
MODEL 356A series

Digital Multimeter

Instruction Manual

I-01138

TSURUGA ELECTRIC CORPORATION

Contents

1. Preface	2
1-1 General notes	2
1-1-1 Inspection	2
1-1-2 Storage	2
1-2 Preparations prior to use	2
1-2-1 Power source	2
1-2-2 Power source cord	2
1-2-3 Replacement of fuse	2
1-2-4 Handling notes	3
2. Name of parts and functions	3
2-1 Front panel	3
2-2 Rear panel	4
3. Operation	5
3-1 Power source	5
3-2 Change-over of measuring range	5
3-3 Comparator operation	5
3-3-1 Conditions for comparison	5
3-3-2 Comparison output	5
3-3-3 Adjustable range	5
3-4 Mask time	5
3-4-1 Adjustable range	5
3-5 Protective action	6
3-6 NORMAL mode	6
3-7 CONTINUE mode	6
3-8 Manual operation	7
3-9 Remote operation	7
4. Measurement	8
4-1 Measuring method	8
5. Panel mount use (option)	9
5-1 Mounting	9
5-2 Dimension when fitted with escutcheon	9
6. Specifications	10
6-1 Model names and measuring range	10
6-2 General specifications	10 6-3
External dimensions	Back cover

1. Preface

Thank you very much for your purchase of our MODEL 356A. For safety and proper use of the product, please observe the following precautions and read the instructions carefully before the initial operation.

⚠ CAUTION

To avoid break-down, malfunction or shortening the life time of the product, do not use this product in such places where:

exposed to rain, water drops or direct sunlight.

high temperature or humidity, heavy dust or corrosive gas.

affected by external noise, radio waves or static electricity.

Do not dismantle or modify the product.

The model 356A is the digital megger provided with a comparator function which enables to perform insulation resistance tests of domestic electric appliances or electronic apparatus based on the electric appliances regulations and various foreign regulations.

It employs an easy-to-read green LED and is a compact insulation resistance tester with its digital comparator of GOOD/NG judgement speed 0.2 sec. As an escutcheon for panel mounting is available at option, it is easy to mount the tester in the system panel.

1-1 General notes

1-1-1 Inspection

Upon receiving the tester, confirm that it corresponds to the specifications and that it has not been damaged during the transportation.

If any damage or inconvenience is found, please consult our dealer or us informing of the model number and serial number of the product.

1-1-2 Storage

In case of storing the tester for a long time, choose the place with the low ambient humidity and where it is not exposed to the direct sunlight.

1-2 Preparations prior to use

1-2-1 Power source

The power source voltage is set to 100VAC at the factory before delivery and it is indicated on the caution plate fitted to the rear panel. When the tester is used as originally set, use it with the power source voltage within 90V~132VAC and frequency 50/60Hz.

In case that the tester is used with the power source voltage 180~264VAC, change over the internal selection switch to the 180~264V side, and replace the caution plate [90V~132VAC] with [180~264VAC] accordingly. Be sure to make a change of selection switch after confirming the power source voltage to use. Also ensure that the power switch is OFF when connecting the power source cord.

1-2-2 Power source cord

The plug of power source cord connected to the tester is for 100VAC use. When the tester is used with 200VAC, replace the plug with appropriate one for 200VAC use.

1-2-3 Replacement of fuse

A 0.5A power source fuse is mounted at the factory before delivery.

In case that the tester is used with the power source voltage 180~264VAC, replace it with an attached 0.25A power source fuse. The power source fuse is housed in the fuse holder on the rear panel.

Be sure to unplug the power source cord before replacing the fuse.

1-2-4 Handling notes

1) To avoid an electric shock, do not touch the measuring terminals (EARTH, LINE, GUARD terminals on the front/rear panel) during the test.

- 2) When switching on the main power just after it is switched off, be sure to wait for several seconds before switching it on again.
- 3) To avoid an electric shock, do not touch the metallic parts of measuring lead during the test.
- 4) In case of high resistance display, the stability of display becomes bad due to response speed but it is not a defect.

2. Name of parts and functions

2-1 Front panel

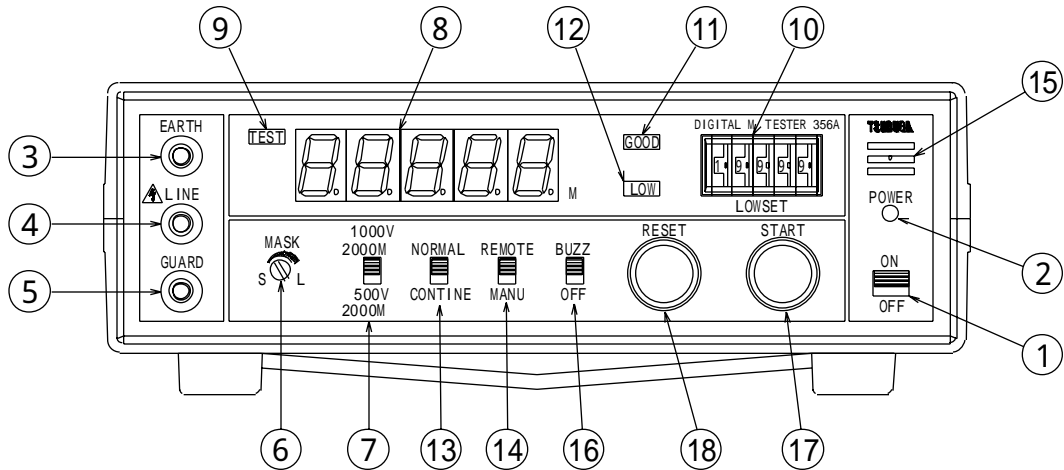


Fig.2-1

- 《1》 **Power ON/OFF switch (ON/OFF)**
Switch to power ON or OFF the tester.
 - 《2》 **Power display LED (POWER)**
LED lights on when main power is ON.
 - 《3》 **Measuring terminal (EARTH)**
+side measuring terminal. Connect to the grounded side of the sample when it is grounded.
 - 《4》 **Measuring terminal (LINE)**
-side measurement terminal, connected to the non-grounded side of the sample.
 - 《5》 **Measuring terminal (GUARD)**
Terminal to guard a leak current of LINE.
 - 《6》 **Mask volume (MASK)**
For setting the waiting time for judgement in NORMAL operation mode.
It is adjusted by a small minus driver.
 - 《7》 **Measuring range change-over switch**
For change-over of 2 ranges (500V-2000MΩ, 1000V-2000MΩ)
 - 《8》 **Display (MΩ)**
1999.9 green LED to display the measured resistance value.
 - 《9》 **In-measurement light (TEST)**
Yellow LED lights on when measuring voltage outputs.
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- 《10》 **Lower limit setting switch (LOWSET)**
For setting the lower limit.
 - 《11》 **Good judgement display (GOOD)**
Green LED is lit up when measurement result is good.

- 《12》 **Lower limit judgement display (LOW)**
Red LED is lit up when the display value is at or lower than lower limit value.
- 《13》 **Mode switch (NORMAL/CONTINUE)**
Change-over switch to select NORMAL or CONTINUE mode.
- 《14》 **Remote switch (REMOTE/MANU)**
Change-over switch to select remote or manual operation.
- 《15》 **Buzzer**
Fault warning buzzer.
- 《16》 **Buzzer switch (BUZZ/OFF)**
Buzzer becomes mute when switch is turned OFF.
- 《17》 **Start switch (START)**
For starting a test in manual operation mode.
- 《18》 **Reset switch (RESET)**
For resetting a test in manual operation mode.

2-2 Rear panel

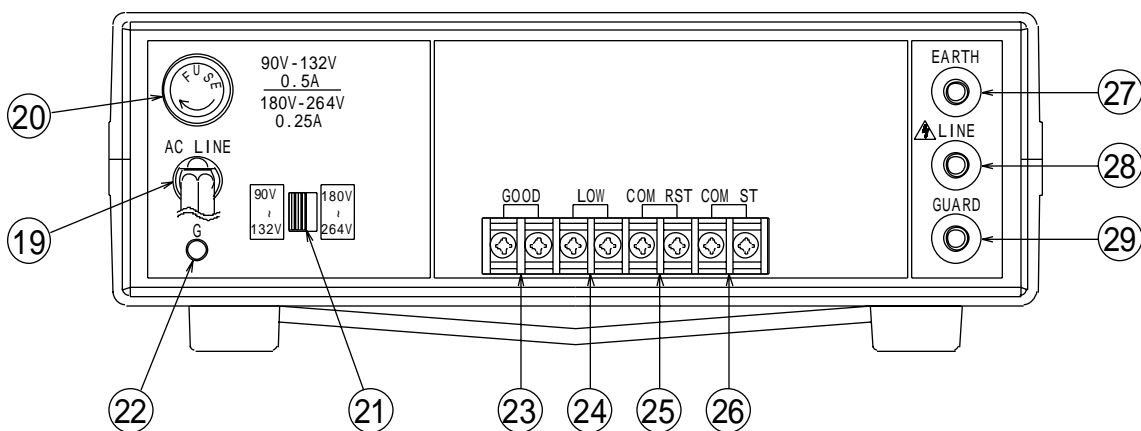


Fig.2-2

- 《19》 **Power source cord (AC LINE)**
 - 《20》 **Fuse holder**
0.5A miniature type fuse is used (0.25A for 200V).
 - 《21》 **Power source voltage selection switch**
100VAC or 200VAC is selected.
 - 《22》 **Earth terminal (G)**
Ground terminal.
 - 《23》 **Good judgement contact output (GOOD)**
When measuring result is good, a contact (1a) turns ON.
Contact capacity AC250V, 1A resistive load
-
- 《24》 **Lower limit judgement contact output (LOW)**
When the display value is at or lower than the lower limit value, a contact (1a) turns ON.
Contact capacity AC250V, 1A resistive load
 - 《25》 **Reset input (COM-RST)**
Input terminal for reset signal of test, in remote operation mode.
 - 《26》 **Start input (COM-ST)**

- Input terminal for start signal of test, in auto operation mode.
- 《27》 **Rear measuring terminal (EARTH)**
Common with 《3》 measuring terminal (EARTH) on the front panel.
- 《28》 **Measuring terminal (LINE)**
Common with 《4》 measuring terminal (LINE) on the front panel.
- 《29》 **Measuring terminal (GUARD)**
Common with 《5》 measuring terminal (GUARD) on the front panel.

3. Operation

3-1 Power source

After confirming that the power source switch of the tester is OFF, plug the power source cord into the receptacle and turn ON the power source switch. The tester will promptly be ready to operate, but it is recommended to have a pre-heating time for 30 minutes or more.

3-2 Change-over of measuring range

The measuring range DC500V-2000M Ω or DC1000V-2000M Ω can be selected by measuring range change-over switch. Note) Do not change measuring range during a test operation.

3-3 Comparator operation

It is a digital comparator which compares a display value with the lower limit value.

3-3-1 Conditions for comparison

Displayed value > Lower limit value GOOD output
Displayed value < Lower limit value LOW output

3-3-2 Comparison output

Relay contact output : GOOD, LOW, each 1a contact 250VAC, 1A resistive load
Display : Red for LOW, green for GOOD
Buzzer : Buzzer sounds at LOW output.
(Buzzer sound can be turned OFF by BUZZ switch on the front panel.)

3-3-3 Adjustable range

Lower limit: 0~19999, the last digit corresponds to the resolution 0.1M Ω and no decimal point is set.

e.g.) To set the lower limit value 10.0M Ω , set the digital switch to 00100.

3-4 Mask time

It is a timer to prohibit the comparator operation for a certain time and functions in the NORMAL operation mode. It is set in such measurement of the samples with delay like condenser load etc. as may require the judgement waiting time. Set MASK volume fully to the S side.

3-4-1 Adjustable range

0.1~10.0 sec.

3-5 Protective action

It notifies abnormality without lighting TEST LED on in case of:

- 1) making EARTH terminal short-circuit to GUARD terminal.
- 2) abnormality of measuring voltage.

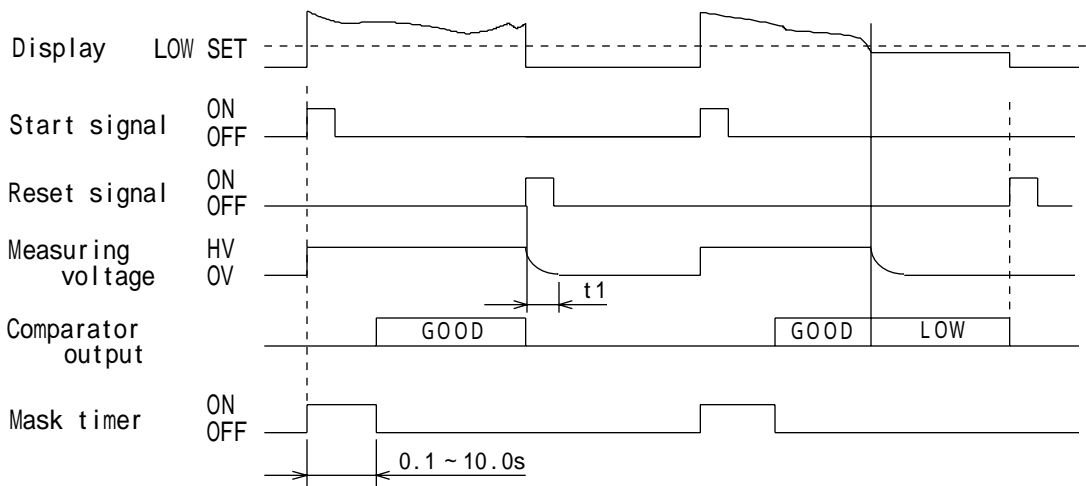
3-6 NORMAL Mode

In this operation mode, when the judgement becomes LOW during the measurement, the tester holds

the judgement result and display value, and shuts down the measuring voltage, then ends the measurement. To start the measurement, press start switch to output the measuring voltage and to activate mask timer. During the mask timer operation, comparator does not operate.

To end the measurement, shut down the measuring voltage by reset switch, and reset the judgement result and display value.

In case of the measurement ended with LOW judgement, start the measurement again after reset.



t_1 : approx. 0.3sec. It changes depending on samples.

Timing chart 3-1

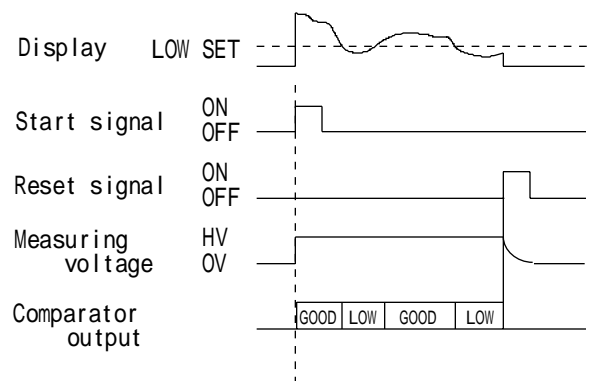
3-7 CONTINUE Mode

In this operation mode, the measurement continues without shutting down the measuring voltage, even if the LOW judgement is made during the measurement.

To start the measurement, press start switch to output the measuring voltage and to activate mask timer.

To end the measurement, shut down the measuring voltage by reset switch, and reset the judgement result and display value.

In this operation mode, MASK timer does not work.



Timing chart 3-2

3-8 Manual operation

When REMOTE switch is at MANU side, it is in the manual operation mode.

During the manual operation, start or end the test with START switch or RESET switch on the front panel.

Operating procedures

Set REMOTE switch at MANU side.

Set NORMAL or CONTINUE mode by mode switch.

Select the measuring range by measuring range change-over switch.

Set BUZZ switch OFF on necessity..

Set the lower limit value with the digital switch of the comparator.

Turn the power source switch ON.

Test

- (1) To start a test, switch start switch ON.
- (2) Applying the measuring voltage to the measuring terminal, start the measurement.
- (3) To end a test, switch reset switch ON.

3-9 Remote operation

When the remote switch on the front panel is at the REMOTE side, it is in the remote operation mode.

During the remote operation mode, start or end the test by ST or RST terminals at terminal block on the rear panel

Operating procedures

Set REMOTE switch at REMOTE side.

Set the NORMAL or CONTINUE mode by mode switch.

Select the measuring range by measuring range change-over switch.

Set BUZZ switch OFF on necessity.

Set the lower limit value with the digital switch of comparator.

Turn the power source switch ON.

Test.

- (1) To start a test, switch ST (start signal) ON (min. width 10ms).
- (2) Applying the measuring voltage to the measuring terminal, start the measurement.
- (3) To end a test, make RST (reset signal) ON (min. width 10 ms)

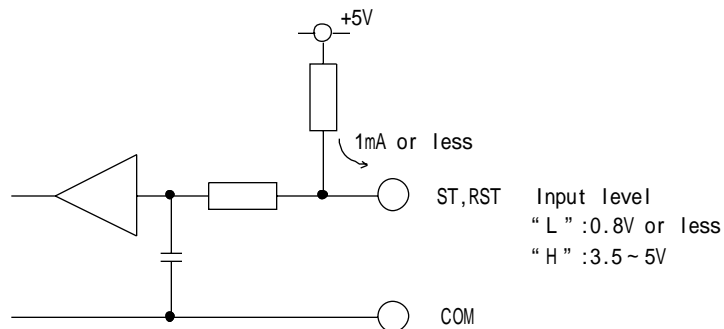


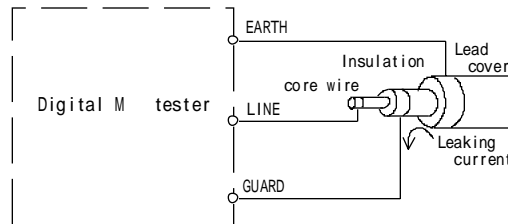
Fig.3-1

4. Measurement

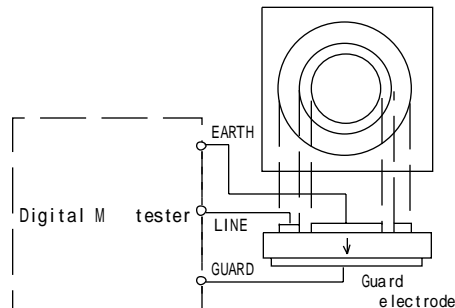
4-1 Measuring method

- (1) Connect the earth lead (black) plug into EARTH terminal, the line lead into (red) LINE terminal respectively. When getting the probe in contact with the sample, the insulation resistance is displayed.
- (2) When measuring the insulation resistance of the sample grounded, measure it by connecting the grounded side to EARTH terminal.
- (3) GUARD terminal is used when the fluctuation of display value is big due to the influence of leak or inductive current. Also, the volume or surface resistance of the cables, insulation materials and etc. can be measured by using GUARD terminal.

Measurement for cable insulation resistance



Measurement for surface resistance rate



Measurement for volume resistance rate

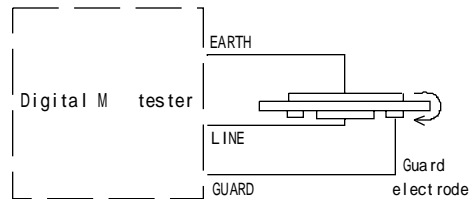


Fig.4-1

- (4) As the measuring terminal on the front panel and the measuring terminal on the rear panel are internally connected, use either measuring terminal. Both measuring terminals can not be used simultaneously.

5. Panel mount use (option)

Model name **356A**

Measuring range

Measuring range		Mean value	Accuracy
DC500V/2000MΩ	0~199.9 MΩ	50MΩ	± (2%rdg. +3digit)
	200.0~1000.0 MΩ		± (3%rdg. +8digit)
	1000.1~1999.9 MΩ		± (5%rdg. +8digit)
DC1000V/2000MΩ	0~199.9 MΩ	50MΩ	± (2%rdg. +3digit)
	200.0~1000.0 MΩ		± (3%rdg. +8digit)
	1000.1~1999.9 MΩ		± (5%rdg. +8digit)

Accuracy: 23°C ± 5°C, 45~75%RH

6-2 General specifications

Applicable standard	Conformity with JIS C1302-1994
Voltage with no load	+30%, -0% of rated voltage or less
Rated measuring current	1mA
Short circuit current	12mA or less
Display	0~19999 green LED (character height 14.2mm) Auto zero suppress function Flashing with 1999.9 at over-range or open input
Sampling rate	10 times/sec.
Display response	within 0.2 sec. * Note 1
Comparator	Setting for lower limit value, digital comparison system Adjustable range : 0~19999 Judgement time : within 0.2 sec. * Note 2 Judgement display : Red for LOW, Green for GOOD Judgement output : LOW, GOOD, each 1a contact Contact capacity - 250VAC, 1A (resistive load)
Judgement buzzer	Electronic buzzer for LOW, NG. Buzzer OFF function provided
Mask timer	0.1~10.0 sec.
Insulation resistance	Terminals - Enclosure : 1000VDC 100MΩ or more
Withstanding voltage	Case - Power source, input/output : 2000VDC for 1 min. terminals, control input, relay terminals Power source - Input/output terminals, : 1500VAC for 1 min. control input
Power source	100VAC (90~132V) or 200VAC (180~264V) 50/60Hz *Note 3
Power consumption	approx. 15VA
Operating ambient temperature	0~50°C
Storage temperature	-20~70°C
Weight	approx. 1.2 kg
Diameter	206(W) × 74(H) × 179(D)mm
Accessories	1 Measuring lead 1 Power source fuse 0.25A 1 Instruction manual

Note 1: Time required for the value to reach the rated accuracy when the mean value resistance is suddenly connected to the open measuring terminal.

Note 2: Time required to make a judgement operation when the judgement value is set to the mean value and the open measuring terminal is suddenly short-circuited.

Note 3: The tester can be used at 100VAC or 200VAC by change-over switch on the rear panel of the tester.

6-3 External dimensions

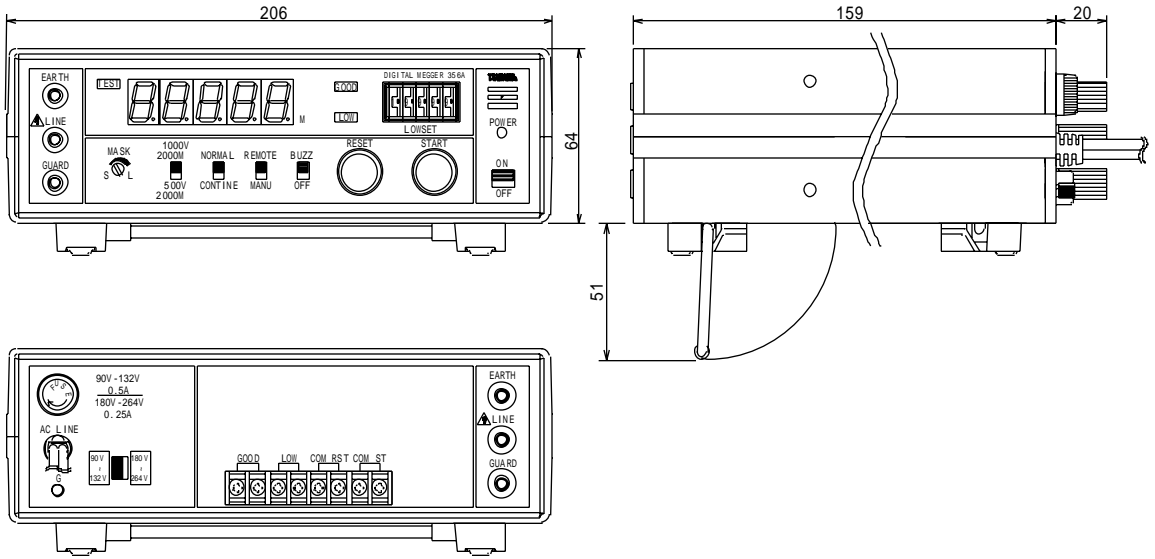


Fig.6-1