User's Guide

SM2100 Series
Digital AC Millivolt Meters

Suin Instruments Co., Ltd. 5/2020

Introduction

With MCU control and LED technique as well as the combination of digital technique and analog technique together, SM2130 is suitable for measuring of RMS value voltage of Sine waveform that the frequency range is 5Hz~3MHz and voltage is 50μV~400V, while SM2160 is suitable for measuring of RMS value voltage of Sine waveform that the frequency range is 5Hz~6MHz and voltage is 50μV~300V. They are all have the switch function between automatic and manual and automatic decimal positioning, as well as $3^{1/2}$ digits or $4^{1/2}$ digits 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, the results for two channels can be displayed at the same time. 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.

SM2100 series is dual-input digital AC millivolt meter with USB interface.

Packing list

Digital DC Millivolt meter	1
Power cord	1
Test Clip Leads	2
CD (including User's Guide)	1

Summary

Chapter 1 Quick Start

Help users learn SM2100 series millivolt meter quickly.

Chapter 2 Basic Operation

Mainly introduce the basic operation of SM2100 series millivolt meter.

Chapter 3 Programmable Interface

Mainly introduce the programmable interface of SM2100 series millivolt meter.

Chapter 4 Service and Support

Introduce the maintenance and technical support.

Chapter 5 Specification

Introduce the specifications of SM2100 series millivolt meter in detail.

Note: please excuse any modification of contents without special notification. Besides, it is unavoidable for not-so-adequate description and wrong print. Suin Instruments Co., Ltd. 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

1.1 Check-up the meters and accessories

Check whether the meter and 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 and stable operation, meters should be used in these conditions:

1.2.1 Environment:

Temperature: 0℃~+40℃

Relevant Humidity: 40℃ (20~90)%

Air Pressure: 86kPa~106kPa

1.2.2 Power supply:

Frequency: 50Hz (1±5%)

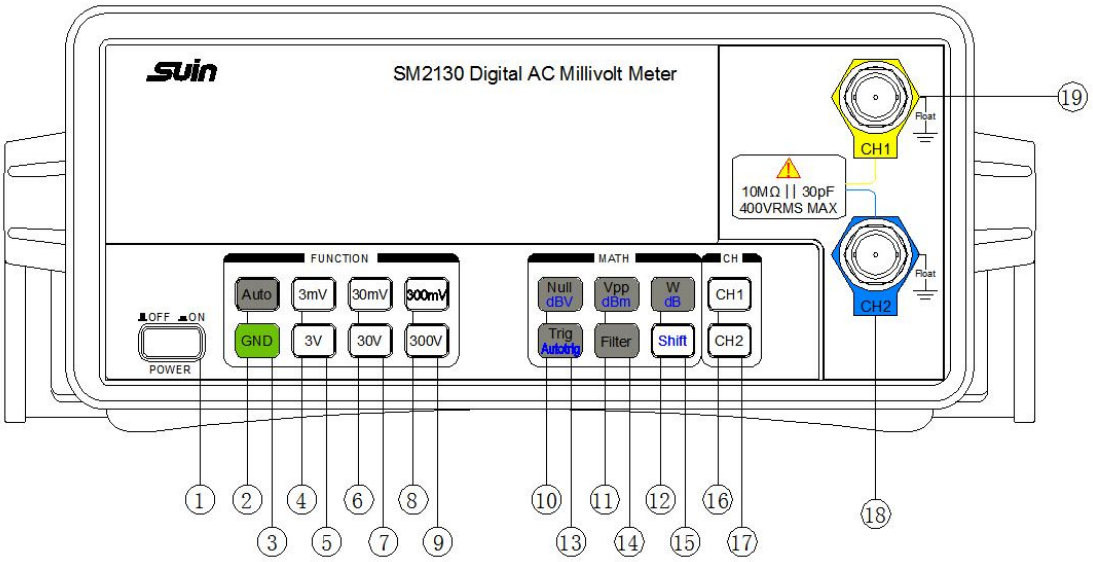
Voltage: 220V (1±10%)

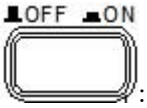
Power consumption: <20VA

Warning: To ensure users' safety, three-core power socket with grounding wire must be used.

Front panel and Real panel

1.3 Front panel



(1) 

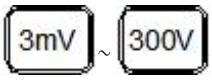
: Power ON/OFF

(2) 

: Press it to switch to the automatic mode to choose the range. In auto mode, when the input signal is higher 10% than the current range, it will increase the range automatically; when the input signal is less 9% than the current range, it will decrease the range automatically.

(3) 

: Change the float ground status of input channel. Usually the input channel of meter is in float ground state in default. Press this key, meter will be connected to ground through 1MΩ impedance and enter into grounding state.

(4)~ (9) 

: switch and display range at Manual mode, users can only select one of six keys every time.

(10)~ (12) 

: Mathematics keys.

(13) 

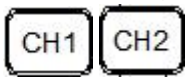
: single trigger or auto trigger

(14) 

: To start the filter function, and display readings with 5 digits.

(15) 

: The shift key

(16)~ (17) 

: To select the input channel, users can only select one of two keys

every time. CH1 will be selected when press CH1, and CH2 will be selected when press CH2.

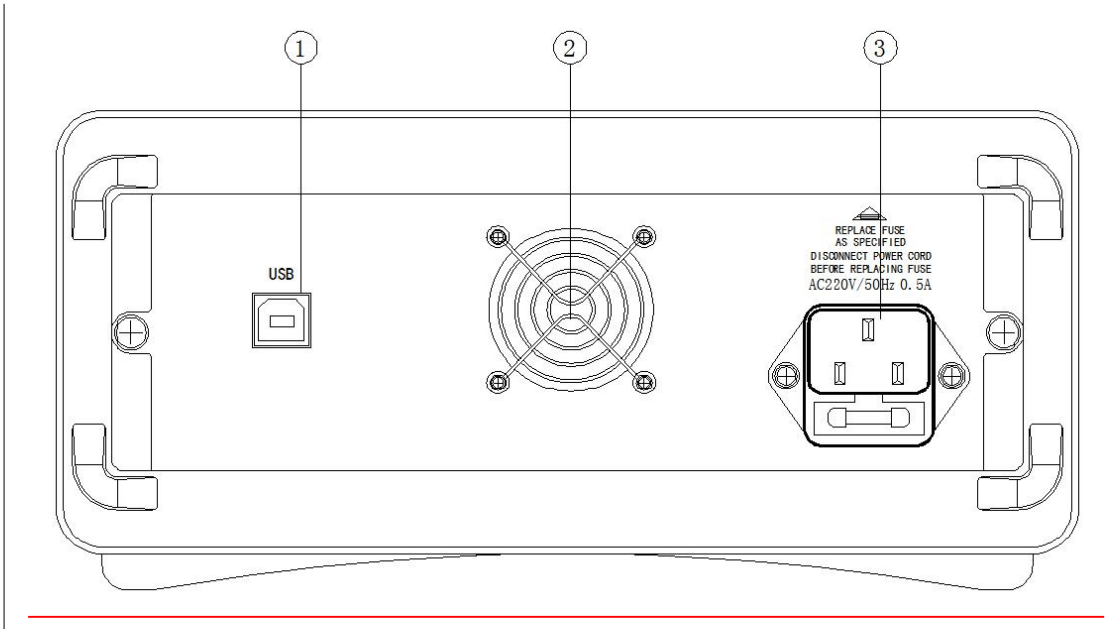
(18) 

: CH1 input interface

(19) 

: CH2 input interface

1.4 Rear panel



(1) USB interface

(2) Fan

(3) Power socket: 220V/50Hz 0.5A, with fuse and backup fuse.

Chapter 2 Basic Operation

2.1 Power on

Press the Power ON/OFF button on the front panel, the meter will enter 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 CH1 key, select the first line of display and set the relative parameter.

2.3.2 Press 3mV ~ 300V to select the range by manual. Press Auto to select the automatic measurement range.

2.3.3 Press Null dBV Vpp dBm W dB to select Null, Vpp or W Math function. Press Shift, and then press the above keys again to select dBV, dBm or dB math function. Default unit is dBV. If select dBm or W function, resistance 600Ω or 50Ω will blink and user can switch resistance value during blink, the result will display after 2s blink.

a. dBV =20*log10(Vin)

b. dBm=10*log(Vin^2/r*1000) r=50Ω or 600Ω

c. dB=20*log(Vin/Vref) Vref=1V

d.W= Vin^2/r r=50Ω or 600Ω

e.Vpp=2.828 Vin.

f.Null Set the current display value to 0.

2.3.4 Trig Autotrig: Single trigger function can be selected. Press Shift, then press Trig Autotrig to select the auto trigger function.

2.3.5 Filter: Default is 3½ mode after powering on. Press Filter to enable filter function and switch to 4½ mode. Press it again to return to 3½ mode.

2.3.6 Press CH2 key to select the second line of the display and set the relevant parameters according to the way of 2.3.1

Chapter 3 Programmable Interface

USB interface

3.1 Interface performance

It uses USB to serial port way, USB2.0 compatible, which conforms to EIA-232 Standards.

3.1.1 Transmission rate: 9600bits/s

3.1.2 Interface connection: standard USB connection

3.2 Interface parameters

Interface parameters

Baud rate	Word length	Check	Stop bit
9600	8	No check(n)	1

3.3 Programmable Command

SM2100 interface command:

1. [:SENSe]:VOLTage:AC:CH1 Set CH1

[:SENSe]:VOLTage:AC:CH2 Set CH2

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

Parameter <n>=

SM2130 0-400(V)

SM2160 0-300(V)

MINimum 0

MAXimum Maximum value

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

3. [:SENSe]:VOLTage:AC:FILTer <b> Select 3½ or 4½ display mode

Parameter <b>=1/ON FILTER ON

0/OFF FILTER OFF

Query [:SENSe]:VOLTage:AC:FILTer? to check filter status.

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

<b>=1/ON Enable Grounding state

0/OFF Disable Grounding state

Query [:SENSe]:VOLTage:AC:GND? to check the grounding status

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

<b>=1/ON Enable AUTO range

0/OFF Disable AUTO range

Query [:SENSe]:VOLTage:AC:RANGe:AUTO？ to check on or off of auto range

6. :CALCulate:FUNCtion "<function>"

Parameter <function>= dBv/dBm/dB/W/Vpp/Null execute math function

Query :CALCulate:FUNCtion？ Return to math function

7. :SYSTem:VERSion?

Return to system version.

8. IDN?

Return to identity character string of meter.

9. *RST

Reset to configuration before powering on.

10. :TRG

Trigger measuring one time.

11. :TRIGger:SOURce { BUS|IMMediate}

Select the trigger source. Meter will receive the trigger signal from trigger source, which can come from the software trigger of remote interface (Bus) or inner immediate trigger(Internal).

12. :READ?

Return to the measuring data.

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

Chapter 4 Service and Support

4.1 Warranty

For the technical and material's defects of the products that Suin Instruments Co., Ltd produced and sold, we promise one year warranty since the shipment day. During the warranty, as to the defective products which are proved, we will regroup or replace these 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.

4.2 Contact

If you have any inconvenience during the use of this product, please contact us directly.

Working time: 8:30am~17:15pm Monday to Friday, Beijing Time

Sales: 0086-0311-83897147

Fax: 0086-0311-83897040

Email: export@suintest.com

Website: www.suindigital.com

Chapter 5 Specification

5.1 Measurement range

SM2130: 50μV～400V

SM2160: 50μV～300V

5.2 Range: 3mV, 30mV, 300mV, 3V, 30V, 300V

5.3 Frequency Range:

SM2130: 5Hz～3MHz

SM2160: 5Hz～6MHz

5.4 Measuring error for voltage (23±50℃)

Frequency range	Error
≥5Hz~100Hz	±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
>5MHz~6MHz	±5% reading ±4% range

5.5 Resolution

	$3\frac{1}{2}$ digits		$4\frac{1}{2}$ 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 Math Function

	SM2130	**SM2160**
dBV	-86~52dBV	-86~50dBV
Vpp	141uV$_{PP}$~1131V$_{PP}$	141uV$_{PP}$~848V$_{PP}$
dBm	-73~65.05dBm (50Ω)	-73~62.55dBm (50Ω)
	-84~54.26dBm (600Ω)	84~51.76dBm (600Ω)
W	0.05nW~3200W (50Ω)	0.05nW~1800W (50Ω)
	0.00417nW~267W (600Ω)	0.00417nW~150W (600Ω)

5.7 Input Impedance: 10MΩ±1%

5.8 Input Capacitance: ≤30pF

5.9 Maximum undamaged input voltage

Model	Range	Input Voltage	Input Frequency	Max Undamaged Input Voltage
SM2130	3mV 30mV 300mV	≤300mV	5Hz-1kHz	350Vrms
			1kHz-10kHz	35Vrms
			10kHz-3MHz	10Vrms
	3V 30V	0.3V-7V	5Hz-3MHz	350Vrms
	30V 300V	7V-300V	5Hz-100kHz	350Vrms
	300V	300V-400V	45Hz-10kHz	400Vrms
SM2160	3mV 30mV 300mV	≤300mV	5Hz-1kHz	350Vrms
			1kHz-10kHz	35Vrms
			10kHz-3MHz	10Vrms
	3V 30V	0.3V-7V	5Hz-6MHz	350Vrms
	30V 300V	7V-300V	5Hz-100kHz	350Vrms

5.10 Warm up: 30 minutes

5.11 Power Supply:

Frequency: 50 (1±5%) Hz

Voltage: 220(±10%)V

5.12 Power Consumption: <20VA

5.13 Environment requirement:

Temperature: 0℃～ +40℃

Relative humidity: 40℃(20～90)%

Air pressure: 86kPa～106kPa

5.14 Dimension: 106mm×256mm×386mm

5.15 Weight: 3.9kg