sanwa®

PDR302

EARTH RESISTANCE METER

取扱説明書
INSTRUCTION MANUAL

CONTENTS

[1] Warning Instruction for safe use

⚠ WARNINGS

1. Do not input voltage or signals that exceed the specified allowable values.
2. Do not open the casing or battery compartment cover except to replace the batteries. Otherwise, do not attempt to repair, modify, or disassemble the unit.
3. Be sure to use the specified type of test lead.
4. Do not use the unit with high-power and high-voltage circuits.
5. Do not use a test lead with a damaged lead wire or exposed core wire. If the insulation coating is damaged, replace the test lead with a new one.
6. Do not use the unit when it is wet, your hands are wet, or when the humidity is high (80 % RH or more relative humidity).
7. Do not touch the test pin during measurement.
8. Do not use the unit if it proves defective and is not capable of performing required measurements.

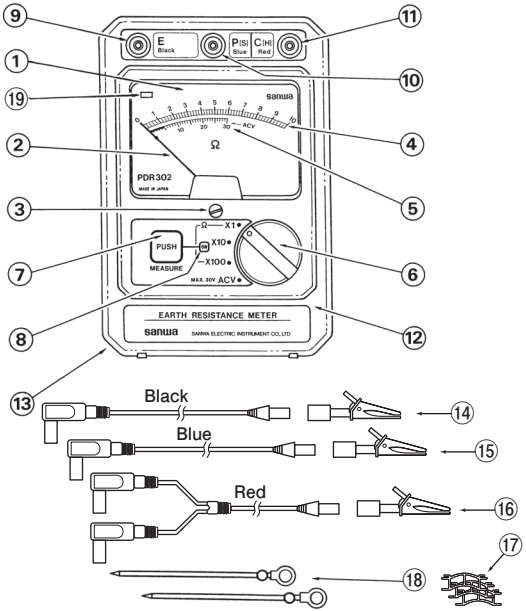
[2] INTRODUCTION

Together with an insulation resistance meter and a circuit meter, an earth resistance meter is required for the inspection and maintenance of electrical construction work. The obligatory nature of this instrument has resulted in strong demand for an earth resistance meter with handling convenience and a maintenance facility.

The Sanwa PDR302 Earth Resistance Meter is just the device to satisfy these requirements as it features solid-state circuitry and automatic direct reading of earth resistance using a battery-powered constant-current system. Some of the main benefits and advantages of the PDR302 include:

1. The indication circuitry employs a phase detection system. This eliminates external noise interference and helps achieve high-precision measurement.
2. A stable, constant-current power source is used for measurement so self-calibration is not required each time a measurement is to be performed. Measurements can be quickly performed at the touch of a button.
3. The unit is powered by six R6 (SUM-3) 1.5 V batteries. The compact, lightweight design is easy to use.
4. An AC voltage range is reserved exclusively for measurement of grounded voltage (0～30 V) to prevent indication errors of earth resistance values caused by leakage current that flows to the earth.
5. Earth resistance measurement is a simple push-button operation, making the unit easy to use and eliminating wasteful battery consumption.

[3] PANEL ARRANGEMENT AND ACCESSORIES



① Meter (indicator)
② Pointer
③ Zero adjuster
④ Earth resistance scale (0～10 Ω), black
⑤ AC voltage scale (0～30 V), red
⑥ Range switch
⑦ Earth resistance measurement switch (push-button)
⑧ Power supply indicator/battery check
⑨ E terminal (for grounding)
⑩ P(S) terminal (for auxiliary grounding)
⑪ C(H) terminal (for auxiliary grounding)
⑫ Panel
⑬ Rear case
⑭ E-terminal connection cord (black), approx. 5 m, with alligator clip (black)
⑮ P(S) terminal connection cord (blue), approx. 10 m, with alligator clip (blue)
⑯ C(H) terminal connection cord (red), approx. 20 m, with alligator clip (red)
⑰ Lead wire reel, x 3
⑱ Earth bars (metal), 2 pcs.
⑲ Auxiliary grounding value excess indicator lamp

[4] OPERATION

1. Arrangement of Auxiliary Earth Bars and Connections

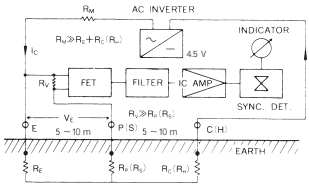


Fig. 1

$$V_E = I_C \cdot R_E$$

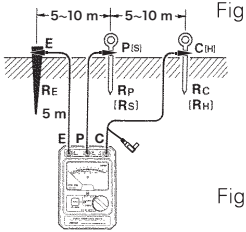
$$\therefore R_E = \frac{V_E}{I_C}$$

For example

$I_C = 1$ mA

$V_E = 10$ mV

$$R_E = \frac{V_E}{I_C} = \frac{10\ \text{mV}}{1\ \text{mA}} = 10\ \Omega$$



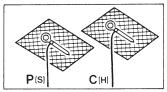


Fig. 2

⚠ WARNING

Take extra care not to drop the earth bars or pierce anything with them when carrying them or inserting them into the ground. The tips of the earth bars are very sharp.

As shown in Figs.1 and 2, the auxiliary bars are arranged parallel to the earth (E) at intervals of 5〜10 meters. Where it is impossible to align them parallel, a certain amount of bending ($\angle$E , P(S) C(H) $\geqq 120^\circ$) is allowed.

When the nets are used instead of the bars, the $R_P(R_S)$ and $R_C(R_H)$at the earth poles read larger. Normally, the impedance of the power supplying constant AC current to E-C(H) is high enough to prevent reading errors due to a slight increase of resistance. However, when the nets are used on a concrete surface, wet them to enable better contact with the ground. Measurement is not possible on asphalt surfaces. Once the bars have properly set, make connections as illustrated.

2. Measurement of Earth Resistance Using the Tripolar System

⚠ WARNING

Make sure that the object being measured — an electric appliance, for example — is properly grounded. If the object is improperly grounded or not grounded, commercial voltage may leak into or be applied to the object. Double-check all safety precautions before starting measurement.

CAUTION:

Make sure the earth bars are inserted into the ground securely. If they are improperly inserted, R_P(R_S) and R_C(R_H) values increase. This will result in errors in measurement values and instabilities in indicated values.

1. The range switch is placed at one of the three ranges to be selected according to the size of the earth resistance (R_E).
2. Press the MEASURE PUSH switch. The power indicator lamp (ON) will light red and the pointer will point at the earth resistance value (R_E).
3. For the "X1" range, the figures along the arc are read directly (0〜10 Ω). For the "X10" and "X100" ranges, they are read multiplied by 10 for 0〜100 Ω and by 100 for 0〜1000 Ω.
4. If the red LED (OVER AUX. R) on the upper left of the meter scale lights after the MEASURE PUSH switch is pressed, this means the auxiliary grounding resistance value is excessive and correct measurement cannot be performed. Should this happen, re-insert the earth bars into the ground.
5. If the power indicator lamp (ON) starts blinking after the MEASURE PUSH switch is pressed, this means the batteries are low. Replace them with new ones. For details, refer to "5. Replacing the Batteries."

3. Measurement of Earth Resistance Using the Bipolar System

1. When earth is available whose resistance value has been already detected or whose resistance is extremely low and can be regarded as immaterial with respect to the earth resistance in question, you can measure unknown earth resistance by taking advantage of the electrical circuit ground at hand.
2. The earth of unknown resistance is connected to the terminal E. Next, insert the plugs of the C-terminal connection cord to the P(S) and C(H) terminals and connect the alligator clip to a point with known earth resistance value.
3. The value measured with this method is the sum of an unknown earth resistance Rx and known earth resistance rE. If the value is already known, obtain the true value by subtracting the known earth resistance value rE from the meter reading RE.

Earth resistance to be measured: Rx

Rx = RE – rE

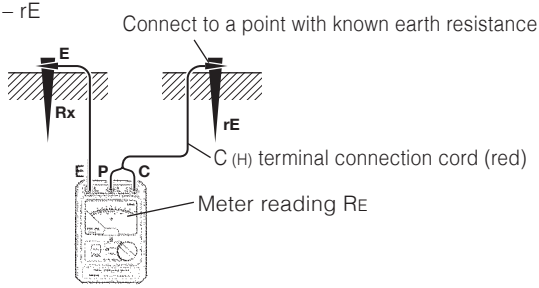


Fig.3

4. Measurement of Leakage Voltage Using the ACV

⚠ WARNINGS

1. Never attempt to supply voltage over 30 V — the maximum allowable voltage — since the ACV of this unit uses leakage AC voltage (ground voltage).
2. Never supply standard commercial voltage (AC 100 V for example).

1. Once connections have been made, turn the range switch "ACV."
2. The pointer responds if there is any earth voltage present to indicate leakage AC current flowing into the earth circuit. The red 0∼30 V scale reads it.
3. If the scale reads above 5 V, there will be interference with earth resistance measurement. In this case, before taking measurement, open either the power circuit, the equipment using the earth, or its earth circuit to reduce the effect of the voltage leak.
4. Earth voltage can be checked independently across E and P(S) without using the C(H) terminal.

5. Replacing the Batteries

1. When the batteries are low, the power indicator lamp (ON) starts blinking after the MEASURE PUSH switch is pressed. When this happens, replace the batteries with new ones. Refer to Fig.4 for replacing the batteries.

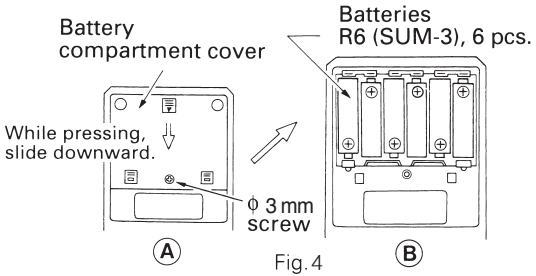


Fig.4

2. Unfasten the screw from the battery compartment cover on the back of the unit. While pressing the rectangular protrusion in the center of the cover as shown in Fig.4Ⓐ, slide it down to remove it. Insert new batteries and align them according to the battery directions shown in Fig.4Ⓑ.
3. When the new batteries are loaded, replace the cover on the battery compartment and tighten the screw to secure it.

CAUTIONS

1. Be sure to use specified batteries only. Never mix different types or brands of batteries even if the rated voltage is the same.
2. To avoid deterioration of performance, use only brand-new batteries when replacing batteries.

6. Maintenance

1. Remove the batteries when not using the tester for extended periods.
2. Do not drop the instrument or otherwise subject it to severe shock. Do not expose it to high temperatures or moisture.
3. The indicator cover is treated with anti-electrification coating. Do not rub it hard with a dry cloth. If the coating is found ineffective, you can spray it with disc cleaner as a temporary measure.

[5] SPECIFICATIONS

1. Measurement Ranges
   Ω(earth resistance):
   X1 reading 0 ～ 10 Ω(0.2 Ω per scale)
   X10 reading 0 ～ 100 Ω(2 Ω per scale)
   X100 reading 0 ～ 1,000 Ω(20 Ω per scale)
   ACV (leakage voltage) 0 ～ 30 V(1 V per scale)
2. Accuracy
   ±5 % fs for Ω x 1
   ±2.5 % fs for Ω x 10, Ω x 100
   ±2.5 % fs for ACV
3. Batteries
   R6(SUM-3)x6
4. Method of Measurement
   Constant-current system (tripolar & bipolar)
5. Constant Current AC Power
   Abt. 100 V(1 kHz), through inverter
6. Auxiliary grounding value alarm LED lights at approx.10 kΩ or more
7. Battery Alarm
   Blinking LED, approx. 6.5 V operation voltage
   (LED normally lights during measurement)
8. Accuracy Guarantee Temperature/Humidity Range
   15 ℃～35 ℃, 80 % RH or less
   No dew condensation allowed
9. Operating Temperature/Humidity Range
   0 ℃～40 ℃, 80 % RH or less
   No dew condensation allowed
10. Accessories

Measurement cords:	1 ea., black 5 m / blue 10 m / red 20 m 3 lead wire spools	] TL-66
Alligator clips:	1 ea., black / blue / red (CL-302)	
Earth bars:	2 ea. (CL-ER)	
Carrying case:	1 (C-PDR302)	
Storage bag:	1 (C-302CB)	
Instruction manual:	1	

11. Dimension and Mass
    175 x 118 x 55 mm, Abt. 500 g(main unit)

sanwa®

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