sanwa

PM300

DIGITAL MULTIMETER

INSTRUCTION MANUAL

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[1] SAFETY PRECAUTIONS

Before use, read the following safety precautions.

This instruction manual explains how to use your new digital multimeter PM300 safely.
Before use, please read this manual thoroughly. After reading it, keep it together with the product for reference to it when necessary.
If you use the product in a method not specified in this manual, the protection function of the product may be imperiled.
The instruction given under the heading of "⚠WARNING" and "⚠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 instructions 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.

Symbols attached to the product
⚠ : Symbol soliciting reference to this manual before use
⧈ : Double or enhanced insulation
⏚ : Ground Ω : Resistance ⊳| : Diode
•)) : Buzzer ⊣⊢ : Capacitance

1-2 Warning Instructions for Safe Use

⚠ WARNING

The following instructions are intended to prevent personal injury such as burn and electric shock. Be sure to follow them when using the tester.

1. This instrument is a digital multimeter for metering low voltages. Never use it on electric circuits that exceed CAT.IV 300 V or CAT.III 600V.
2. Pay special attention when measuring the voltage of AC 33 Vrms (46.7 V peak) or DC 70 V or more to avoid injury.
3. Never apply an input signal exceeding the maximum rating input value (see 1-3).
4. Never use the 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. Before starting measurement, make sure that the function is properly set in accordance with the measurement.
10. Never use meter with wet hands or in a damp environment.
11. Never open tester case except when replacing the battery. Do not attempt any alteration of original specifications.
12. To ensure safety and maintain accuracy, check the meter in the start-up inspection as well as in the inspection/calibration to be performed at least once a year.
13. The meter is for indoor use only.
14. Wear insulating protective gear when using the meter with equipment containing a hazardous live part. Also be sure to observe your local and national safety rules.
15. Always use the meter in a specified method to prevent the protective function from being imperiled.

⚠ CAUTION

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

1-3 Overload protections

Function	Input terminals	Max. rated input value	Max. overload protection input
ACV / Hz	+ (Red) and – (Black)	AC 600 V	AC/DC 660 V
DCV		DC 600 V	
Ω/⊳|/•))/⊣⊢		Voltage input prohibited	AC/DC 600 V

[2] APPLICATIONS AND FEATURES

2-1 Applications

This instrument is a pocket-type digital multimeter with rms value response, designed for measurements within the range specified as CAT. Ⅳ 300 V/CAT.Ⅲ 600 V in IEC61010.

2-2 Features

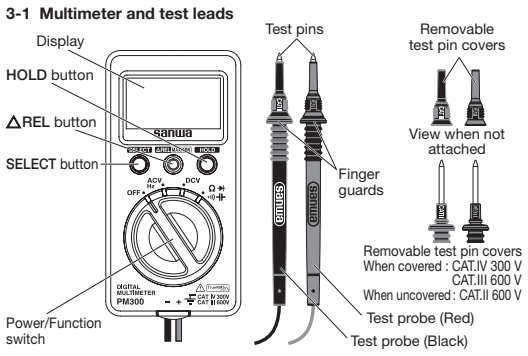
- Safety design compliant to IEC61010.
- AC measurements with True RMS conversion.
- High portability using the carrying case provided as standard.

Measurement categories (Overvoltage categories)

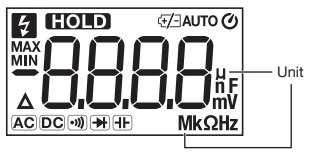
CAT. II : Primary circuit of equipment with a power cord to be connected to a mains socket.
CAT.III : Primary circuit of equipment that inputs power directly from the distributor and the circuit from the distributor to the mains socket.
CAT.IV : Circuit from the leading wire to the distributor.

[3] NAMES OF COMPONENT UNITS

3-1 Multimeter and test leads

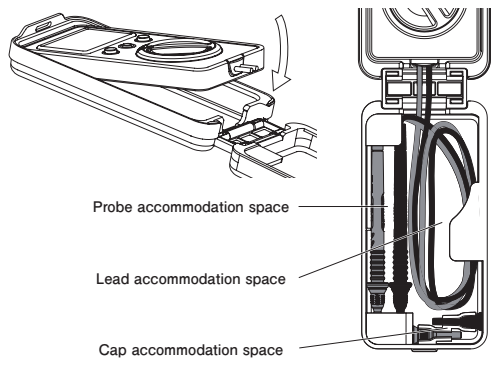


3-2 Display



⚡ : Voltage alarm HOLD : Data Hold indicator
AUTO : Auto Range indicator ⊕/⊖ : Low battery indication
Ⓐ : Auto Power Save indicator △ : Relative operation indication
•)) : Continuity check ⊳| : Diode ⊣⊢ : Capacitor
AC : Alternative Current DC : Direct Current
MAX MIN : MAX/MIN mode indicator

3-3 Using the carrying case



[4] DESCRIPTION OF FUNCTIONS

4-1 Power/Function switch

Turn this switch to turn on and off the power and to switch the measuring functions.

4-2 Auto Power Save

The Auto Power Save function turns the display off automatically in about 15 minutes after the last operation or after an input of 20 V or higher was applied to save the power consumption. To return from this status, press the **SELECT** button or turn the power switch to OFF then to another position.
To disable the Auto Power Save function, switch the meter on by turning the function switch while holding the **SELECT** button depressed. A short buzzer beep is generated, "dAPS" is displayed for 2 seconds, and the Ⓐ indicator disappears.
* A small current flows inside the meter even in the Auto Power Save status. After measurement, always turn the function switch to the OFF position.

4-3 Low battery indication

When the battery is exhausted until the supply voltage drops below about 2.3 V, the ⊕/⊖ indicator lights on the display. Replace the battery when this indicator appears.

4-4 Measurement function selection : SELECT button

When the **SELECT** button is pressed, the functions change as follows.
ACV position : ACV → Hz → ACV → …
Ω position : Ω → ⊳| → •)) → ⊣⊢ → Ω → …

4-5 Relative value measurement : △ REL button

When the**△REL** button is pressed, △ appears on the display, the measuring range is fixed and the display shows the relative values assuming that the value at the moment the button is pressed is 0 (reference value). When the button is pressed again, △ disappears and the relative value measurement is canceled. Relative value measurement mode is not available in the **Hz**, ⊳| and •)) functions.
* The △REL mode is also canceled when the function is switched.

4-6 MAX/MIN memory : △REL (MAX/MIN) button

When the **△REL** button is held depressed, the meter enters the MAX/MIN mode, in which the measurement range is fixed and the Auto Power Save and Relative value measurement functions are canceled.

- Every time the **SELECT** button is pressed, the displayed information changes as follows : Current measurement display (**MAX MIN** displayed) → MAX value display (**MAX** displayed) → MIN value display (**MIN** displayed) → Current measurement display (**MAX MIN** displayed) → …
- Current measurement display : The meter stores the maximum and minimum values while displaying the current measurement value. The buzzer beeps every time a value is updated. The maximum and minimum values can be checked by pressing the button to view the MAX value display and MIN value display. To cancel the MAX/MIN mode, press the button for 1 sec. or more.
- MAX value display : Maximum value measured since the entry in MAX/MIN mode.
- MIN value display : Minimum value measured since the entry in MAX/MIN mode.

The MAX/MIN mode can also be entered when the relative value measurement function is active (△ displayed). In this case, the MAX/MIN mode displays the relative values assuming that the value at the moment the button is pressed is 0 (reference value).
MAX/MIN memory mode is not available in the **Hz**, ⊳|, •)) and ⊣⊢ functions.
* The MAX/MIN mode is canceled when the function is switched.

4-7 Data Hold : HOLD button

When the **HOLD** button is pressed, the current display is hold (HOLD appears on the display). The display will not be changed even when the input varies thereafter. Press the button again to cancel the Data Hold mode (HOLD on the display disappears).
* The Data Hold mode is also canceled when the function switch is switched or the **SELECT** button is pressed.

4-8 Disable Buzzer

When the meter is switched on while holding the **△REL** button, the display shows dbEP for 2 seconds and the buzzer beep is canceled. Even when the buzzer is canceled, it still beeps in the case of OL alarm, in the continuity check, when the meter is turned on and before Auto Power Save. To enable all of the buzzer sounds, turn the meter off then on again.
* This mode cannot be used when the Auto Power Save function is canceled.

[5] MEASUREMENT PROCEDURE

⚠ WARNING

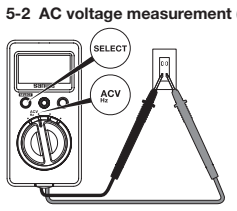
1. Never apply an input signal exceeding the maximum rating input value of each function.
2. Be sure to disconnect the test pins from the circuit when changing the function.
3. Always keep your fingers behind the finger guards on the probe when making measurements.
4. After measurement, release the red and black test pins from the object measured and set the function switch to the OFF position.

5-1 Start-up inspection

Check the following items before starting the daily measurement work.

- Appearance check : Check the appearance of the meter to see if it is free from damage caused by falling, etc.
- Accessory : Check that the test leads are free from irregularities such as wire disconnection and crack.
- Battery: Install the battery before using the meter for the first time. Ensure that the ⊕/⊖ low battery indication is not displayed and, if it is displayed, replace the battery with new one. If nothing is displayed, the battery may be exhausted totally (see 6-4).
- Test lead wire disconnection can be checked by setting the function switch to •)) and shorting the test pins.
- Also check that the meter and your hands are not moistened by water, etc.

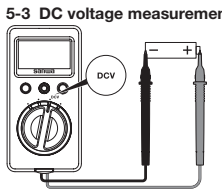
5-2 AC voltage measurement (ACV), frequency measurement (Hz)



Set the function switch to **ACV**.
Each press of the **SELECT** button alternates **ACV** and **Hz**.

While selecting ACV, ⚡ appears on the display when a voltage of 20 V or more is input.
At the moment the input exceeds 20 V, the buzzer beeps to indicate it.

5-3 DC voltage measurement (DCV)



Set the function switch to **DCV**.
⚡ appears on the display when a voltage of 20 V or more is input.
At the moment the input exceeds 20 V, the buzzer beeps and the backlight flashes to indicate it.

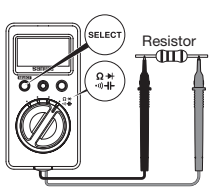
5-4 Resistance (Ω), diode (⊳|), continuity (•)) , capacitance (⊣⊢)

⚠ WARNING

- Never apply voltage to the input terminals.

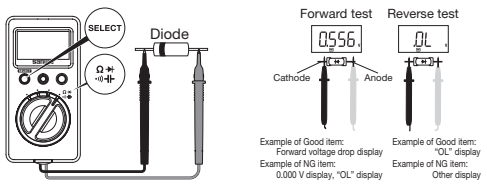
Set the function switch to Ω ⊳| •)) ⊣⊢
Each press of the **SELECT** button switches the function in order of
Ω → ⊳| → •)) → ⊣⊢ → Ω …

5-4-1 Resistance measurement (Ω)

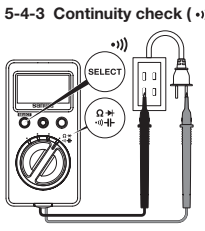


If measurement is likely to be influenced by noise, shield the object to measure with negative potential (COM). If a finger touches a test pin during measurement, measurement will be influenced by the resistance in the human body, and that results in measurement error.
The open voltage across the measurement terminals is about DC 1.2 V.

5-4-2 Diode test (⊳|)

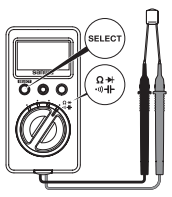


5-4-3 Continuity check (•)))



The buzzer beeps at 10 to 50 Ω or less.

5-4-4 Capacitance measurement (⊣⊢)



Discharge the capacitor before measurement. It takes a while to measure large capacitance. This measurement is not suitable for measurement of a capacitor with a high leak current such as an electrolytic capacitor.

[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 or the core wire not exposed at any place of the test leads?

If any of the above is found with the appearance, do not use the equipment and have it repaired.

6-2 Calibration

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

6-3 Cleaning and storage

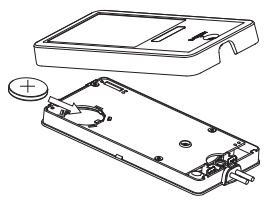
⚠ CAUTION

1. The main unit is not resistant to volatile solvent and must not be cleaned with lacquer thinner or alcohol. If it gets dirty, wipe lightly with a soft cloth moistened with a small amount of water.
2. The main unit is not resistant to heat. Do not place it near a source of high heat.
3. Do not store the instrument in a place where it may be subjected to excessive vibrations 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.
5. When the instrument is not to be used for a long period, be sure to remove the battery from it.

6-4 Battery replacement

⚠ 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 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.



① Turn the rear case retaining screw (x 1) with a Phillips screwdriver, and remove the rear case.
② Replace the battery(CR2032) by taking care of the polarity (so that the "+" indication is visible from you).
③ Attach the rear case and tighten the retaining screw.

[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 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 and polarity of installation.
- 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:
- When the original functionality is expected to be restored by repair, we will repair the product upon request and payment by the customer.
- 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 six (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.
- 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 web site

http://www.sanwa-meter.co.jp
E-mail: exp_sales@sanwa-meter.co.jp

[8] SPECIFICATIONS

8-1 General specifications

Operation method	△ - Σ method
AC detection method	True RMS method (AC coupling)
Display	Max. 6000 counts
Sampling rate	Max. approx. 5 times/sec.
Overload indication	" OL" mark indication on digital display
Range selection	Auto
Polarity switching	Auto ("-" indicated when negative voltage is input)
Low battery indication	⊕/⊖ mark displayed when battery voltage drops at 2.3 V or less.
Operating environmental conditions	Altitude ≤2000 m, indoor use, pollution degree II
Operating temperature/ humidity ranges	-10 °C to 40 °C. Humidity range is as follows (without condensation): Max. 80 %RH at 5 °C to 31 °C, decreasing linearly to 50 %RH at 40 °C.
Storage temperature/ humidity range	-20 °C to 40 °C: ≤80 %RH (without condensation). 40 °C to 50 °C: ≤70 %RH (without condensation). (The battery should be removed when the instrument is not to be used for a long period.)
Temperature coefficient	Below 18 °C and above 28 °C: Accuracy x 0.15 should be added per °C. (Accuracy x 0.25 should be added in the ⊣⊢ function.)
Power supply	CR2032 (Coin-shaped lithium battery)3 V × 1
Auto Power Save	Power Save in about 15 minutes after last operation. Typ. 20 μA
Current drain	About 1.5 mA, max. about 5 mA
Battery life	About 150 hours
Dimensions & mass	110 (*H*) x 56 (*W*) x 13 (*D*) mm, about 84 grams (incl. the battery) 121 (*H*) x 63 (*W*) x 28 (*D*) mm, about 135 grams (when stored in case)
Test lead length	About 0.5 m
Safety standards	IEC61010-1, IEC61010-2-030, IEC61010-2-33, IEC61010-31 CAT.Ⅳ 300 V/CAT.Ⅲ 600 V
EMC Directive, RoHS Directive	IEC61326 (EMC), EN50581 (RoHS)
Accessories	Instruction manual, coin-shaped battery (CR2032), carrying case (C-PM300)

8-2 Measurement ranges and accuracies

Accuracy-assured temperature/humidity ranges: 23±5 °C, ≤ 80 %RH, no condensation.
rdg: reading. dgt: digits (lowest digits)
As the ACV measurements employ the rms value response, the accuracy-assured ranges and crest factor become as follows.
Accuracy range: 1 % to 100 % of measurement range.
Crest factor CF: Full scale CF < 1.8, half scale CF < 3.6.

Function	Range	Accuracy	Remarks
AC voltage **ACV**	6.000 V	± (1.2 %rdg+9 dgt)	Input resistance: About 10 MΩ • Accuracy-assured frequencies : 45 Hz – 500 Hz
	60.00 V	± (1.2 %rdg+5 dgt)	
	600.0 V		
Frequency **Hz**	99.99 Hz	± (0.5 %rdg+3 dgt)	Input resistance: About 10 MΩ • Accuracy not assured below 10 Hz. • Sensitivity 10 Hz – : ≥1 Vrms 10 kHz – : ≥15 Vrms (It is limited to a sine wave.)
	999.9 Hz		
	9.999 kHz		
	99.99 kHz		
DC voltage **DCV**	600.0 mV	± (0.8 %rdg+3 dgt)	Input resistance: About 10 MΩ
	6.000 V		
	60.00 V		
	600.0 V		
Resistance **Ω**	600.0 Ω	± (1.5 %rdg+5 dgt)	• Open voltage: About DC 1.8 V • Measurement current varies depending on the resistance value of the object measured.
	6.000 kΩ		
	60.00 kΩ		
	600.0 kΩ		
	6.000 MΩ	± (2.0 %rdg+ 5 dgt)	
	60.00 MΩ	± (4.0 %rdg+ 5 dgt)	
Diode test ⊳|			Open voltage: About DC 3.2 V "OL" displayed at 3.000 V or more.
Continuity check •))			Open voltage: About DC 1.0 V Buzzer beep generated at 10 to 50 Ω or less.
Capacitance ⊣⊢	60.00 nF	± (3.0 %rdg+10 dgt)	Auto range only. Accuracy with a capacitor with low leak current such as a film capacitor or equivalent. Less than 10 nF add +15 dgt to the accuracy.
	600.0 nF		
	6.000 μF	± (5.0 %rdg+10 dgt)	
	60.00 μF		
	600.0 μF		

Accuracy calculation method

Example) AC voltage measurement (ACV)
Displayed value: 100.0 V
Range accuracy: 600.0 V range ±(1.2 %rdg+5 dgt)
Error: ±(100.0 V x1.2 %rdg+5 dgt) = ±1.7 V
True value: 100.0 V±1.7 V (between 98.3-101.7 V)
* In the 600.0 V range, 5 dgt corresponds to 0.5 V.

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

DRAWING No. PM300 03-1712 2040 6006