

## SP20 MULTITESTER

### INSTRUCTION MANUAL

SANWA ELECTRIC INSTRUMENT CO., LTD.  
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#### [2] APPLICATION AND FEATURES

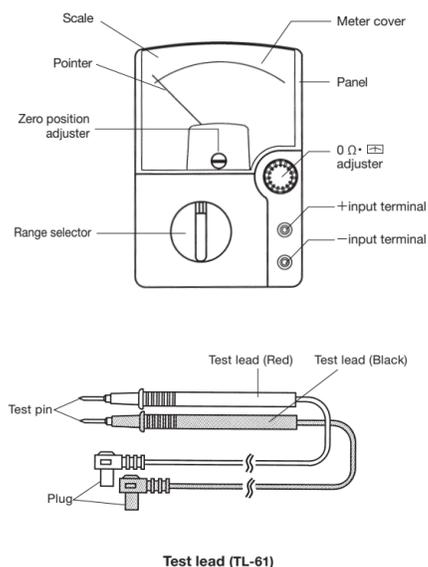
##### 2-1 Application

This instrument is portable multimeter designated for measurement of weak current circuit.

##### 2-2 Features

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

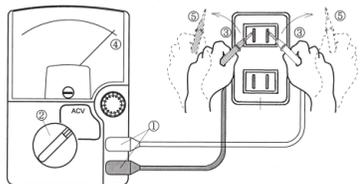
#### [3] NAME OF COMPONENT UNITS



Test lead (TL-61)

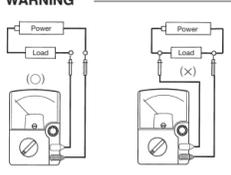
#### 4-4-2 ACV Measurement ( ~ ) Maximum rating input value 500 VAC

- Connect the black plug of the test lead to the -input terminal and the red plug to the + input terminal.
  - Set the range selector knob to an appropriate ACV range.
  - Apply the red and black test pin to measured circuit.
  - Read the move of the pointer by V. A scale.
  - After 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 0.25 ADC

- WARNING**
- Never apply voltage to the input terminals.
  - Be sure to make a series connection via load. (Please see to above drawing)
  - Do not apply an input exceeding the maximum rated current to the input terminals.



#### 5-1 Maintenance and Inspection

- Appearance
    - Is the appearance not damaged by falling?
  - 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.

#### 5-2 Calibration

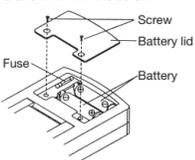
The calibration and inspection may be conducted by the dealer. For more information, please contact the dealer.

#### 5-3 How to Replace Battery and Fuse

- WARNING**
- 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 input is applied.
  - Be sure to use the fuse is same rating so as to ensure safety and performance of tester.
  - When operator remove the battery lid, do not touch the internal parts or wire with hand.

#### <How to replace the battery>

- Remove the battery lid screw with a screwdriver.
- Remove the battery lid.
- Take out the battery and replace it with a new one.
- Attach the battery lid and fix it with the screw.



#### <How to replace the fuse>

- Fuse of the specified rating and type  
0.5 A/250 V φ 6.3×30 mm Blowout capacity:500 A
- Remove the battery lid screw with a screwdriver.
  - Pull out the fuse out of holder on the circuit board and replace it.
  - Put back the battery lid where it was and tighten the screw.
  - Check 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**
- 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.
  - The panel and the case are not resistant to heat. Do not place the instrument near heat-generating devices (such as a soldering iron).
  - Do not store the instrument in a place where it may be subjected to vibration or from where it may fall.
  - 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 at any 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 transit. Please send it in a box at least five times as large as the original box with enough cushioning material stuffed around it.

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

This instruction manual explains how to use your multimeter SP20 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 " or " ⚠ 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.
- ⚡ : Voltage
- ~ : AC Voltage
- Ω : Resistance
- ⚡ : Fuse & Diode protection
- ⚡ : Drop proof
- ⚡ : Glaund
- ⊕ : Plus input
- ⊖ : Minus input
- ⊕ : Fuse

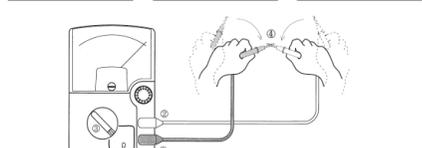
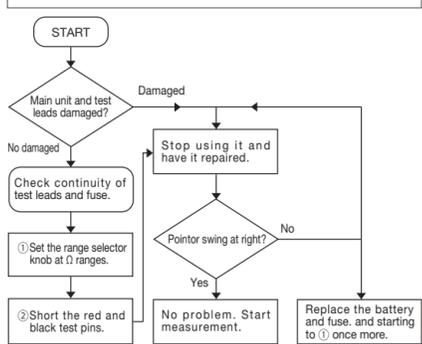
#### 1-2 Warning instruction for safe use

- To ensure that the meter is used safely, be sure to observe the instruction when using the instrument.
- Never use meter on the electric circuit that exceed 3 kVA.
  - Pay special attention when measuring the voltage of AC 33 Vrms (46.7 Vpeak) or DC 70 V or more to avoid injury.
  - Never apply an input signals exceeding the maximum rating input value.
  - 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.

#### [4] MEASUREMENT PROCEDURE

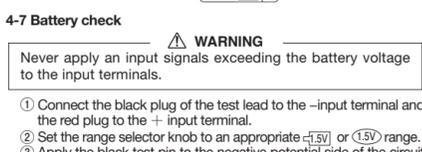
##### 4-1 Start-up Inspection

- WARNING**
- Never use meter if the meter or test leads are damaged or broken.
  - Make sure that the test leads are not cut or otherwise damaged.



#### 4-7 Battery check

- WARNING**
- Never apply an input signals exceeding the battery voltage to the input terminals.
- Connect the black plug of the test lead to the -input terminal and the red plug to the + input terminal.
  - Set the range selector knob to an appropriate  $\Omega$  range.
  - Short the red and black test pins to the measured resistance.
  - Read the move of the pointer by  $\Omega$  scale.



#### 4-8 Measuring Capacity ( μF )

- WARNING**
- Never apply voltage to the input terminals.
  - Do not measure as for a condenser of a charged condition.

- Connect the black plug of the test lead to the -input terminal and the red plug to the + input terminal.
- Set the range selector knob to an appropriate  $\mu F \times 1$  range.
- Short the red and black test pins and turn the 0  $\Omega$  adjuster so that the pointer may align exactly to 0  $\Omega$ .
- Apply the black and red test pin to the measured capacitor.
- The pointer moves full scale by the charge current to the capacitor. However, the point starts gradual returning from a certain point. Read the indicated maximum value on  $\mu F$  scale.

#### 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 band meter  
Accuracy Assurance Temperature/Humidity Range : 21 ~ 25 °C 75 %RH max. No condensation  
Operating Temperature/Humidity Range : 3 ~ 43 °C 80 %RH max. No condensation  
Storage temperature/Humidity Range : -10 ~ 50 °C 70 %RH max. No condensation  
Internal Battery : R6 (IEC) or UM-3 1.5 V×2  
internal fuse : φ 6.3×30 mm 0.5 A/250 V Fast fuse  
Blowout capacity 500 A  
Dimension and Mass : 144(H)×99(W)×41(D)mm · approx. 270 g  
Accessories : Instruction manual 1 Spare fuse 1 Test leads (TL-61)

##### 7-2 Optional Accessories

- Clip adapter CL-14 (Red, Black 1 set)
- HV probe HV-10
- Carrying Case C-SP
- Carrying Case C-SPH
- Clip adapter TL-9IC

- Never use meter if the meter or test leads are damaged or broken.
- Never use uncased meter.
- Be sure to use a fuse of the specified rating or type. Never use a substitute of the fuse or never make a short circuit of the fuse.
- Always keep your fingers behind the finger guards on the probe when making measurements.
- Be sure to disconnect the test pins from the circuit when changing the function or range.
- Never use meter with wet hands or in a damp environment.
- Never open tester case except when replacing batteries or fuse. Do not attempt any alteration of original specifications.
- To ensure safety and maintain accuracy, calibrate and check the tester at least once a year.
- 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	DC 1000 V, AC 750 V or PEAK MAX 1100 V
ACV 50 ~ 500			* DC, AC 200 V or PEAK MAX 250 V
DCV 0.25 ~ 10			* DC, AC 0.5 A
ACV 10			* DC, AC 1 mA
DCA 2.5 m/25 m/0.25			* DC, AC 200 V or PEAK MAX 250 V
DCA 50 μ		Voltage and current input prohibited	
Ω		DC 2 V	
⊖			

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

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

- When 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 can not be predicted.
- Appropriate range for measuring a resistance (Ω) , select the range that the pointer indicates approximately in the center.

#### 4-3 Preparation for Measurement

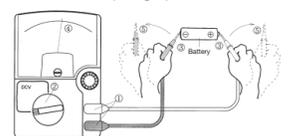
Turn the zero position adjuster so that the pointer may align left to zero position. Select a range proper for the item to be measured and set the range selector accordingly.

#### 4-4 Voltage Measurement

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

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

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



#### 4-9 DC High Voltage measurement (Optional 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.

- Connect the black plug of the HV probe to the -input terminal and the red plug to the + input terminal.
- Set the range selector knob to [HV PROBE] range.
- First, 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.
- Read the move of the pointer by V. A scale, measured value in terms of kV.

#### 4-10 Optional Temperature Probe (T-THP) Max value +200 °C

- Connect the pin of the temperature probe to the + input terminal and the black plug to the -terminal.
- Set the range selector to [C. PROBE] range.
- Adjust the pointer to the 0  $\Omega$  by the range selector. Remove the pin of the temperature probe from the + terminal and then connect the red plug.
- Connect the measuring pin to a point to be measured. Read the value on °C scale when the pointer is stabilized.

#### 4-11 End of Measurement

Turn off the range to prevent voltage applied to resistance and current ranges.

#### [5] MAINTENANCE

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

#### 7-3 Measurement Range and Accuracy

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

Function	full scale value	Accuracy	Remarks
DCV ( --- )	0.25/2.5/5/10/50/100 500	±3 % against full scale	Input impedance 20 kΩ/V input impedance 9 kΩ/V
ACV ( ~ )	10/50/250/500	±3 % against full scale	Input impedance 9 kΩ/V Frequency : 40 Hz ~ 100 kHz (AC 10 V range ±3 %)
DCA ( --- )	50 μ/2.5 m/25 m/0.25	±3 % against full scale	Voltage drop 0.25 V Not including the resistance of the fuse
Ω	2 k/20 k/200 k/2 M (×1)(×10)(×100)(×1k)	±3 % of arc	Center value 20 Ω Max. Value 2 kΩ Release voltage 3 V
Battery Check	2.0 V	—	Load resistance 20 Ω
Capacity ( μF )	500	—	Pointer indication of the maximum move by charged current in the capacitor.
HV	DC 25 kV	±20 % with probe	Optional HV-10
Temp °C	-20 ~ + 200	±3 % against full scale	Optional THP

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