

sanwa



PM3

DIGITAL MULTITESTER

INSTRUCTION MANUAL



**SANWA ELECTRIC
INSTRUMENT CO.,LTD.**
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Chiyoda-ku, Tokyo, Japan



[1] SAFETY PRECAUTIONS

: Before use, read the following safety precautions

This instruction manual explains how to use your multimeter PM3 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.

DCV 	: DC voltage	ACV~ : AC voltage	Ω : Resistance		
	: Buzzer		: Diode		: Capacitance
Hz	: Frequency	DUTY	: Duty cycle		: Ground
+	: Plus	-	: Minus		: Double insulation

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 3.6kVA.
2. Pay special attention when measuring the voltage AC 30Vrms (42.4 V peak) or DC 60V or more to avoid injury.
3. Never apply an input signal 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. Always keep your fingers behind the finger guards on the probe when making measurements.
8. Be sure to disconnect the test pins from the circuit when changing the function.
9. Never use meter with wet hands or in a damp environment.
10. Never open tester case except when replacing batteries. Do not attempt any alteration of original specifications.
11. Do not use the device near an item of strong electromagnetic generation or a charged item.
12. To ensure safety and maintain accuracy, calibrate and check the tester at least once a year.
13. The multimeter restricts in use in indoor.

1-3 Maximum Overload Protection Input

Function	Input	Maximum rating Input value	Maximum overload Protection voltage
DCV (Hz/ DUTY)	+, -	DC500V	DC500V, AC500V or Peak Max.700V
ACV (Hz/DUTY)		AC500V	
Ω / \blacktriangleright / \bullet / Hz / DUTY		Δ Voltage and current Input prohibited	

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

[2] APPLICATION AND FEATURES

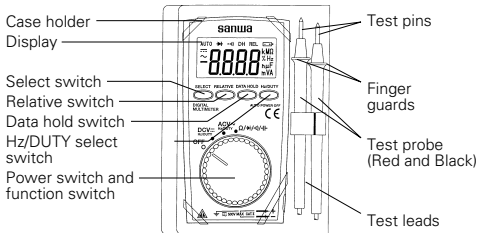
2-1 Application

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

2-2 Features

- This multimeter is very thin type. Body thickness is 8.5mm.
- Sharp contrast LCD with character 13.6mm high is employed, and unit symbols is displayed on the screen of the LCD.
- Addition function: Hz/Duty, Relative and Data Hold.
- Auto power off(15 min.) It is able to cancel it.
- The instrument has been designed in accordance with the safety standard IEC 1010-1. (DC/AC 500V Max. CAT II)

[3] NAME OF COMPONENT UNITS



[4] DESCRIPTION OF FUNCTIONS

⚠ WARNING

In the case of action or cancel that function as follows, do not turn the function switch in the condition applied input.

1) Power switch and function switch

Turn this switch to turn on and off the power and select the functions of DCV, ACV, Ω , \bullet), \blacktriangleright , \blacktriangleright).

2) Select switch

This switch uses it for the switching of Ω / \blacktriangleright / \bullet) / \blacktriangleright . In the case of the mode change as $\Omega \rightarrow \blacktriangleright \rightarrow \bullet$) $\rightarrow \blacktriangleright \rightarrow \Omega$.

3) Data hold switch

When this switch is pressed, the data display at that time continues (DH lights on the display). When the measuring input changes, the display will not change. When this switch is pressed again, the hold status is canceled you can return to the measuring status. (DH on the display disappears.)

(DATA HOLD function does not work when measuring frequency.)

4) Relative measurement switch (RELATIVE)

Suppose that actual value is X1 when REL switch is pressed. Then, value of X-X1 is displayed for actual input value X after that. Each time pressing REL switch, value of X1 is updated. This function is except the Hz/DUTY measurement mode.

<In the case of use at the DCV and ACV function>

- In the case of canceled, please push the switch again.
- The measurement range is fixed to the range in the point that pushed the switch. About measurement after this, the range is fixed. To return to the auto range, please stop measurement once and set the function again.
- Do not measure any signal that exceeds the maximum of current range.

<In the case of use Ω 、 \bullet)、 \blacktriangleright function>

- When "O.L" is displayed, setting and cancellation are not possible.
- In the case of canceled, please push the switch again.
- The resistance measurement range is fixed to the range in the point that pushed the switch. About measurement after this, the range is fixed. To return to the auto range, please stop measurement once and set the function again.

<In the case of use \ddagger function>

- In the case of canceled, please push the switch again.
- The Capacitance measurement is auto range mode only. After canceled relative mode, it is possible measurement with the auto range.

5) Hz/DUTY (Frequency/Duty)switch

This switch uses it for the switching of Hz/DUTY. In the case of the mode change as Hz→DUTY→voltage measuring mode→Hz.

- When it returns it to the voltage function after the Hz/DUTY measurement the range is fixed automatically. (DCV function is 400mV. ACV function is 4V.) Please stop measurement once to cancel the manual range. And please do measurement after the function is set up again.

6) Auto power off

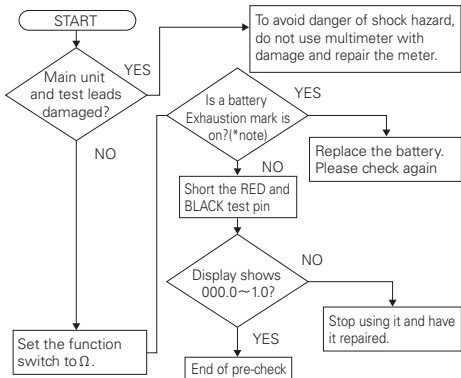
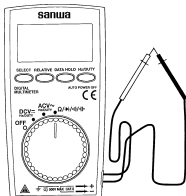
This equipment incorporates an auto power off which turns off the display in about 15 minutes to save power. If you want to continue to use the equipment, press the SELECT switch. To cancel auto power off for long time measurement, turn function switch from OFF position to position of desired function while holding down SELECT switch. Then release SELECT switch approx. 2sec. to 3sec. after.

[5] MEASUREMENT PROCEDURE

5-1 Start-up Inspection

⚠ WARNING

1. Be sure to pre-check the meter before use.
2. Do not use a damaged meter and test leads.
3. Check continuity of test leads.
4. When a battery exhaust mark appears in the display, replace the battery with a new one.



* note: Non-marking may suggest that a battery be exhausted.

5-2 Voltage, Hz/DUTY measurement

⚠ WARNING

1. Never apply an input signal 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 Voltage Measurement (DCV,ACV)

Maximum rating input value DC/AC 500V

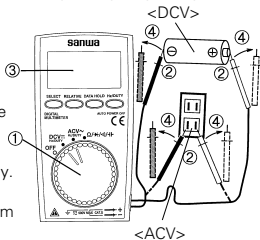
1) Applications

DCV \equiv : Measures batteries and DC circuits.

ACV \sim : Measures sine-wave AC voltage as lighting voltages.

2) Measurement procedure

- ① Set the function switch "DCV" or "ACV" function.
- 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.
- Since this instrument employs the means value system for its AC voltage measurement circuit, AC waveform other than sine wave may cause error.
- In the AC4V ranges a figure of about 3~9 counts will stay on even if no input signal is present.
- The accuracy guaranteed frequency range is 40Hz to 400Hz.

5-2-2 Hz/DUTY Measurements

Maximum rating input value 60.00kHz / 99%

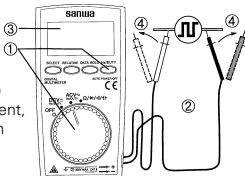
⚠ CAUTION

The setting and measurement (At the time of AC voltage input) of the Hz/DUTY are possible at the DCV function too. However, we recommend the use in the ACV function.

1) Applications: Measures frequency and duty of any circuit.

2) Measurement procedure

- ① Set the function switch at ACV function. Push the Hz/DUTY switch one time, and select the Hz function. (The unit display is Hz display.)
In the case of duty measurement, then push the Hz/DUTY switch one more time, and select the duty function. (The unit display is % display.)
 - 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.
- With measuring terminals disconnected, display may overflow or value may unsteadily fluctuate. There are not malfunctions.
 - Input sensitivity varies according to frequency and wave-form.
 - Please refer to 8-2 Measurement Range and Accuracy.
 - It is only auto range mode.
 - When it returns it to the voltage function after the Hz/DUTY measurement the range is fixed automatically. (DCV function is 400mV. ACV function is 4V.) Please stop measurement once to cancel the manual range. And please do measurement after the function is set up again.
 - DATA HOLD function does not work when measuring frequency.
 - The meter cannot measure frequency that does not go to and fro 0 voltage.



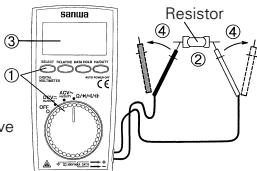
5-3 Resistance Measurement (Ω)

⚠ WARNING

Never apply voltage to the input terminal.

- 1) Application: Resistance of resistors and circuits are measured.
- 2) Measuring ranges: $400\ \Omega \sim 40\text{M}\ \Omega$ (6 range)
- 3) Measurement procedure

- ① Set the function switch at $\Omega / \blacktriangleright / \bullet / \oplus / \opl�$ function.
- ② Apply the black red test pin to measured circuit.
- ③ Read the value on the display.
- ④ After measurement, remove the red and black test pins from the circuit measured.



- If measurement is likely to be influenced by noise, shield the object to measure with negative potential (test lead black).
- The input terminals release voltage is about 0.4V.

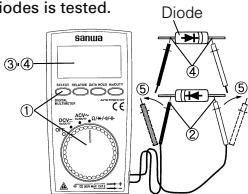
5-4 Testing Diode (\blacktriangleright)

⚠ WARNING

Never apply voltage to the input terminal.

- 1) Application: The quality of diodes is tested.
- 2) Measurement procedure

- ① Set the function switch at $\Omega / \blacktriangleright / \bullet / \oplus / \opl�$ function and select the function by SELECT switch.
- 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 Replace the red and black test pins, make sure that the displays the same as that when the test leads are released.
- ⑤ After measurement, release the red and black test pins from the object measured.

Judgment: When the items ③ and ④ are normal, the diode is good.

- The input terminals release voltage is about 1.5V.

5-5 Checking Continuity (•••)

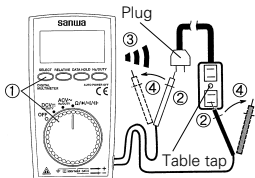
⚠ WARNING

Never apply voltage to the input terminal.

1) Application: Checking the continuity of wiring and selecting wires.

2) Measurement procedure

- ① Set the function switch at Ω / \blacktriangleright / (•••) / \ddagger function and select the function by SELECT switch.
- 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.



- The buzzer sounds when the resistance in a circuit to measure is less than about $10\Omega \sim 100\Omega$.
- The input terminals release voltage is about 0.4V.

5-6 Capacity Measurement (\ddagger)

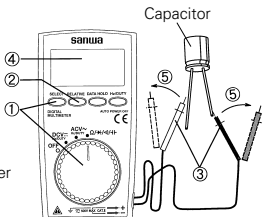
⚠ WARNING

1. Never apply voltage to the input terminal.
2. This is not suitable for measurement of electrolytic condenser such as a large leakage condenser.

1) Application: Measures capacitance of capacity.

2) Measurement procedure

- ① Set the function switch at $\Omega/\blacktriangleright/(\bullet\bullet)/nF$ function and select the function by SELECT switch.
- ② Press the RELATIVE switch to make display show 00.00nF. (The "REL" mark illuminates in the upper right area of the display.)
- ③ Apply the black red test pin to capacitor.



- ④ Read the value on the display.
 - ⑤ After measurement, remove the red and black test pins from the circuit measured.
- For measurement of 100nF or below, the display will not stabilize due to the influence of ambient noise and floating capacity.
 - Necessarily please discharge the electric charge that was charged to the condenser before measurement.
 - As the capacitance increases, the measuring time becomes longer. (Example: approx. 5sec. at 10 μ . Approx.45sec. at 150 μ F.)

[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: 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, referring to the section.

6-2 Calibration

The dealer may conduct the calibration and inspection. For more information, please contact the dealer.

6-3 How to Replace Battery

⚠ WARNING

1. If the rear case 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 operators remove the rear case, do not touch the internal parts or wire with hand.

<How to replace the battery>

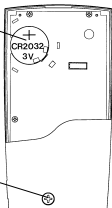
- ① Remove the rear case screw with a screwdriver.
- ② Remove the rear case.
- ③ Take out the battery and replace it with a new one.
- ④ Attach the rear case and fix it with the screw.

⚠ CAUTION

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

Coin type
lithium battery
CR2032

Screw



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

[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.

7-2 Repair

Customers are asked to provide the following information when requesting services:

1. Customer name, address, and contact information
2. Description of problem
3. Description of product configuration
4. Model Number
5. Product Serial Number
6. Proof of Date-of-Purchase
7. Where you purchased the product

Please contact Sanwa authorized agent / distributor / service provider, listed in our website, in your country with above information. An instrument sent to Sanwa / agent / distributor without those information will be returned to the customer.

Note:

- 1) Prior to requesting repair, please check the following:
Capacity of the built-in battery, polarity of installation and discontinuity of the test leads.

- 2) Repair during the warranty period:
The failed meter will be repaired in accordance with the conditions stipulated in 7-1 Warranty and Provision.
- 3) Repair after the warranty period has expired:
In some cases, repair and transportation cost may become higher than the price of the product. Please contact Sanwa authorized agent / service provider in advance.
The minimum retention period of service functional parts is 6 years after the discontinuation of manufacture. This retention period is the repair warranty period. Please note, however, if such functional parts become unavailable for reasons of discontinuation of manufacture, etc., the retention period may become shorter accordingly.
- 4) Precautions when sending the product to be repaired:
To ensure the safety of the product during transportation, place the product in a box that is larger than the product 5 times or more in volume and fill cushion materials fully and then clearly mark "Repair Product Enclosed" on the box surface. The cost of sending and returning the product shall be borne by the customer.

7-3 SANWA Website

<http://www.sanwa-meter.co.jp>

E-mail: exp_sales@sanwa-meter.co.jp

[8] SPECIFICATIONS

8-1 General Specifications


Measuring Method: $\Delta \Sigma$

Display: 4000 counts max.

Range selection: Auto ranges

Over display: "O.L" display

Polarity: Automatic selection (only "—" is displayed)

Low Battery Indication: 

Sampling rate: Approx. 3 times/sec.

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, Pollution degree II

Power supply: Coin type lithium battery CR2032 (3V), 1 pcs.

Power consumption: Approx.6mW TYP. (at DCV)

Battery life: Approx.150 hours at DCV

Dimension and weight:108(H)×56(W)×11.5(D)mm Approx.50g

Accessories: Instruction manual 1, Case holder 1

Safety: IEC 1010-1(EN61010-1)

≤DC·AC 500V: Designed to protection Class II
requirement of IEC 1010-1, Pollution degree II.

EMC: EN50081-1 (EN55022), EN50082-1 (EN61000-4-2)
EN50082-1 (EN61000-4-3), EN50082-1 (EN50204)

Installation Category(Overvoltage Category) II

:Local Level

Appliance

Portable Equipment

8-2 Measurement Range and Accuracy

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

Function	Range	Accuracy	Input Resistance	Remarks
DCV =	400.0mV	±(0.7%rdg+3dgt)	≥100MΩ	
	4.000V	±(1.3%rdg+3dgt)	Approx.11MΩ	
	40.00V		Approx.10MΩ	
	400.0V			
	500V			
ACV ~	4.000V	±(2.3%rdg+10dgt)	Approx.11MΩ	*Accuracy in the case of sine wave. *Frequency range: 40~400Hz
	40.00V		Approx.10MΩ	
	400.0V	±(2.3%rdg+5dgt)		
	500V			
Ω	400.0Ω	±(2.0%rdg+5dgt)	*Open voltage: Approx. 0.4V *The measuring current changes according to the resistance measure.	
	4.000kΩ			
	40.00kΩ			
	400.0kΩ			
	4.000MΩ	±(5.0%rdg+5dgt)		
	40.00MΩ	±(10%rdg+5dgt)		
CAP. ⊕	4.000nF	—————	*Accuracy was measured after canceling display value by relative key.	
	40.00nF	±(5.0%rdg+10dgt)		
	400.0nF			
	4.000μF			
	40.00μF			±(10%rdg+15dgt)
	200.0μF			

Function	Range	Accuracy	Remarks
Hz	9.999Hz	$\pm(0.7\%rdg+5dgt)$	*Accuracy in the case of sine wave. 9.999Hz~9.999kHz: 10Vrms~250Vrms. 60.00kHz: 40Vrms~100Vrms.
	99.99Hz		
	999.9Hz		
	9.999kHz		
	60.00kHz		
DUTY	0.1~99%	_____	About input sensitivity and frequency characteristic: (Square wave DUTY 50% input) 2.5V 0 to peak input: $\geq 1kHz$ 6V 0 to peak input: $\geq 10kHz$ 40V 0 to peak input: $\geq 60kHz$
BUZZER •)))			• Buzzer sounds at less than 10~120 Ω • Open voltage: Approx. 0.4V
DIODE ▶			Open voltage: Approx 1.5V

Accuracy in the case of sine wave.

◎Accuracy calculation

For example : Measurement DCmV

Displayed value : 100.0mV

Accuracy : 400mV range ···· $\pm(0.7\%rdg+3dgt)$

Error : $\pm(100[mV] \times 0.7\% + 3[dgt]) = \pm 1.0[mV]$

True value : $100.0[mV] \pm 1.0[mV]$ (In a range of 99.0~101.0mV)

*3[dgt] in the 400mV range corresponds to 0.3mV.

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

sanwa

保証書

ご氏名

様

ご住所

□□□-□□□□

TEL

保証期間

ご購入日 年 月より3年間

型名 **PM3**

製造No.

この製品は厳密なる品質管理を経てお届けするものです。

本保証書は所定項目をご記入の上保管していただき、アフターサービスの際ご提出ください。

※本保証書は再発行はいたしませんので大切に保管してください。

三和電気計器株式会社

本社=東京都千代田区外神田2-4-4 電波ビル
郵便番号=101-0021 電話=東京 (03) 3253-4871代

保証規定

保証期間中に正常な使用状態のもとで、万一故障が発生した場合には無償で修理いたします。ただし下記事項に該当する場合は無償修理の対象から除外いたします。

記

- 取扱説明書と異なる不適当な取扱いまたは使用による故障
- 当社サービスマン以外による不当な修理や改造に起因する故障
- 火災水害などの天災を始め故障の原因が本計器以外の事由による故障
- 電池の消耗による不動作
- お買い上げ後の輸送、移動、落下などによる故障および損傷
- 本保証書は日本国内において有効です。

This warranty is valid only within Japan.

年 月 日	修理内容をご記入ください。

※無償の認定は当社において行わせていただきます。