User's Guide

SM2000A Series
Digital AC Millivolt Meters

Introduction of SM2000A Series Digital AC Milivolt Meters

With MCU control and VFD technique as well as the combination of digital technique and analog technique together, SM2030A is suitable for measuring of RMS value voltage of Sine waveform that the frequency range is 5Hz~3MHz (5Hz~5MHz for SM2050A) and the voltage range is 50μV~300V. They are all have the switch function between automatic and manual and automatic decimal positioning, as well as three-digit or four-digit display. The measurement result can be displayed as the form of RMS, peak-peak value, voltage level, power level and other units. With two independent input channels also two display lines in the screen, the results for two channels can be displayed at the same time, also display result of one channel with two different units. The range switch mode, range, unit and other operating information can be displayed simultaneously. Clarity and direct vision makes them convenient in application. Input and output floated （to ground） makes them safe during operating. They may be used widely in universities, factories, military units, labs and scientific institutions.

AC2000 series is dual-input digital AC millivolt meter with RS-232 interface.

Packing List

- Digital AC Millivolt Meter 1
- Power cord GB841 1
- BNC Testing Cable 2
- CD 1

Summary

Chapter 1 Quick Start

Help users to learn of the SM2000A series digital AC millivolt meters quickly.

Chapter 2 Basic Operation

Mainly introduce the basic operation for this instrument.

Chapter 3 Programmable Interface

Mainly introduce the programmable interface of this instrument in detail.

Chapter 4 Service and Support

Introduce the maintenance and technical support.

Chapter 5 Specification

Introduce the specifications of the instruments in detail.

Note: please excuse any modification of the contents without special notification. Besides, it is unavoidable for not-so-adequate description and wrong print. Our comoany will not warrant in any form including, but not limited to, those for special aims.

Content

Chapter 1 Quick Start

Prepare to use AC Millivolt Meter

1. Check-up the meters and accessories

Check whether the meter and the accessories are complete and ready. If the package is badly damaged, please keep it until the meter passes the performance testing.

1.2 Operation conditions

To guarantee the safe operation of the meter, the following conditions should be achieved.

1.2.1 Environment qualifications：

Temperature： 0℃~ +40℃

Relative humidity： 40℃ (20~90)%

Atmospheric pressure： 86kPa~106kPa

1.2.2 Power supply：

Frequency： 50（1±5%）Hz

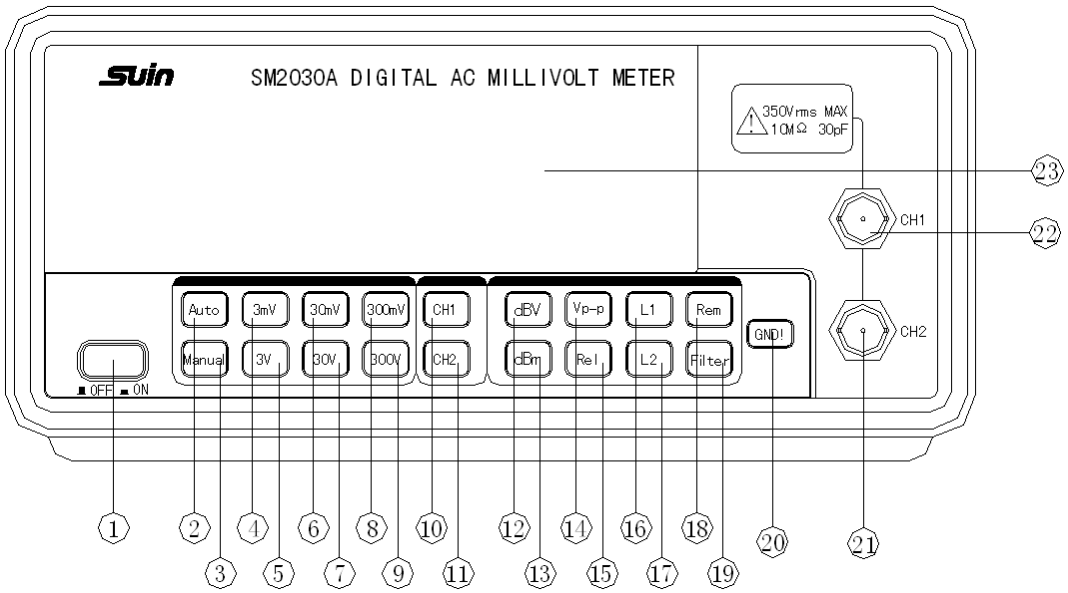
Voltage： 220（1±10%）V

Power consumption： 20VA

Warning: in order to ensure the security of the operator, triple- core socket outlet with the safe earthing wire must be used.

Front & Rear Panel

1.3 Front panel



The indicator light equipped with every key is used to indicate the current state.

⑴【ON/OFF】key: The power switch

⑵~⑶ 【Auto】 and 【Manual】key: The way to select the range, and the two keys are restricted with each other. Press 【Auto】 key to switch to the automatic mode to choose the range. At this position, the range will be increased automatically if the input signal is greater than 13% of present range, and it will be reduced automatically if the input signal is less than 10% of present range. Press 【Manual】key to switch to the auto mode to select the range. At this position, OVLD will be displayed if the input signal is greater than 13% of present range then should increase range; LOWER will be displayed if the input signal is less than 8% of present range then should lessen range. The measurement speed of manual range is faster than that of auto range.

⑷~⑼【3mV】key ~【300V】key: switch and display range at Manual mode, users can only select one of six keys every time.

⑽~⑾【CH1】and【CH2】key: To select the input channel, users can only select one of two keys every time. CH1 will be select when press 【CH1】, while CH2 will be selected when press 【CH2】.

⑿~⒁ 【dBV】and 【Vpp】key: To show voltage value with the three different units, press any range key to quit. 【dBV】: voltage level key, 0dBV=1V. 【dBm】: power level key, 0dBm=1mW, 600Ω. 【Vpp】: to display peak-peak value.

⒂【Rel】key: relative key. Record 'current value' then display value turned to be 'measured value subtracts current value'. This key is valid for RMS and peak value, press again then quit.

⒃~⒄ 【L1】 and【L2】key: there are two lines in the display screen and the two keys are used to select and users can set the input channels, range and unit for the selected one.

⒅ 【Rem】key: the instrument enter into remote state when press this key and will quit if press again.

⒆ 【Filter】key: to start the filter function and display reading with 5 digits.

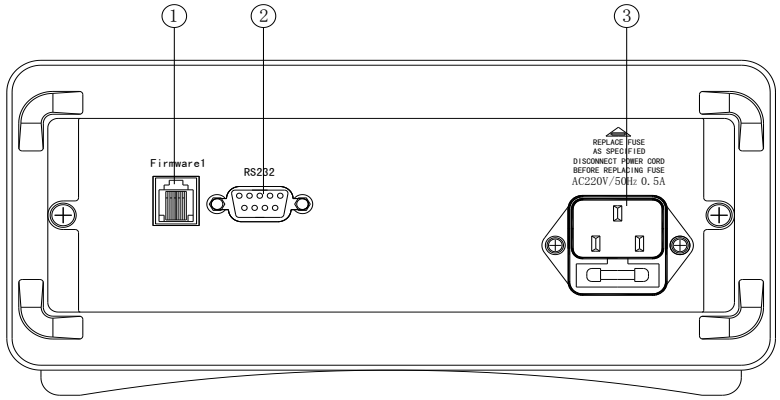
⒇ 【GND!】key: grounding function. The instrument will be in the grounding state if press this key twice continuously (input signal must not exceed the SELV and in case of electric shock!) and the instrument will enter into float ground if press this key again.

(21) CH1: input channel 1.

(22) CH2: input channel 2.

(23) VFD display screen.

1.4 Rear panel



(1) Firmware1: Programmable interface.

(2) RS232: Remote interface.

(3) 220V/50Hz 0.5A: It is the power socket with fuse and spare fuse.

Chapter 2 Basic Operation

2.1 Power-on

Press the button power on the front panel, the meter will be in the initial state.

2.2 Warm up

Warm up at least 30 minutes if need a precise measurement.

2.3 Select input channel, range and display unit

2.3.1 Press【L1】and select the first line of the display and set the relative parameter:

2.3.1.1 Use【CH1】/【CH2】key to choose the input channel.

2.3.1.2 Use【Auto】/【 Manual】key to choose the range switch way.

When select 'Manual' , users can choose range by using【3mV】~【300V】key and indicate the selected results. When select 'Auto'， the range can be selected automatically.

2.3.1.3 **Use** 【dBV】,【dBm】and【Vpp】key to choose unit, and the default unit is RMS.

2.3.2 Press【L2】and select the second line of the display and set the relative parameter as the same way of 2.3.1.

2.4 Input the signal

There are two input terminals for SM2000A series. The signal to be measured can be inputted by either CH1 or by CH2. Two signals to be measured can be inputted simultaneously by CH1 and CH2.

2.5 Read out the measurement result.

2.6 The interval time between power-off and power-on again should be greater than 10 seconds.

Chapter 3 Programmable Interface

Interface RS232

3.1 Interface performance

The interface accords with the regulation of EIA-232 standard.

3.1.1 The interface level : Logic "0"：+5V~+15V Logic "1"：-5V~-15V

3.1.2 Transmission format: every frame of data of the transmission information is made of 11 digits: 1 start bit (logic 0), 8 data bits (ASCII code), 1 mark bit (Logic 1 is the address byte, and logic 0 is the data byte) and 1 stop bit (Logic 1)

3.1.3 Transmission rate：9600 bits/s

3.1.4 Interface connection: use 9-P standard connector and 3-core shield cable.

3.1.5 System buildup: the total length of the linking cable among the apparatuses cannot be over 100 meters.

3.1.6 Application area: labs and production surroundings without strong electric disturbance.

3.2 Enter into Programmable state

The meter works at the local operation state after power-on. Press【Rem】key to enter into the RS232 remote state.

3.3 Selection of interface parameters

Interface parameters

Baud Rate	Character Length	Check	Stop Bit
9600	8	No check（n）	1

3.4 Program command

SM2000A program command：

1.[:SENSe]:FUNCtion "VOLTage:AC 1" set CH1

[:SENSe]:FUNCtion "VOLTage:AC 2" set CH2

Query [:SENSe]:FUNCtion? query current measurement function

2.[:SENSe]:VOLTage:AC:RANGe[:UPPer] <n>

[:SENSe]:VOLTage:AC:RANGe:LOWer <n>

[:SENSe]:VOLTage:AC:RANGe:PTPeak <n>

Parameter <n>=

0-320(V) ACV

MINimum 0

MAXimum maximum

Query [:SENSe]:VOLTage:AC:RANGe[:UPPer]?

3. [:SENSe]:VOLTage:AC:FILTer:STATe <b>

Parameter <b>=1/ON filter function

0/OFF cancel filter

Query [:SENSe]:VOLTage:AC:FILTer:STATe? Query filter state

4. [:SENSe]:VOLTage:AC:GND:STATe <b>

Parameter <b>=1/ON select grounding

0/OFF cancel grounding

Query [:SENSe]:VOLTage:AC:GND:STATe? Query grounding state

5.[:SENSe]:VOLTage:AC:RANGe:AUTO <b>

Parameter <b>=1/ON select auto range

0/OFF cancel auto range

Query [:SENSe]:VOLTage:AC:RANGe:AUTO? Query auto open/close

6.[:SENSe]:VOLTage:AC:REFerence:STATe <b>

Parameter <b>=1/ON select reference

0/OFF cancel reference

Query [:SENSe]:VOLTage:AC:REFerence:STATe？Query reference state

7.Command grammar：:SYSTem:LOCal

8. Command grammar：:UNIT:VOLTage:AC DB

:UNIT:VOLTage:AC DBm

Query :UNIT:VOLTage:AC? Query math function

9. Command grammar：*RST

10. Command grammar：[:SENSe]:DATA1? Return to CH1

11. Command grammar：[:SENSe]:DATA2? Return to CH2

12. Command grammar：*IDN? Return to software version number

Note: When programming, the end character 'Chr(10)' should be added at the end of each command code.

Chapter 4 Service and Support

Warranty

For the technical and material's defects of the products that our company produced and sold, we promise one year warranty since the shipment day. During the warranty, to the defective products which is proved, we will regroup or replace this defective ones based on the detailed provisions of the warranty

Except guarantees of this outline and warranty, we factory make no any other forms of expressed or implied guarantees at all. In any case, we factory bear no responsibility with those direct, indirect or any other consequential loss.

Chapter 5 Specifications

5.1 Measurement range

AC voltage：50μV~300V

dBV： -86dBV~50dBV (0dBV=1V)

dBm： -83dBm~52dBm (0dBm=1mW 600Ω)

Vpp： 140μV~850V

5.2 Range

3mV, 30mV, 300mV, 3V, 30V, 300V

5.3 Frequency range

SM2030A: 5Hz~3MHz

SM2050A: 5Hz~5MHz

5.4 Measuring error for voltage（23±5^{0}C）

Frequency range	Error
≥50Hz~100kHz	±2.5% reading ±0.8% range
>100Hz~500kHz	±1.5% reading ±0.5% range
>500kHz ~2MHz	±2% reading ±1% range
>2MHz~3MHz	±3% reading ±1% range
>3MHz~5MHz	±4% reading ±2% range

5.5 Resolution

	3 1/2 digits		4 1/2 digits	
Range	Full-scale	Resolution	Full-scale	Resolution
3mV	3.000mV	0.001mV	3.0000mV	0.0001mV
30mV	30.00mV	0.01mV	30.000mV	0.001mV
300mV	300.0mV	0.1mV	300.00mV	0.01mV
3V	3.000V	0.001V	3.0000V	0.0001V
30V	30.00V	0.01V	30.000V	0.001V
300V	300.0V	0.1V	300.00V	0.01V

5.6 Input impedance 10MΩ

5.7 Input capacitance 30pF

5.8 Maximum undamaged input voltage

Range	Frequency	Maximum input voltage
3V~300V	5Hz~5MHz	350Vrms
3mV~300mV	5Hz~1kHz	350Vrms
	1kHz~10kHz	35Vrms
	10 kHz~5MHz	10Vrms

5.9 Warm-up 30 minutes

5.10 Power supply

Frequency：50 (1±5%)Hz ；

Voltage：220(1±10%)V；

Power：≥20VA

5.11 Power consumption ＜20VA

5.12 Environment requirements：

Temperature： 0℃~ +40℃；

Relative humidity：40℃,（20~90）%

Atmospheric pressure：86kPa~106kPa

5.13 Dimensions 106mm×260mm×375mm (width×height×depth)

5.14 Weight 3Kg