HIOKI

INSTRUCTION MANUAL

SM-7A

SMALL INSULATION RESISTANCE TESTER

HIOKI E. E. CORPORATION

Contents

1. Cautions for Operation

Please pay attention to the followings when operating this instrument:

(1) Pay much attention to the operation, since principally high voltage in low impedance is generated at the measuring terminals.

(2) The polarity of measuring voltage becomes as follows:
(+) : Voltage on red terminal
(−) : Voltage on black terminal

(3) When conducting self-calibration "CAL" of this instrument, always open the "Rx" terminal.

(4) When this instrument is not in service, always store it in a place where there is less humidity.

2. Specifications

Followings are the specifications of this instrument.

(1) Measuring voltage and measuring ranges

100VDC : 0.1 to 400MΩ (3-range)
250VDC : 0.25 to 1,000MΩ (3-range)
500VDC : 0.5 to 2,000MΩ (3-range)

(2) Measuring accuracy
500VDC : within ±10% of indicated value
between 0.5 and 5 on the scale range of 500V
For other voltage ranges: Conforms to the scale range of 500V

(3) Measuring voltage accuracy
Within ±3% for each voltage

(4) Alarm setting range
Full scale

(5) Alarm signal
Lamp (LED) and buzzer

(6) Power supply
AC line ±10% ,50/60Hz

(7) Dimensions
Approx. 249(w) x 120(h) x 235(d)mm

(8)Weight
Approx. 2.7kgs

Standard accessories

Measuring rods (red and black)	1 each
Instruction manual	1 copy

3. General Description

3.1 Principle of operation

This instrument employs the voltammeter method for its measurement which detects flowing current by the application of measuring voltage to a measured object.

For the accurate measurement, the measuring voltage stabilized through the whole measuring range is supplied by the introduction of a constant voltage circuit used with an error amplifier.

In addition, a comparator is so built-in that deviation for the set point is detected.

When the deviation is below the set point, alarm by an "ALARM" lamp (LED) and buzzer are generated.

Fig. 1 shows a block diagram of this instrument.

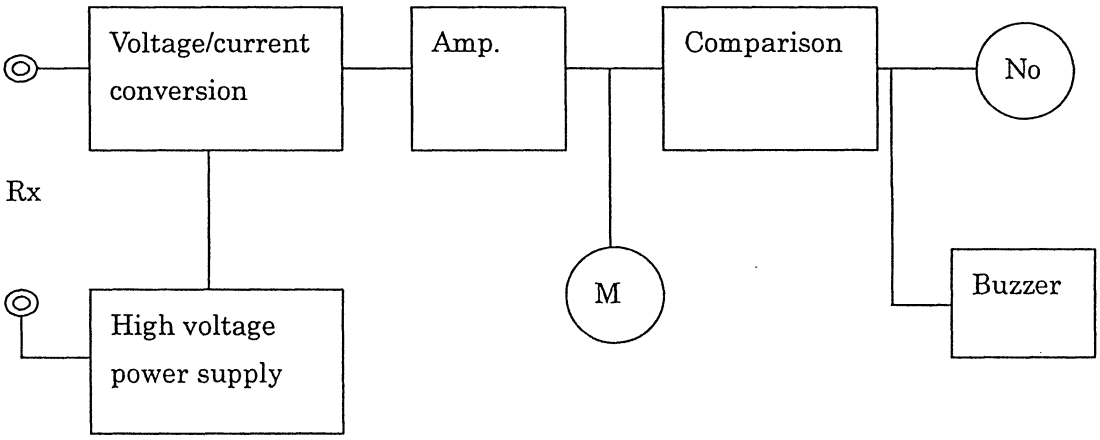


Fig. 1 Block Diagram

3.2 Features

This instrument has the following features and is so designed that the sate and efficient insulation resistance test can be conducted under the extremely easy operation.

Stabilized power supply for measurement

Each instrument in Hioki's SM series has a stabilized and constant power supply for the measurement. It also has a very accurate built-in power supply, resulting in the stable and accurate measurement.

Alarm device

This instrument can set any desired insulation resistance value ranging from the minimum to maximum scales on the indicator.

When the insulation resistance of a measured object is below this setting, an "ALARM" lamp (LED) on the front panel is lit and a buzzer sounds for alarm.

The evaluation test of the measured object becomes extremely easy.

Multi-range selection

The whole measuring range is covered by three ranges, which results in accurate reading.

With self-calibration circuit

Self-calibration at "CAL" is possible for checking the operating condition of this instrument. Thus, this instrument can always be used without any error.

Small in size and light in weight

This instrument is small in size and light in weight.

Thus, no large space is required on a work bench during the measurement.

3.3 Measuring power supply voltage stabilization

This instrument has a stabilized measuring power supply voltage.

Almost all of insulation resistance testers manufactured by other manufacturer have the specification of "±95% of rated value at mid-scale point" or " ±90% or more of rated value when the measuring terminals are open".

this means that measuring power voltage varies depending on load change.

The measuring voltage decreases especially when an insulation resistance smaller than the mid-scale point is measured.

This can be known from the specification and indicator.

Namely, "0" is graduated at the left or right end on the indicator scale. Thus, prior to operation, it is required to "adjust until the indicator pointer indicates "0" on the scale by short-circuiting measuring rods".

This instrument doe not required such "0" adjustment described above, thus realizing always the accurate measuring through the stabilized measuring power supply.

4.Name of each section

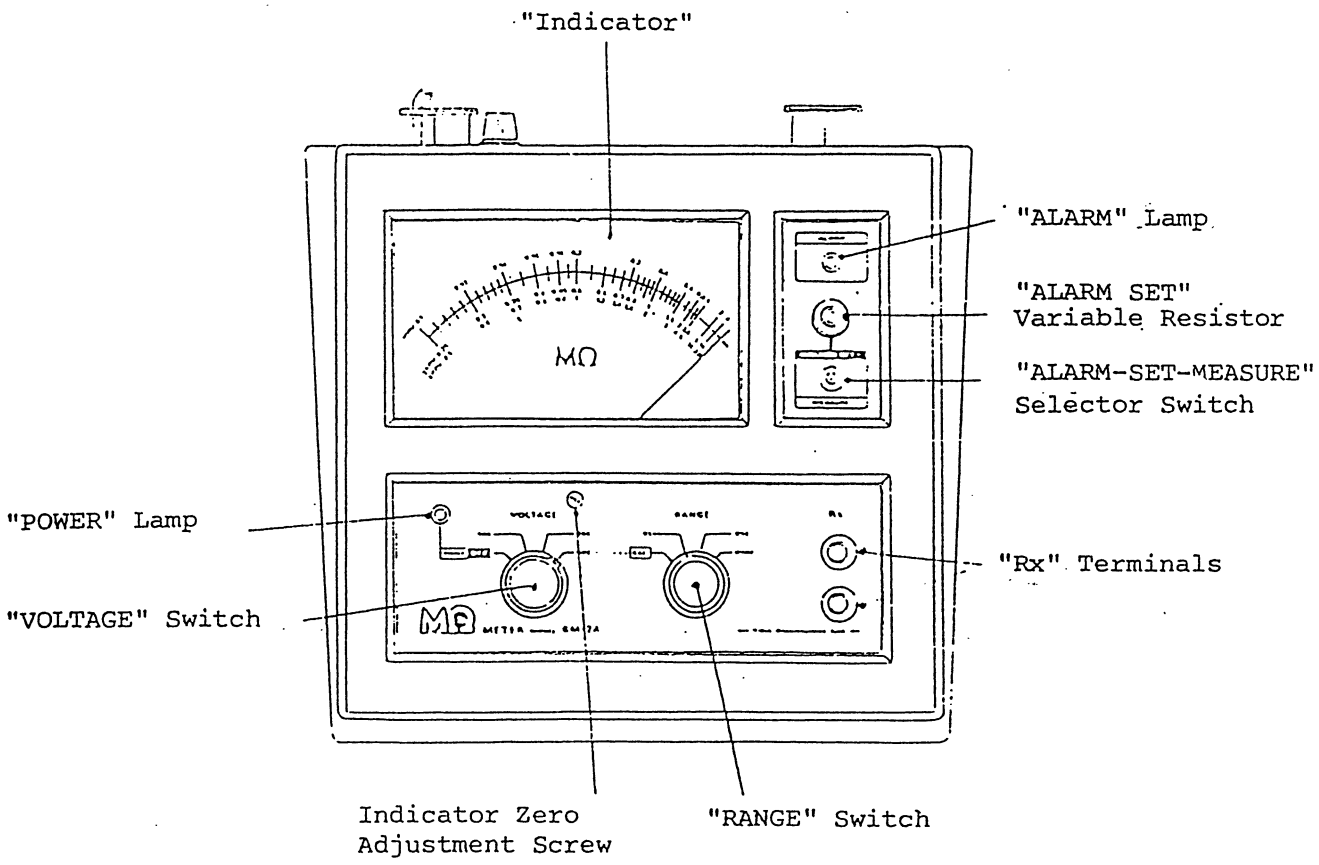


Fig. 2 Front Panel

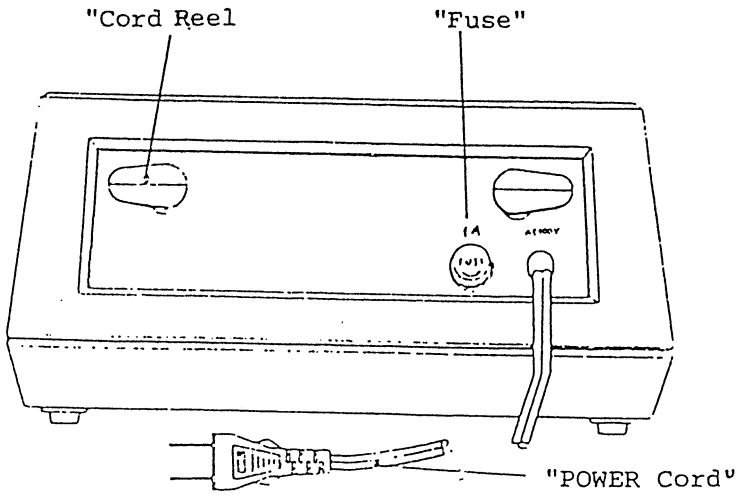


Fig. 3 Rear Panel

5. Description of each section

1) Front panel (Refer to Fig.2)

"POWER " lamp:

A lamp (LED) to indicate that AC commercial power is supplied to this instrument.

"VOLTAGE" switch:

A switch for measuring voltage selection and also used as a "POWER" switch.

Indicator zero adjustment screw:

A screw to adjust mechanical "zero" of the indicator on this instrument

Set the indicator pointer to the "∞" scale point when the "VOLTAGE" switch is set to "OFF".

"RANGE" switch:

A switch to select the measuring range of this instrument.

There are three ranges of x 1,x10 and x100.

"CAL" is for self-calibration of this instrument.

"Rx" terminal:

Terminals to connect the lead wire of measuring rods attached.

Insulation resistance of a measured object is measured using these rods.

"ALARM SET-MEASURE" selector switch

This switch is turned to the "ALARM SET" for alarm setting, while turned to the "MEASURE" side for the measurement.

"ALARM SET" variable resistor:

A variable resistor for alarm setting

"ALARM" lamp:

This lamp is lit when the insulation resistance of a measured object is below the alarm set point.

Simultaneously, a buzzer sounds.

"Indicator":

This indicator indicates a measured value and is graduated in "MΩ "

2) Rear panel (Refer to Fig.3)

Power cord:

A cord to supply AC commercial power to this instrument.

Fuse:

A fuse with a capacity of 1A is encased in a glass tube.

Cord reel:

A reel to wind the power cord when this instrument is unused.

6. Operation

Operate this instrument in accordance with the following procedures:

6.1 Preparation

Set the switches on the front panel to the positions indicated as follows:

Rx terminal "NO connection"

Voltage "OFF"

Range "x1"

Alarm set-measure selector switch "Measure"

Check the ∞ point on the indicator, then connect the power cord to an AC receptacle

This instrument is thus put to the stable measuring condition after a few minutes.

6.2 Self-calibration

Check that the indicator pointer indicates the " ∞" scale point, then turn the "RANGE" switch to "CAL". The pointer deflects to the left direction to indicate the FULL SCALE (scale point at the left end).

If this instrument is in the above condition, it is normal.

If the pointer deviates from the " ∞ " or "FULL SCALE" (CAL) point ,refer to item 8.

6.3 Alarm setting

When alarm is required, turn t he "ALARM SET-MEASURE" selector switch to The "ALARM SET" side, then turn the "ALARM SET" variable resistor until the indicator pointer matches with the scale point corresponding to the measuring voltage. The set point at this time becomes the value of the "scale" point now set x the multiplying factor of the "RANGE" selected.

If alarm within the scale range is not required, set the "ALARM SET" variable resistor to the position beyond the full-scale point 'Full turn to the left".

Again turn the "ALARM-MEASURE" switch to the "MEASURE" side.

6.4 Measurement

Connect a measured object to the "Rx" terminals.

Thus ,the insulation resistance is obtained from the indicated value by the pointer times the multiplying factor (x1, x10, x100)of the range selected (read the indicated value by paying attention to the measuring voltage).

When insulation resistance of a capacitive measured object is measured by this instrument, the pointer deflects beyond the full-scale. The degree of deflection becomes shortest if the range of x1 is selected.

When the measured value almost matches with the set point (when the measured value is slightly larger than the set point.) the "ALARM" lamp flashes and the buzzer interrupted sounds. However, this is not abnormal.

7. Relation with regulations of electric appliance

This instrument is provided with the requirements of the insulation resistance test by an insulation resistance tester conforming to Japanese Regulations of electrical appliance and material safety law. It is required to use an insulation resistance tester of 500V in the regulations.

This instrument is an insulation resistance tester of 500V with stabilized measuring power supply, thus being able to stably measure up to 2000MΩ.

When the dielectric test is conducted together with this test, use the Hioki's dielectric tester.

8. Troubleshooting and measures

If the self-calibration in item 6.2 is impossible or the indication is not within the rated value by measuring the resistance of a standard resistor (Hioki's model SR-2), this instrument may be in trouble. Therefore in this case check the instrument in accordance with the following procedures.

First, prepare a DC voltmeter with the input resistance of 10MΩ or more.

Then, remove the base plate by loosening 4 screws on the plate. Take away the metals, such as screw driver, etc. from around the instrument. then supply AC commercial power by placing the instrument in such a position that the indicator is on its upper side.

8.1 Check of measuring power supply

""RANGE"	x1
"VOLTAGE"	100V

Connect the voltmeter to the "Rx" terminals.

The voltmeter indicates about 100V. If the voltmeter indicates about 100V, turn the "RANGE" switch form 100V to 250V and then to 500V.

If there is error in each range, adjust R23 on the printed circuit board.

If the output voltage is several hundred volts under the voltage range of 100V, the circuit may be in trouble.

In this case, immediately turn "OFF" the power supply.

8.2 Amplifier check

"RANGE" x1

"VOLTAGE" 100V

"ALARM SET-MEASURE" switch MEASURE side

Connect a voltmeter (Max. scale range 15V) between TP1 and TP2 on the printed circuit board.

The voltmeter indicated about "0" volt.

If not, adjust R4 until the indication becomes 0 ± 10mV. When the adjustment is impossible, the amplifier may be in trouble.

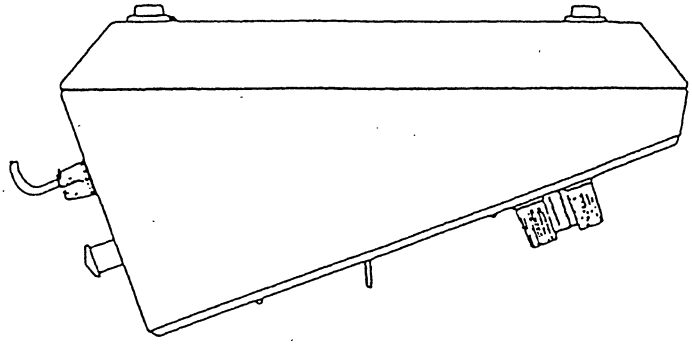
Next, turn the "RANGE" switch to "CAL" ,thus the indicator indicates the full -scale point.

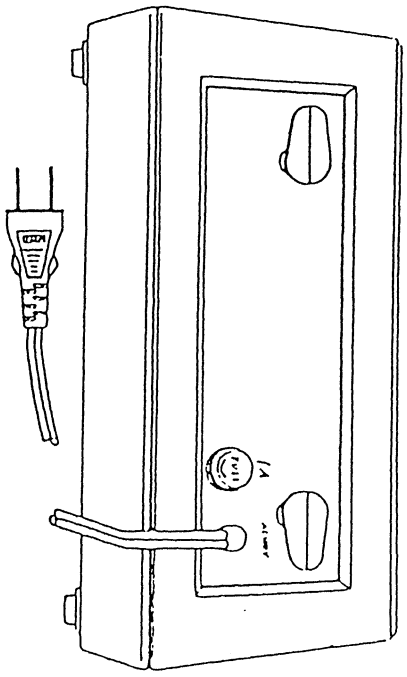
If not, adjust the indicator indication by R9.

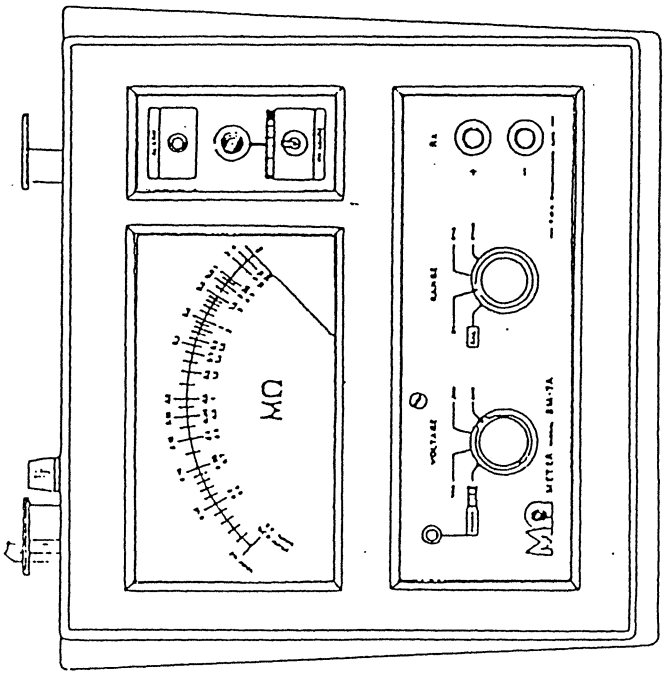
8.3 Measures for trouble

When this instrument is considered to be in trouble due to parts failure, contact us.

9. Attached drawing







10. Alarm output terminal (option)

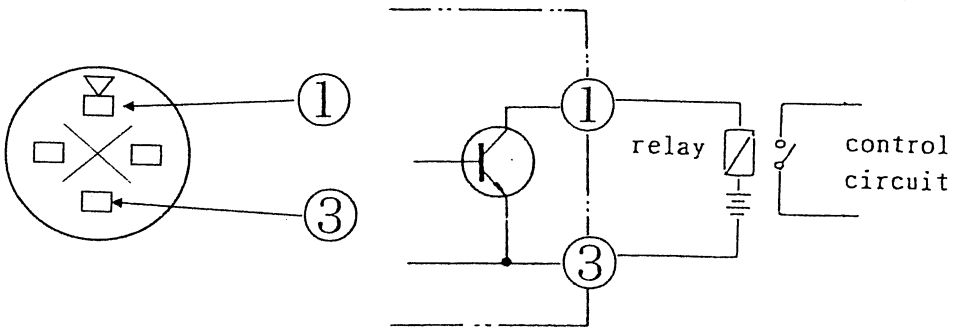
Description and how to use

This is a partially modified type of SM-7A to provide the optional alarm output terminal.

Be careful to the following points in handling this meter.

(1) Alarm output comes out from OUTPUT terminal on the rear panel.
Its connection is shown below.

Example of usage



Operating of both alarm lamp & buzzer makes continuous between 1 and 2 in the circuit (shown above right). Output is of open collector, using 24DC and 300mA or less.

(2) This meter remains unchanged in specifications other than the addition of alarm terminal.

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