sanwa

SP20
MULTITESTER

Instruction Manual

04.05

sanwa

SANWA ELECTRIC
INSTRUMENT CO.,LTD.
Dempa Bldg,Sotokanda2-Chome
Chiyoda-Ku,Tokyo,Japan

[1] SAFETY PRECAUTIONS:Before use,read the following safety precautions

This instruction manual explains how to use your multimeter SP21 safely. Before use,please read this manual thoroughly. After reading it,keep it together with the product for reference to it when necessary.

The instruction given under the heading "⚠WARNING" "⚠CAUTION" must be followed to prevent accidental burn or electrical shock.

1-1 Explanation of Warning Symbols

The meaning of the symbols used in this manual and attached to the product is as follows.

⚠ : Very important instruction for safe use.
- The warning messages are intended to prevent accidents to operating personnel such as burn and electrical shock.
- The caution messages are intended to prevent damage to the instrument.

⎓ : DC Voltage
~ : AC Voltage
Ω : Resistance
⏚ : Glaund
+ : Plus input
− : Minus input
: Fuse & Diode protection
: Fuse
: Drop proof

1-2 Warning Instruction for safe use

⚠ WARNING

To ensure that the meter is used safely,Be sure to observe the instruction when using the instrument.

1. Never use meter on the electric circuit that exceed 3k VA
2. Pay special attention when measuring the voltage of AC 30Vrms (42.4 Vpeak) or DC 60V or more to avoid injury
3. Never apply an input signals exceeding the maximum rating input value.
4. Never use meter for measuring the line connected with equipment (i.e.motors) that generates induced or surge voltage since it may exceed the maximum allowable voltage
5. Never use meter if the meter or test leads are damaged or broken.
6. Never use uncased meter.
7. Be sure to use a fuse of the spesified rating or type. Never use a substitute of the fuse or never make a short circuit of the fuse.
8. Always keep your fingers behing the finger guards on the probe when making measurements.
9. Be sure to disconnect the test pins from the circuit when changing the function or range.
10. Be sure to disconnect the test pins from the circuit when changing the function or range.
11. Never use meter with wet hands or in a damp environment.
12. Never open tester case except when replacing batteries or fuse. Do not attempt any alteration of original specifications.
13. To ensure safety and maintain accuracy,calibrate and check the tester at least once a year.
14. Indoor use.

1-3 Maximum Overload Protection Input

Function (Range)	Input	Maximum rating input value	Maximum overload protection input
DCV 50 ~ 500	+, −	Full scale value at the ranges	DC1000V, AC750V or PEAK MAX 1100V
ACV 50 ~ 500			
DCV 0.25 ~ 10			＊DC, AC200V or PEAK MAX 250V
ACV 10			
DCA 2.5m/25m/0.25			＊DC, AC0.5A
DCA 50μ			＊DC, AC1mA
Ω		Voltage and current input prohibited	＊DC, AC200V or PEAK MAX 250V
⊣15		DC2V	

Note : AC voltage is regulated by rms value of sinusoidal wave.
"＊" is within 5 second.

[2] APPLICATION AND FEATURES

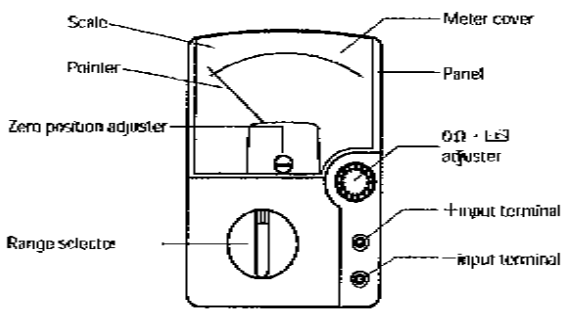
2-1 Application

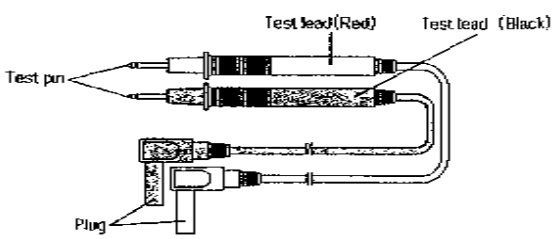
This instrument is portable multimeter designated for measuremaent of week current circuit

2-2 Features

- Taut-band structure is adopted in the meter part.
- A stand is equipped.

[3] NAME OF COMPONENT UNITS





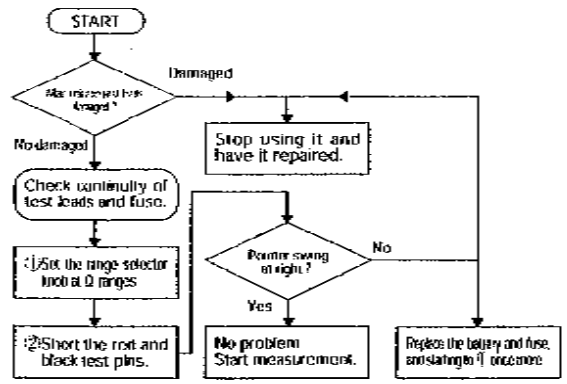
Test lead(TL-61)

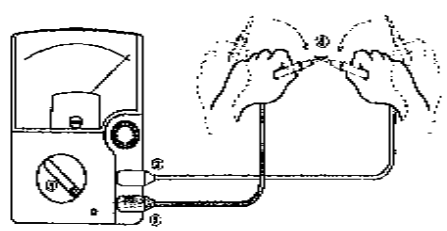
[4] MEASUREMENT PROCEDURE

4-1 Start-up Inspection

⚠ WARNING

1. Never use meter if the meter or test leads are damaged or broken.
2. Make sure that the test leads are not cut or otherwise damaged





4-2 How to Set up Range (Selection of appropriate range)

①When determining a measuring range, select a higher voltage than the value to be measured as well as where the pointer of a meter moves to a considerable extent. However, select the maximum range and measure in case the extent of value to be measured cannot be predicted.

②Appropriate range for measuring a resistance (Ω) Select the rang that the pointer indicates approximately in the center.

4-3 Preparation for Measurement

Turn the zero position adjuster so that the pointer may align left to zero position. Select a range proper for the item to be measured an set the range selector accordingly.

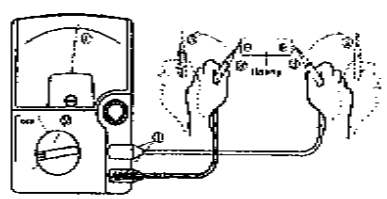
4-4 Voltage Measurement

⚠ WARNING

1. Never apply an input signals exceeding the maximum rating input value.
2. Be sure to disconnect the test pins from the circuit when changing the function.
3. Select the maximam range and measure in case the extent of value to be measured can not be predicted.
4. Always keep your fingers behind the finger guards on the probe when making measurements.

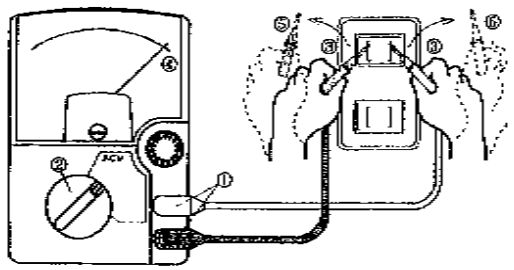
4-4-1 DCV Measurement (⎓) Maximum rating input value 500VDC

1) Applications
Measures batteries and d.c. circuits.
2) Measuring ranges
0.25/2.5/5/10/50/100 (6ranges)



4-4-2 ACV Measurement(～)Maximum rating input value500VAC.

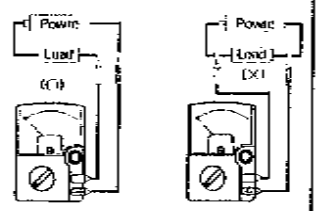
①Connect the test lead of the black plug to the - input terminal and the red plug to the + input terminal.
②Set the range selector knob to an appropriate ACV range.
③Apply the red and black test pin to measured circuit.
④Read the move of the pointer by V. A scale
⑤After measurement, remove the red and black test pins from the circuit measured.
● Since this instrument adopts the mean value system for its AC voltage measurement circuit, AC waveform other than sine wave may cause error.
● Errors occur under such frequencies other than specified specification.



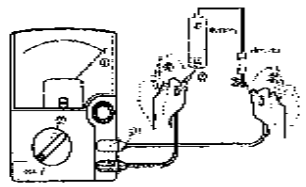
4-5 DCA Measurement (⎓)Maximum rating input value 0.25ADC

⚠ WARNING

1. Never apply voltage to the input terminals.
2. Be sure to make a series connection via load.(Please see to above drawing)
3. Do not apply an input exceeding the maximam rated current to the input terminals.



①Connect the testlead of the black plug to the －input terminal and the red plug to the +input terminal.
②Set the range selector knob to an appropriate DCA range.
③Apply the black test pin to the negative potential side of the circuit to measure and the red test pin to the positive potential side.
④Read the move of the pointer by V - A scale.
⑤After measurement, remove the red and black test pins from the circuit measured.



4-6 Resistance Measurement(Ω)

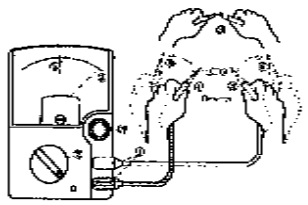
⚠ WARNING

Never apply voltage to the input terminals.

①Connect the testlead of the black plug to the －input terminal and the red plug to the +input terminal.
②Set the range selector knob to an appropriate Ω range.
③Short the red and black test pins and turn the 0Ω adjuster so that the pointer may align exactly to 0Ω.
④Apply the black and red test pin to the measured resistance
⑤Read the move of the pointer by Ω scale.
⑥After measurement, remove the red and black test pins from the resistor measured.

Note : Be sure to use the same rated fuse. In case a fuse other than the same rated one(see "SPECIFICATIONS") is used, error in indication occurs and/or circuit protection is made unble.

Caution : If the pointer fails to swing up to 0 Ω even when the 0Ω adjuster is turned clokwise fully, replace the internal battery with a fresh one.



4-7 Battery check

⚠ WARNING

Never apply an input signals exceeding the battery voltage to the input terminals.

①Connect the testlead of the black plug to the －input terminal and the red plug to the +input terminal.
②Set the range selector knob to an appropriate 1.5V or ⑮ range.
③Apply the black test pin to the negative potential side of the circuit to measure and the red test pin to the positive potential side.
④Read the move of the pointer by 1.5V.

4-8 Measuring Capacity(μF)

⚠ WARNING

1.Never apply voltage to the input terminals.
2.Do not measure as for a condenser of a charged condition.

①Connect the testlead of the black plug to the －input terminal and the red plug to the +input terminal.
②Set the range selector knob to an appropriate μF×1 range.
③Short the red and black test pins and turn the 0Ω adjuster so that the pointer may align exactly to 0Ω.
④Apply the black and red test pin to the measured capacitor.
⑤The pointer moves full scale by the charge current to the capacitor. However, the pointer starts gradual returning from a certain point. Read the indicated maximam value on μF scale.

4-9 DC High Voltage measurement (Oputinal HV Probe)

⚠ WARNING

The probe is designed for the measurement of very small direct current circuit. Never use the probe to measure high voltage in power lines, such as transmission and distribution lines ; it is very dangerous.

①Connect the HV Probe of the black plug to the －input terminal and the red plug to the +input terminal.
②Set the range selector knob to HV PROBE range.
③First, connect the clip (black) of the probe to the earth line (－) in the circuit to be measured, and then apply the measuring pin on the probe body to your measuring point.
④Read the move of the pointer by V - A scale, measured value in terms of kV.

4-10 Optional Temperature Probe (T-THP) Max value +200oC
① Connect the pin of the temperature probe to the + input terminal and the black plug to the - terminal
② Set the range selector to oC PROBE range.
③ Adjust the pointer to the 0Ω by the range selector. Remove the pin of the temperature probe from the + terminal and then connect the red plug.
④ Connect the measuring pin to a point to be measured. Read the value on oC scale when the pointer is stabilize.

4-11 End of Measurement
Turn off the range to prevent voltage applied to resistance and current ranges.

[5] MAINTENANCE

⚠ WARNING

1. This section is very important for safety. Read and understand the following instruction fully and maintain your instrument properly.
2. The instrument must be calibrated and inspected at least once a year to maintain the safety and accuracy.

5-1 Maintenance and Inspection
1. Appearance

・Is the appearance not damaged by falling ?
2.Test leads and fuse
・Is the cord of the test leads not damaged ?
・Is the core wire not exposed at any place of the test leads ?

If your instrument falls in any of the above items, do not use it and have it repaired or replace it with a new one.

●Make sure that the test leads are not cut.

-2 Calibration

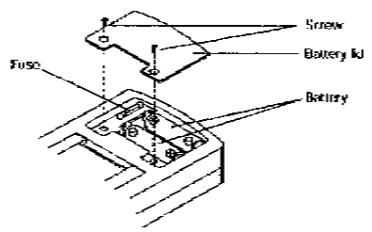
The calibration and inspection may be conducted by the dealer. or more information, please contact the dealer.

-3 How to Replace Battery and Fuse

⚠ WARNING

1. If the rear case or the battery lid is removed with input applied to the input terminals, you may get electrical shock. Before starting the work, always make sure that no inputs is applied
2. Be sure to use the fuse is same rating so as to ensure safety and performance of tester.
3. When operator remove the battery lid, do not touch the internal parts or wire with hand.

How to replace the battery>
①Remove the battery lid screw with a screwdriver.
②Remove the battery lid.
③Take out the battery and replace it with a new one.
④Attach the battery lid and fix it with the screw.



<How to replace the fuse>

Fuse of the specified rating and type
0.5A/250V φ6.3×30mm Blowout capacity:500A

①Remove the battery lid screw with a screwdriver.
②Pull out the fuse out of holder on the circuit board and replace it.
③Put back the battery lid where it was and tighten the screw.
④Check and see whether or not indications of respective ranges are normal

●Please use spare fuse of a battery lid back side.

5-4 Storage

⚠ CAUTION

1. The panel and the case are not resistant to volatile solvent and must not be cleaned with thinner or alcohol For cleaning, use dry, soft cloth and wipe it lightly.
2. The panel and the case are not resistant to heat. Do not place the instrument near heat-generating devices (such as a soldering iron).
3. Do not store the instrument in a place where it may be subjected to vibration or from where it may fall.
4. For storing the instrument, avoid hot, cold or humid places or places under direct sunlight or where condensation is anticipated.

Following the above instructions, store the instrument in good environment.

[6] AFTER-SALE SERVICE

6-1 Repair

If the multimeter fails during use, check the following items before sending it for repair.
・Is the battery not exhausted ?
・Are the test leads not disconnected ?
・Is the fuse not blown ?
We repair defective product ay cost. When mailing it to us for repair, do not use the same cardboard box in which it was delivered to you because it may receive damage in trasit. Please send it in a box at least five times as large as the orignal box with

enougt cushioning material stuffed around it.

6-2 For Information or Enquiries

If you need information regarding purchase of repair parts or if you have any other sales related questions, please contact the dealer, selling agent, or maker.

[7] SPECIFICATIONS

7-1 General Specifications

AC Rectifier Form
: Half-wave rectifier form
Meter type : Internal magnet type, Taut hand meter
Accuracy Assurance Temperature/Humidity Range
: 21～25℃ 75%RH max. No condensation
Operating Temperature/Humidity Range
: 3～43℃ 80%RH max. No condensation
Storage temperature/Humidity Range
: －10～50℃ 70%RH max. No condensation
Internal Battery : R6 (IEC), or UM-3 1.5V×2
Internal fuse : φ6.3×30mm 0.5A/250V Fast fuse Blowout capacity 500A
Dimension and Weight
: 144(H)×99(W)×41(D)mm - approx.270 g
Accessories : Instruction manual 1 Spare fuse 1 Test leads(TL-61) 1

7-2 Optinal Accessories

- Clip adapter CL-11 (Red, Black 1set)
- HV probe HV-
- Carrying case C-SP
- Carrying Case C-SPH
- Alligator Clip CL-5
- IC Test Clip CL-5IC

7-3 Measurement Range and Accuracy

Accuracyassurance range : 23℃±2℃ 45～75%RH max No condensation
Attitude : Horizontal (±5°)
ACV accuracy in the case of sine wave AC.

Function	full scale value	Accuracy	Remaks
DCV (⎓)	0.25/2.5/5/10/50/100	±3% against full scale	Input impedance 20kΩ/V
	500		Input impedance 9kΩ/V
ACV(～)	10/50/250/500	±3% against full scale	Input impedance 9kΩ/V Frequency : 40Hz 1000Hz (AC V range)
DCA(⎓)	50μ/2.5m/25m/0.25	±3% against full scale	Voltage drop 0.25V Not including the resistance of the fuse
Ω	2k/20k/200k/2M (x1)(x10)(x100)(x1k)	±3% of arc	Center value 20Ω Max. Value 2kΩ Release voltage 3V
Battery Check	2.0V	———	Load resistance 20Ω
Capacity (μF)	500	———	Point indication of the maximum move by charged current in the capacitor.
HV	DC25kV	±20% with probe	Optional HV-10
Temp ℃	-20～+200	±3% against fullscale	Optional THP

Spesifications and external appearance of the product described above may be revised for modification without prior notice.