or less (no condensation) after 10 minutes minimum warm-up Accuracy guaranteed for 1 year.	
Operating environment	Max. 2000 m height (6562 feet), Pollution Degree 2, Indoors	
Power supply	3173 : 100 V AC 3173-01: 120 V AC 3173-02: 220 V AC 3173-03: 230 V AC 3173-04: 240 V AC (Voltage fluctuations of 10% from the rated supply voltage are taken into account.)	
Power supply frequency	50/60 Hz	
Dielectric strength	1.35 kV AC, 10 mA, 1 minute between power supply and frame	
Maximum rated power	3173: 100 V AC 3173-01: 120 V AC 3173-02: 220 V AC 3173-03: 230 V AC 3173-04: 240 V AC (Common to all voltages: 50 VA)	
Dimensions	149W X 200H X 215D mm (5.87"W X 7.87"H X 8.46"D) Approx. (excluding projections)	
Mass	3173 : 6.3 kg (222.2 oz.) Approx. 3173-01, 3173-02, 3173-03, 3173-04 : 7.0 kg (246.9 oz.) Approx.	
Fuse	250VT1AL (3173, 3173-01), 250VT0.5AL (3173-02, 3173-03, 3173-04)	
Accessories	9615 H.V.TEST LEAD (HIGH/LOW side) Power cord Spare fuse Instruction manual	1 each 1 1 1
Standard applying	EMC: EN61326 CLASS A Safety: EN61010	
Product warranty period	3 years	

5.3 9615 H.V. TEST LEAD Specifications

Rated voltage	HIGH : 5 kV AC / 5 kV DC LOW : 600 V AC / 600 V DC
Rated current	HIGH : 150 mA AC/ 150 mA DC LOW : 10 A AC / 10 A DC
Dielectric strength	HIGH : 6.25 kV AC, sensitivity current 5 mA, 1 minute LOW : 1.35 kV AC, sensitivity current 5 mA, 1 minute Tested area: (Conductor-cable covering)
Operating temperature and humidity	0 to 40°C (32 to 104°F), 20 to 80%RH (no condensation)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 90%RH or less (no condensation)
Operating environment	Max. 2000 m height (6562 feet), Pollution Degree 2, Indoors
Dimensions	1.5 m (59.06") Approx.
Mass	100 g (3.5oz.) Approx. (HIGH and LOW)
Standard applying	EN61010

Chapter 6

Maintenance and Service

6.1 Maintenance and Inspection

To ensure the safe operation of this unit, perform maintenance regularly.

- If the unit has been subject to moisture, or if oil and dust have accumulated in the unit interior, the danger of electrical shock or fires resulting from the deterioration of insulation increases greatly. If the unit is ever subject to excessive moisture, oil, or dust, cease use immediately, and return the unit to us for maintenance.
- Spare and replacement parts for this product are guaranteed to be available only until 7 years after manufacture of this model is terminated.

Replaceable Parts

Main parts to be replaced periodically, and their life times: (Useful life depends on the operating environment and frequency of use. Operation cannot be guaranteed beyond the following periods.)

Part	Life
Start Switch	Approx. 200000 cycles
Stop Switch	Approx. 200000 cycles

- If damage is suspected, check the "Troubleshooting" section before contacting your dealer or Hioki representative.

When reshipping the product, 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.

Troubleshooting

Symptom	What to check and Solution
The power switch is ON, but no power is supplied.	Is the power cord disconnected? Connect the power cord. Has the fuse blown? Replace the fuse. (See "6.3 Fuse Replacement.")
The tester does not begin testing when the START key is pressed.	Are the external input terminals (START, STOP) fixed to low level? Set the external input terminals so that they become high when there is no input.
The external TEST signal is not output.	Is the pull-up resistor for TEST signal connected? Is TEST signal pulled up at appropriate resistance? Pull up TEST signal using an appropriate resistance level. (See "4.2.2 Example of Output Signal Connection.")

If any of the following should occur, stop using the unit, disconnect the power cord and 9615 H.V.TEST LEAD, and contact your dealer or HIOKI representative.

- If you are certain that the unit is damaged.
- If the measurement you wish to perform is inoperative.
- If the unit was stored for a long period of time in high temperatures and humidity, or other undesirable conditions.
- If the unit was damaged in transit.

6.2 Cleaning

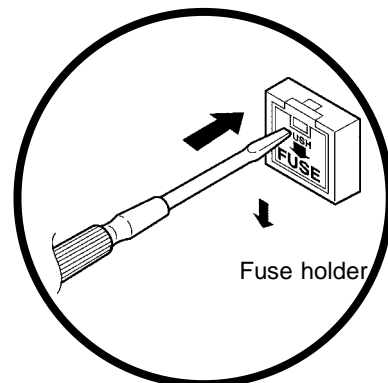
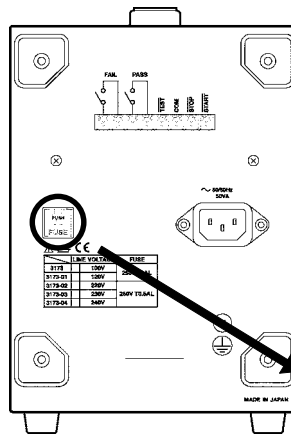
To clean the product, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.

6.3 Fuse Replacement

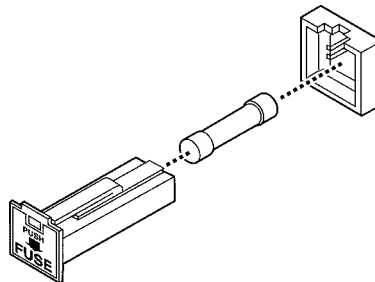


- To avoid electric shock, turn off the power switch and disconnect the H.V. TEST LEAD before replacing the fuse.
 - Replace the fuse only with one of the specified characteristics and voltage and current ratings. Using a non-specified fuse or shorting the fuse holder may cause a life-threatening hazard.
- Fuse type: 250VT1AL (3173, 3173-01), 250VT0.5AL (3173-02, 3173-03, 3173-04)

1. Turn the power OFF, and disconnect the power cord.
2. Unlock the fastener on the fuse holder on the rear panel using a slotted screwdriver, and remove the fuse holder.



3. Replace the power fuse with a rated fuse.



4. Reset the fuse holder.

Warranty Certificate

HIOKI

Model	Serial number	Warranty period Three (3) years from date of purchase (____ / ____)
-------	---------------	--

Customer name: _____

Customer address: _____

Important

- Please retain this warranty certificate. Duplicates cannot be reissued.
- Complete the certificate with the model number, serial number, and date of purchase, along with your name and address. The personal information you provide on this form will only be used to provide repair service and information about Hioki products and services.

This document certifies that the product has been inspected and verified to conform to Hioki's standards.

Please contact the place of purchase in the event of a malfunction and provide this document, in which case Hioki will repair or replace the product subject to the warranty terms described below.

Warranty terms

1. The product is guaranteed to operate properly during the warranty period (three [3] years from the date of purchase).
If the date of purchase is unknown, the warranty period is defined as three (3) years from the date (month and year) of manufacture (as indicated by the first four digits of the serial number in YYMM format).
2. If the product came with an AC adapter, the adapter is warranted for one (1) year from the date of purchase.
3. The accuracy of measured values and other data generated by the product is guaranteed as described in the product specifications.
4. In the event that the product or AC adapter malfunctions during its respective warranty period due to a defect of workmanship or materials, Hioki will repair or replace the product or AC adapter free of charge.
5. The following malfunctions and issues are not covered by the warranty and as such are not subject to free repair or replacement:
 - 1. Malfunctions or damage of consumables, parts with a defined service life, etc.
 - 2. Malfunctions or damage of connectors, cables, etc.
 - 3. Malfunctions or damage caused by shipment, dropping, relocation, etc., after purchase of the product
 - 4. Malfunctions or damage caused by inappropriate handling that violates information found in the instruction manual or on precautionary labeling on the product itself
 - 5. Malfunctions or damage caused by a failure to perform maintenance or inspections as required by law or recommended in the instruction manual
 - 6. Malfunctions or damage caused by fire, storms or flooding, earthquakes, lightning, power anomalies (involving voltage, frequency, etc.), war or unrest, contamination with radiation, or other acts of God
 - 7. Damage that is limited to the product's appearance (cosmetic blemishes, deformation of enclosure shape, fading of color, etc.)
 - 8. Other malfunctions or damage for which Hioki is not responsible
6. The warranty will be considered invalidated in the following circumstances, in which case Hioki will be unable to perform service such as repair or calibration:
 - 1. If the product has been repaired or modified by a company, entity, or individual other than Hioki
 - 2. If the product has been embedded in another piece of equipment for use in a special application (aerospace, nuclear power, medical use, vehicle control, etc.) without Hioki's having received prior notice
7. If you experience a loss caused by use of the product and Hioki determines that it is responsible for the underlying issue, Hioki will provide compensation in an amount not to exceed the purchase price, with the following exceptions:
 - 1. Secondary damage arising from damage to a measured device or component that was caused by use of the product
 - 2. Damage arising from measurement results provided by the product
 - 3. Damage to a device other than the product that was sustained when connecting the device to the product (including via network connections)
8. Hioki reserves the right to decline to perform repair, calibration, or other service for products for which a certain amount of time has passed since their manufacture, products whose parts have been discontinued, and products that cannot be repaired due to unforeseen circumstances.

HIOKI E.E. CORPORATION

<http://www.hioki.com>

18-07 EN-3

HIOKI

<http://www.hioki.com>



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