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PM11

DIGITAL MULTIMETER

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INSTRUCTION MANUAL CE

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

This instruction manual explains how to use your new digital multimeter PM11 safely. Before use, please read this manual thoroughly. After reading it, keep it together with the product for reference to it when necessary.

Using this product in ways not specified in this manual may damage its protection function.

The instruction given under the heading " ⚠ WARNING " 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
～ : AC
Ω : Resistance
•ıl) : Continuity
→| : Diode
+ : Plus input (Red)
− : Minus input (Black)
▣ : Double insulation
▭ : Battery

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 3.6 k VA.
2. Pay special attention when measuring the voltage of AC 33 Vrms (46.7 Vpeak) or DC 70 V 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 (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. When connecting and disconnecting the test leads, first connect the ground lead (black). When disconnecting them, the ground lead must be disconnected last.
8. Always keep your fingers behind the finger guards on the probe when making measurements.
9. Be sure to disconnect the test pins from the circuit when changing the function.
10. Before starting measurement, make sure that the function and range are properly set in accordance with the measurement.
11. Never use meter with wet hands or in a damp environment.

⚠ WARNING

12. Never open tester case except when replacing batteries. 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.

⚠ CAUTION

1. Correct measurement may not be performed when using the meter in the ferromagnetic / intense electric field such as places near a transformer, a high-current circuit, and a radio.
2. The meter may malfunction or correct measurement may not be performed when measuring special waveform such as that of the inverter circuit.

1–3 Maximum Overload Protection Input

Function	Input terminal	Maximum rating input value	Maximum overload Protection input
⎓ (DCV)	+ (Red)	DC 500 V	DC 500 V AC 500 V or peak max 700 V
～ (ACV)		AC 500 V	
Ω · •ıl) · →|	− (Black)	⚠ Voltage and current input prohibited	

Note : AC voltage is regulated by rms value of sinusoidal wave.

[2] APPLICATION AND FEATURES

2–1 Application

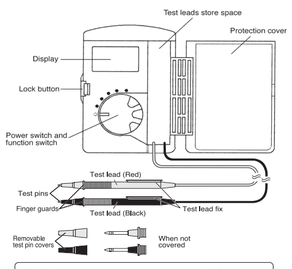
This instrument is pocket type digital multimeter designed for measurement of weak current circuits. It plays an important role in circuitry analysis by using additional functions as well as measurements of small type communication equipment, electrical home appliance, lighting voltage and batteries of various types.

2–2 Features

- Pocket size for easy carrying.
- The instrument has been designed in accordance with the safety standard IEC 61010-1 Measurement Category Ⅱ.
- 4000 counts and circular bar graph available.
- Auto power off. (30min.)
- Test leads strable in the main unit.
- Test leads fixing feature to enable one-hand measurement.
- Voltage and resistance functions in full auto range.
- Main unit and lit quick open/close mechanism.
- The main unit case and the circuit board is made of fire retarding materials.

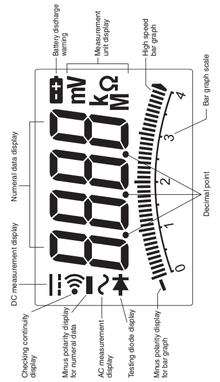
[3] NAME OF COMPONENT UNITS

3–1 Multimeter, Test leads



- When the removable test pin covers are mounted : CAT.Ⅲ 300 V
- When the removable test pin covers are not mounted: CAT.Ⅱ 500 V

3–2 Display



[4] DESCRIPTION OF FUNCTIONS

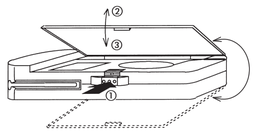
○ Power Switch and Function Switch
Turn this switch to turn on and off the power and to select the functions of DCV, ACV, Ω, •ıl), →|.

○ Battery Voltage Drop Warning Display
If the internal battery has been consumed and the voltage drops, the display shows BT. If it is flashing or lit, replace the battery with a new one.

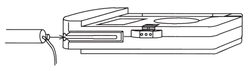
○ Auto power off
If no switch is operated for about 30 minutes after power on, the power will automatically be turned off and the display will become blank.
To reset the meter, remove the object to measure from the meter and set the function switch to OFF set the function switch again according to the measurement and connect the object to measure.

◎ How to open/close main unit lid (Protection cover)
① To open the lid, push the button on the left side of the main unit in the direction shown.
② Open the lid.
③ To close the lid, push in the projection provided inside the lid in the catch on the main unit.

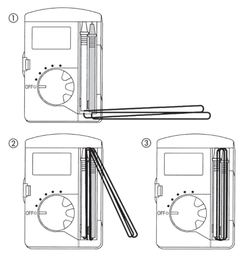
Cautions :
- Keep the lid turned to the rear during measurement.
- The lid can not be closed when the test leads are out.
- If the test leads are projecting from the test lead storage space, the lid may not close completely. Do not force the lid, but re-set the test leads properly.



◎ How to fix test leads
Insert the red or black test leads in the fixing position on the top left corner of the main unit.



◎ How to store test leads.
① Test rod of red-black test leads is let in to store space first of all. (Lead wire is paid outside.)
② Red-black lead wire of the test lead is bundled and it is pulled toward a display and it fold in two and a folded place is put inside the upper part of store space.
③ An end of lead wire is accepted inside the lower part of store space.

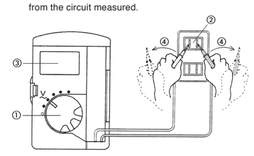


3) Measurement Procedure
① Set the function switch at ⎓ (DCV) range.
② Apply the black test pin to the negative potential side of the circuit to measure and the red test pin to the positive potential side.
③ Read the value on the display.
④ After measurement, remove the red and black test pins from the circuit measured.

● The display fluctuates when the test leads are removed. This is not malfunction.

5-2-2 ACV (⎓) Measurement Maximum Rating Input Value 500V AC

1) Applications
Measures sine-wave a.c. voltages such as lighting voltages.
2) Measuring Ranges
4 ranges from 4 V to 500 V
3) Measurement Procedure
① Set the function switch at ⎓ (ACV) range.
② Apply the red and black test pins to the circuit to measure.
③ Read the value on the display.
④ After measurement, remove the red and black test pins from the circuit measured.



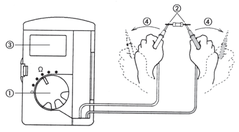
● This instrument employs the average measurement system and some error is made to the display of waveforms other than sine waves.
● The accuracy guaranteed frequency range is 45 Hz to 1 kHz.

5–3 Resistance Measurement

⚠ WARNING

Never apply voltage to the input terminals.

1) Application
Resistance of resistors and circuits are measured.
2) Measuring Ranges
6 ranges from 400 Ω to 40 MΩ.
3) Measurement Procedure
① Set the function switch at Ω range.
② Apply the red and black test pins to an object to measure.
③ Read the value on the display.
④ After measurement, release the red and black test pins from the object measured.



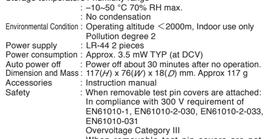
● If measurement is likely to be influenced by noise, shield the object to measure with negative potential (⊖ test lead black).
● If a test pin is touched by a finger during measurement, measurement will be influenced by the resistance in the human body to result in measurement error.
● Open voltage between input terminals.
400Ω range: Approx 1.2 V
Other range: Approx 0.45 V
(Test lead RED: Negative ⊖ Output / BLACK: Positive ⊕ Output)

5–4 Checking Continuity

⚠ WARNING

Never apply voltage to the input terminals.

1) Application
Checking the continuity of wiring and selecting wires.
2) How to Use
① Set the function switch at •ıl) range.
② Apply the red and black test pins to a circuit or conductor to measure.
③ The continuity can be judged by whether the buzzer sounds or not.
④ After measurement, release the red and black test pins from the object measured.



(Test lead RED: Negative ⊖ Output / BLACK: Positive ⊕ Output)

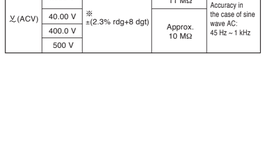
● The buzzer sounds when the resistance in a circuit to measure is less than about 35 Ω.
● The input terminals release voltage is about 1.2 V.

5–5 Testing Diode

⚠ WARNING

Never apply voltage to the input terminals.

1) Application
The quality of diodes is tested.
2) How to Use
① Set the function switch at →| range.
② Apply the black test pin to the cathode of the diode and the red test pin to the anode.
③ Make sure that the display shows a diode forward voltage drop.
④ Apply the red test pin to the cathode of the diode and the black test pin to the anode.



● Open voltage between input terminals is about the same as the voltage of battery.

⑤ Make sure that the display is the same as that when the test leads are released.
⑥ After measurement, release the red and black test pins from the object measured.
Judgement: When the items ③ and ⑤ are normal, the diode is good.

● Open voltage between input terminals is about the same as the voltage of battery.

[6] 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.

6–1 Maintenance and Inspection

1) Appearance
- Is the appearance not damaged by falling?

2) Test leads
- Are you having the problem with "the test leads are damaged, and the cable core and white coating inside of the test leads are exposed"?
(We use double insulation test leads. If you could see the test leads as above condition, you need to change the new one)
Please do not use as it is, if applicable, of the above items. Please have it serviced.

● Make sure that the test leads are not cut, referring to the section 5–1, page 12 ~ 13.

6–2 Calibration

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

MEMO

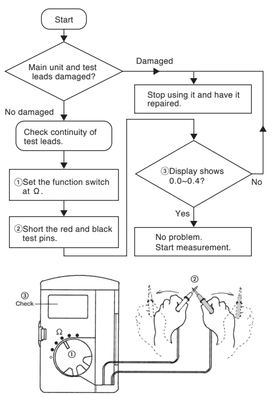
[5] MEASUREMENT PROCEDURE

5–1 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.

The meter will beep when turning its function switch, and it is not malfunction.



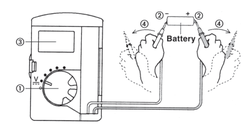
5-2 Voltage Measurement

⚠ 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. Always keep your fingers behind the finger guards on the probe when making measurements.

5-2-1 DCV (⎓) Measurement Maximum Rating Input Value 500 V DC

1) Applications
Measures batteries and d.c. circuits.
2) Measuring Ranges
5 ranges from 400 mV to 500 V.



[7] AFTER-SALE SERVICE

7-1 Warranty and Provision

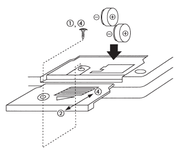
Sanwa offers comprehensive warranty services to its end-users and to its product resellers. Under Sanwa's general warranty policy, each instrument is warranted to be free from defects in workmanship or material under normal use for the period of one (1) year from the date of purchase.
This warranty policy is valid within the country of purchase only, and applied only to the product purchased from Sanwa authorized agent or distributor.
Sanwa reserves the right to inspect all warranty claims to determine the extent to which the warranty policy shall apply. This warranty shall not apply to fuses, disposables batteries, or any product or parts, which have been subject to one of the following causes:
1. A failure due to improper handling or use that deviates from the instruction manual.
2. A failure due to inadequate repair or modification by people other than Sanwa service personnel.
3. A failure due to causes not attributable to this product such as fire, flood and other natural disaster.
4. Non-operation due to a discharged battery.
5. A failure or damage due to transportation, relocation or dropping after the purchase.

6–3 Battery Replacement

⚠ 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 input is applied.
2. Before starting the work, be sure to turn OFF the main unit power and release the test leads from the circuit.

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



The button-battery is made of oxidized silver, etc.
Please keep it away from little children lest they should swallow it in.

⚠ CAUTION

Set a battery with its polarities facing in the correct directions.

Batteris when the meter is shipped:

A battery for monitoring has been installed prior to shipment from the factory. It may be discharged before the expiration of the described battery life.
*The battery for monitoring is a battery used to check the functions and performance of the product.

6-4 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.

[7] AFTER-SALE SERVICE

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4. Non-operation due to a discharged battery.
5. A failure or damage due to transportation, relocation or dropping after the purchase.

[8] SPECIFICATIONS

8–1 General Specifications

Measuring method	: Dual integration
Display	: Counter approx. 4000 counts max. Bar graph max. 40 segments
Range selection	: Auto range (V · Ω)
Over display	: "OL" mark indication
Polarity	: Automatic selection ("−" is displayed only.)
Battery discharge	: If the internal battery has been consumed and the voltage drops, the display shows BT.
Sampling rate	: Approx. 1.3 times/sec (numeral display) Approx. 13 times/ sec (bar graph)
Accuracy assurance	temperature/humidity range : 23±5 °C 80% RH max. No condensation
Operating temperature/humidity range	: 0–40 °C 80% RH max. No condensation
Storage temperature / humidity range	: –10–50 °C 70% RH max. : No condensation
Environmental Condition	: Operating altitude ＜2000m, Indoor use only Pollution degree 2
Power supply	: LR-44 2 pieces
Power consumption	: Approx. 3.5 mW TYP (at DCV)
Auto power off	: Power off about 30 minutes after no operation.
Dimension and Mass	: 117(*H*) x 76(*W*) x 18(*D*) mm. Approx 117 g
Accessories	: Instruction manual
Safety	: When removable test pin covers are attached: In compliance with 300 V requirement of EN61010-1, EN61010-2-030, EN61010-2-033, EN61010-031 Overvoltage Category III When removable test pin covers are not attached: In compliance with 500 V requirement of Overvoltage Category II
Installation Category (Overvoltage Category) Ⅱ	: Local Level Appliances Portable Equipment
Installation Category (Overvoltage Category) Ⅲ	: Distribution Level Fixed Installation
EMC directive, RoHS directive	: IEC61326(EMC). EN50581(RoHS).

8–2 Measurement Range and Accuracy

Accuracy assurance range: 23±5°C 80%RH max.
No condensation.

Function	Range	Accuracy	Input Resistance	Remarks
⎓(DCV)	400.0 mV	±(0.8% rdg+4 dgt)	≧ 100 MΩ	
	4.000 V	±(1.3% rdg+4 dgt)	Approx. 11 MΩ	
	40.00 V		Approx. 10 MΩ	
	400.0 V			
	500 V			
～(ACV)	4.000 V	※ ±(2.3% rdg+8 dgt)	Approx. 11 MΩ	Accuracy in the case of sine wave AC: 45 Hz ~ 1 kHz
	40.00 V		Approx. 10 MΩ	
	400.0 V			
	500 V			

Ω Resistance	400.0 Ω	±(2.0% rdg+4 dgt)		Open voltage between input terminals. 400 Ω range: Approx 1.2 V Other range: Approx 0.45 V ※ Test lead RED: Negative ⊖ Output BLACK: Positive ⊕ Output ※The measuring current changes according to the resistance of the resister to measure.
	4.000 kΩ			
	40.00 kΩ			
	400.0 kΩ			
	4.000 MΩ	±(3.5% rdg+4 dgt)		
	40.00 MΩ	±(10% rdg+5 dgt)		
•ıl) Checking Continuity	・Buzzer sounds at approx. 35 Ω max. ・Open voltage : approx. 1.2 V ※ Test lead RED: Negative ⊖ Output BLACK: Positive ⊕ Output			
→| Testing Diode	・Open voltage between input terminals is about the same as the voltage of battery.			

rdg : reading dgt : digits

※ Accuracy in the case of sine wave AC.

◎ Accuracy calculation
True value :Measurement DCV
Displayed value :100.0 mV
Accuracy :400 mV Range ···· ±(0.8% rdg+4 dgt)
Error :±(100.0 [mV] x 0.8% + 4 [dgt]) = ±1.2 [mV]
For example :100.0 [mV] ± 1.2 [mV] (In a range of 98.8~101.2 mV)

※ 4 [dgt] in the 400 mV range corresponds to 0.4 mV

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