sanwa

DG525
DG251

DIGITAL INSULATION METER

INSTRUCTION MANUAL

sanwa
SANWA ELECTRIC
INSTRUMENT CO.,LTD
Dempa Bldg., Sotokanda 2-Chome
Chiyoda-Ku, Tokyo, Japan

04.09 Ⓜ

DIGITAL INSULATION RESISTANCE TESTERS

Model DG525/Model DG251

— Compliant with measurement voltage characteristics as defined in the new JIS —

Introduction

Thank you for purchasing Sanwa Digital Insulation Resistance Tester Model DG525 or DG251.
Before using this instrument, please read the instructions in this manual to ensure safe use.
Be sure to read this manual thoroughly before use. Otherwise human injury, electric shock, damage to the instrument as well as other equipment, and other trouble may result.
Please retain this manual with the product for future reference.

CONTENTS

Page

[1] Safety Precautions – Be sure to read before use. – 1
1-1 Warning Markings and Other Symbols 1
1-2 Warning Messages for Safety 2
1-3 Maximum Allowable Input 3
[2] Outline and Features 3
2-1 Outline 3
2-2 Features 3
[3] External View and Names of Parts 4
[4] Measurements 5
4-1 Preparation Before Measurement 5
4-2 Checking the Built-in Batteries 6
4-3 Replacing the Built-in Batteries 7
4-4 Measuring the Insulation Resistance (MΩ) 8
4-5 Measuring the AC Voltage (ACV) 9
[5] Maintenance & Management 10
5-1 Maintenance & Inspections 10
5-2 Calibration 11
5-3 Storage 11
[6] Specifications 12
6-1 Insulation Resistance Measuring Block 12
6-2 AC Voltage Measuring Block 12
6-3 Common Specifications 13
6-4 Accessories 13

[1] Safety Precautions — Be sure to read before use. —

Be sure to read carefully the information under "⚠WARNING" and "⚠CAUTION" in this manual in order to prevent human injuries, electric shock and damage to the instrument as well as other equipment.

1-1 Warning Markings and Other Symbols

The symbols and their meanings used with the instrument and in this manual are as described below.

■ The following markings are used to indicate especially important information for safe use of the instrument.

⚠WARNING — The information under this marking must be observed strictly to prevent human injuries, including burns and electric shock.

⚠CAUTION — The handling information under this marking should be observed carefully to prevent damage to the instrument and associated equipment.

■ Other symbols used with the instrument and in this manual

ϟ	Indicates a risk of shock due to a high voltage generated or applied at a measuring terminal.
E	Insulation resistance measurement terminal (Earth = GND)
L	Insulation resistance measurement terminal (Line)
ACV~	AC voltage
MΩ	Insulation resistance
INSUL. TEST VOLT ON	Insulation test voltage ON indication
POWER	Measuring power switch
HOLD	Measurement value hold switch
LIGHT	Back-light lighting switch

1-2 Warning Messages for Safety

⚠ WARNING

1. Check the measurement type (insulation resistance or AC voltage) before measurement and select the appropriate function for it.
2. Do not apply a voltage or signal exceeding the specified maximum allowable input. (For the maximum allowable input voltage value, see section 1-3 on the next page.)
3. Do not open the case or battery cover unless replacing the batteries as described in this manual.
4. Always use the specified test leads.
5. If the insulation coating of a test lead is damaged or its conductor wire is exposed, do not attempt to repair it. Instead, replace with a new test lead.
6. Do not switch the measuring function during measurement.
7. Do not use the instrument when it is moistened, when your hand is wet or when the ambient humidity is high (85%RH or more).
8. Do not touch the metallic parts of the test leads during measurement.
9. Do not use the instrument if it is defective and incapable of making the specified measurements.
10. Do not use the instrument using high-power or higher-voltage circuitry than the maximum allowable input.
11. Be sure to conduct annual inspections.

1-3 Maximum Allowable Input

Function	Input Terminals	Maximum Allowable Input
Insulation resistance	E — MΩ — L	⚠Voltage or current input prohibited
ACV	~ — ACV — ~	600 V AC

[2] Outline and Features

2-1 Outline

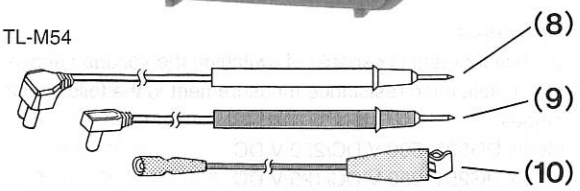
This instrument is a compact, handy high-performance digital insulation tester with an additional AC voltage measuring function. The characteristics of the voltages applied to the measuring terminal during insulation resistance measurement are in compliance with the output voltage characteristics specified in JIS C1302-1994.

2-2 Features

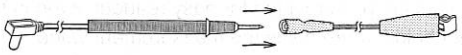
1. Each instrument is capable of switching the voltages applied during insulation resistance measurement in the following 2 ranges.
   Model DG525: 500 V DC/250 V DC
   Model DG251: 250 V DC/125 V DC
2. With both measuring functions, automatic range switching can be used to switch the range according to the measurement value.
3. Even when the user forgets to switch the power off after measurement, the auto power OFF feature turns the power off automatically in about 1 minute.
4. A back-light lamp is provided for easy readout, even in the dark.
5. The data hold feature holds the measurement value.
6. When the built-in batteries run out, the battery alarm display indicates battery replacement timing.

[3] External View and Names of Parts

TL-M54



(1) Measuring terminals (Common for insulation resistance and AC voltage)
(2) LCD (Liquid Crystal Display) panel
(3) HOLD switch & indicator (yellow LED)
(4) POWER switch
(5) INSUL. TEST VOLT ON (Insulation test voltage ON) indicator (red LED)
(6) Function switch
(7) LIGHT (back-light) switch
(8) Red test lead (for L/ ~ terminal)
(9) Black test lead (for E/ ~ terminal)
(10) Aligator clip adapter



Reference When the point of (9) lead is inserted into clip adapter (10), (9) will come to work as clip lead. It will make mesurement multipurpose.

[4] Measurements

4-1 Preparation Before Measurement

⚠ WARNING

For safe use of the instrument, check its appearance and associated accessories carefully before use.
1. Check for damage due to dropping, etc.
2. There is a risk of electric shock if the insulation coating of a test lead or its conductor wire is exposed. Check the test leads carefully before use.

NOTE: Operation of the POWER Switch and Auto Power OFF

The POWER switch of the instrument toggles, or alternates operation, so that each successive press switches the selected measuring function from ON to OFF, and vice versa. The auto power OFF feature provided turns power OFF automatically in about 1 minute, as a safeguard for when you forget to set the POWER switch to OFF after use. Still, we recommend pressing the POWER switch to OFF after measurement to save the power of the built-in batteries.

NOTE: Operation of the HOLD Switch

To hold a measurement value, press the HOLD switch above the POWER switch. The HOLD indicator (yellow LED) light up and the current measurement value will be held in memory. Press the HOLD switch again to clear the held value.

NOTE: Display Illumination by Back-Light

If the measurement value is hard to read under low light, press the LIGHT switch on the bottom right of the panel.

The green back-light turns on to make the readout more visible. As the back-light consumes power of the built-in batteries, we recommend setting the LIGHT switch to off to save battery power when measurement and readout are not required.

4-2 Checking the Built-in Batteries

1. Do not connect any leads to the measuring terminals.
2. Set the function switch to 500 V or 250 V with Model DG525 or to 250 V or 125 V with Model DG251.
3. Press the POWER switch.
4. The built-in batteries are normal if the INSUL. TEST VOLT ON indicator (red LED) lights up and the LCD looks as shown in Fig. 1.

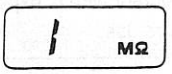


Fig. 1

5. If the INSUL. TEST VOLT ON indicator does not light and the LCD shows nothing, even when the POWER switch is pressed to ON, the batteries may be exhausted completely, or no battery has been loaded. In this case, remove the battery cover on the rear case and insert new batteries as described in section 4-3, "Replacing the Built-in Batteries" on the next page.
6. If the INSUL. TEST VOLT ON indicator does not light and the LCD shows nothing, although unexhausted batteries are loaded, it is possible that the battery terminal contacts have failed. In this case, remove the battery cover on the rear case and check the contacts between the batteries and terminals.
7. If the INSUL. TEST VOLT ON indicator lights up but the LCD shows the "B" marking as shown in Fig. 2 when the POWER switch is pressed to ON, the built-in batteries are nearly exhausted. In this case, replace them with new batteries.

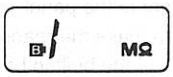


Fig. 2

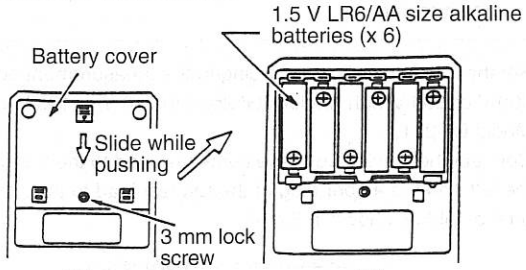
4-3 Replacing the Built-in Batteries

1. Set the function switch to OFF on the center position.

⚠WARNING

Make sure that the function switch is set to OFF before proceeding to the battery replacement operation.

2. Refer to Fig. 3 below for the battery replacement.
3. Remove the lock screw on the battery cover on the rear case, then remove the battery cover by sliding it down while pushing the square projection on the top center (Fig. 3[A]) with your finger, and insert batteries in correct polarity positions as shown by Fig. 3[B].
4. After checking that the batteries have been inserted correctly, place the battery cover in the original position on the rear case and fasten with the lock screw.



• Battery cover Fig. 3 • Battery polarity

⚠CAUTION

1. Always use the specified batteries (LR6/AA size alkaline batteries).
2. To prevent performance degradation, replace all six batteries with six brand-new ones when the time comes to replace batteries.

4-4 Measuring the Insulation Resistance (MΩ)

⚠ WARNING

1. When the power is ON with the insulation resistance measuring function selected (when the INSUL. TEST VOLT ON indicator is lit), a high voltage for insulation resistance measurement is applied across the E-L terminals. To avoid the risk of electric shock, do not touch the metallic parts of the test leads connected to the measuring terminals.
2. Make sure that the object to be measured is not subjected to voltage before proceeding to measurement.
3. Certain measurement objects (capacitive objects, for example) may retain the voltage applied from this instrument for some time after the completion of the measurement.

1. Set the function switch according to the measurement object, to 500 V or 250 V with Model DG525 or to 250 V or 125 V with Model DG251.
2. Connect the black plug of the black test lead to the E terminal on the left and the amber plug of the red test lead to the L terminal on the right as shown in Fig. 4.

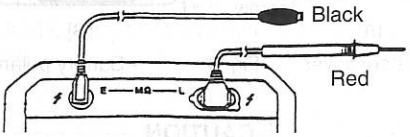


Fig. 4

3. Connect the black clip to a measuring point on the measurement object and the tip of the red test rod to the other point, and press the POWER switch. The INSUL. TEST VOLT ON switch will light up and the resistance measurement value will be shown on the LCD.

4. When the measurement object has resistance of more than 2000 MΩ, the LCD shows the same over-input display as that displayed when the measuring terminals are open, as shown in Fig. 1 under section [4]4-2, "Checking the Built-in Batteries" on page 6.
5. After measurement, press the POWER switch again to OFF or set the function switch to OFF.

NOTE: Distinction Between E and L Terminals

When one of the measuring points is grounded, connect it to the E terminal of the instrument.

This is specified in consideration of safe use, because the resistance measurement value reading in the insulation testing can be reduced in this way. In other measurement operations, consideration of the polarity of measurement points is not necessary.

NOTE: In Case the "B" Marking is Displayed During Measurement

When the resistance measurement value in an insulation test is extremely small, the LCD sometimes shows the "B" marking which is usually used as the battery alarm indicator.

In the present case, the "B" marking is displayed because an extremely small resistance measurement value means consumption of large battery current and the drop in capacity due to exhaustion of the batteries causes the internal operating voltage to fall below the specified level.

4-5 Measuring the AC Voltage (ACV)

⚠ WARNING

1. The maximum allowable input voltage of the ACV range is 600 V. Never apply a higher voltage than this.
2. Voltages higher than 25 Vrms AC are hazardous to the human body. Be very careful during measurement.
3. Never attempt to change the function switch position during measurement.
4. Never measure AC voltage with a wet hand.

1. Set the function switch to ACV.
2. Connect the amber plug of the red test lead to the ~(L) terminal on the right and the black plug of the black test lead to the ~(E) terminal on the left as shown in Fig. 4 under section [4]4-4, "Measuring the Insulation Resistance" on page 8.
3. Press the POWER switch to ON, connect the black clip to a measuring point on the measurement object, and apply the tip of the red test rod to another measuring point. The LCD will show the measurement voltage value.
4. After measurement, press the POWER switch again to OFF or set the function switch to OFF.

[5] Maintenance & Management

⚠ WARNING

This section contains important information for maintenance. The maintenance of the instrument should be performed by managing personnel who understand the instrument and this manual in detail, and who are well-acquainted with handling the instrument.

5-1 Maintenance & Inspections

⚠ WARNING

Be sure to maintain and inspect to ensure safe, long-lasting, optimum-performance use of the instrument.

1. Check that the external finish of the instrument is not damaged due to dropping, etc.
2. Check the test leads to ensure that
   - a plug is not loose when it is inserted into a terminal;
   - the test lead coating is not damaged;
   - the conductor wires are not exposed from any part of the test leads.

3. Check that the function switch is not subject to strong pressure from above. (This could lead to a contact failure of the switch.)

If the instrument cannot comply with any of the above checks, do not use it as it is. Service the defective part or replace it with a new part.

5-2 Calibration

⚠ WARNING

To maintain safety and accuracy, conduct inspections and calibration at least every year.
For inspection and calibration, please consult a dealer in your area or the local sales representative for the instrument.

5-3 Storage

⚠ WARNING

1. The panel and rear case are not resistant to volatile solvents or heat. Do not attempt to clean them with lacquer thinner or alcohol, or place the instrument near a source of heat.
   To clean the instrument, wipe lightly with a soft, dry cloth.
2. Do not store the instrument in a place subject to vibration, or where the instrument may drop.
3. Do not store the instrument under direct sunlight, under extremely high or low temperatures, or in a place where toxic gas is generated.
4. When the instrument is not used, be sure to set the function switch to OFF.
5. When the instrument is not to be used for a long period of time, be sure to remove the built-in batteries before storing it.

[6] Specifications

6-1 Insulation Resistance Measuring Block

1. Rated voltage — DG525: 500 V DC/250 V DC, 2 ranges
   DG251: 250 V DC/125 V DC, 2 ranges
2. Measuring voltage/current characteristics
   When measuring terminals are open
   DG525: 500 V DC range — 600 V (+20% max.)
   > 500 V guaranteed at 500 kΩ
   250 V DC range — 300 V (+20% max.)
   > 250 V guaranteed at 250 kΩ
   DG251: 250 V DC range — 300 V (+20% max.)
   > 250 V guaranteed at 250 kΩ
   125 V DC range — 150 V (+20% max.)
   > 125 V guaranteed at 125 kΩ
   When measuring terminals are shorted
   Approx. 1.5 mA max.
3. Measuring ranges — 0 to 2 MΩ/1 to 20MΩ/10 to 200MΩ/100 to 2000MΩ, 4 auto range switching
4. Measuring accuracy — 2 MΩ/20 MΩ/200 MΩ ranges:
   Within ± (2% of reading + 2 digits)
   2000 MΩ range:
   Within ± (5% of reading + 2 digits)
5. Applied voltage indication
   Red LED with 5 mm dia.

6-2 AC Voltage Measuring Block

1. Measuring range — 0 to 600 V max.
   0 to 200 V/10 to 600 V, 2 auto range switching
2. Measuring accuracy — Within ± (1% of reading + 0.5% of range + 1 digit)
   Frequency: 50 to 400 Hz
3. Input resistance — 1 MΩ

6-3 Common Specifications

1. A/D converter — Operating system: Double integration
   Sampling rate: Approx. 2.5 samplings/sec.
2. Display — LCD, max. 1999
3. Over-input indication — Only the highest digit shows "1".
4. Measuring terminals — MΩ: E, L. ACV: ~, ~
5. Operating temperature/humidity range
   0 to 40°C, ≤ 85%RH (without condensation)
6. Accuracy guaranteed temperature/humidity range
   15 to 30°C, ≤ 80%RH (without condensation)
7. Built-in batteries — 1.5 V LR6/AA size alkaline batteries (x 6)
8. Built-in battery life (time until battery voltage drops to 7 V)
   When power is switched between ON and OFF every minute in succession
   Insulation resistance measurement (measuring terminals open): Approx. 60 hours
   AC voltage measurement: Approx. 250 hours
9. Battery alarm — LCD shows "B" marking when battery voltage drops below 7 V
10. Auto power OFF time — Approx. 1 minute after power ON
11. Data hold — Pressing HOLD switch holds measurement value
    HOLD indicator: Yellow LED with 3 mm dia.
12. Back-light lamp — Pressing LIGHT switch lights up LCD back light (green)
13. Dimensions & weight — 175 x 115 x 55 mm, approx. 600 grams

6-4 Accessories

1. Red test lead with amber plug (L/~terminal) x 1
2. Black test lead with black plug (E/~terminal) x 1
3. Aligator clip adapter x 1
   Set of the above 3 test leads: TL-M54
4. Instruction manual x 1
5. Carrying case C-M53 (with cord case) x 1 OPTION

The specifications in this manual may be subject to change for performance improvement without notice.

MEMO