



S2021H

4-Channel Precision Source Meter

Version 1.0





Product Description

The S2021H precision source meter is compact and cost-effective bench-top Source/Measure Units (SMUs) with the capability to source and measure both voltage and current. These capabilities make the S2021H ideal for IV (current versus voltage) measurement tasks that require both high resolution and accuracy.

The S2021H provides best-in-class performance for a modest price. It can provide maximum $\pm 30V$, $\pm 500mA$ (DC/pulse) output and possess a superior color LCD graphical user interface (GUI). The S2021H offers unmatched measurement throughput and supports conventional SMU SCPI commands for easy test code migration. These features improve efficiency and lower the cost of ownership when integrating the SMUs into systems for production test.

Key Features

Feature	Benefit
Integrated 4-quadrant sourcing and measuring capabilities	Easily and accurately measure current and voltage using a single instrument without the need to manually change any connections
Measurement range: $\pm 30V$, $\pm 500mA$ (DC/pulsed)	A single SMU product covers both high voltage and high current measurement needs, allowing for more standardization and simplifying inventory and support concerns
Source and measurement resolution down to 100pA and 100uV	Can make low-level measurements using a low-cost bench-top SMU that were previously only possible using a more expensive semiconductor device analyzer
Fast measurement	Up to 500K ADC sampling rate, NPLC and sampling rate optional setting
User-friendly front panel GUI with 5.0 inch capacitive touchscreen supports both graphical and numerical view modes	Can quickly and easily perform measurements and display data on the front panel, thereby greatly speeding up interactive test, characterization and debug operations
Free quick V/I control software	Can make measurements remotely from a PC without the need to program
Supports both conventional and default SCPI commands	Conventional SCPI commands provide some compatibility with older SMU code (such as Keithley 2400 series) to minimize code conversion work
Small form factor with USB3.0, LAN	Easy integration into rack and stack systems

Technical Specification

Temperature: $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$

Humidity: 30% to 70% RH



After 60 minutes warm-up, ambient temperature changes less than $\pm 3\text{ }^{\circ}\text{C}$

Calibration period: 1 Year

Measurement speed: 1PLC (power line cycle)

Voltage Source specifications

Voltage Programming accuracy	Range	Programming resolution	Accuracy (1 Year) \pm (% reading+ offset)	Typical Noise (RMS) 0.1 Hz-10Hz
	$\pm 30\text{ V}$	1mV	0.03%+4 mV	1000 μV
	$\pm 6\text{ V}$	200 μV	0.03%+1 mV	100 μV
Temperature coefficient	$\pm(0.15 \times \text{accuracy})/^{\circ}\text{C}(0^{\circ}\text{C}-18^{\circ}\text{C}, 28^{\circ}\text{C}-50^{\circ}\text{C})$			
Channel ¹	CH1 to CH4			
Output power	3 W per channel and 6 W total			
Settling time	<200 μs (typical)			
Overshoot	< $\pm 0.1\%$ (Typical. Normal. Step is 10 % to 90 % range, full range, resistive load)			
Noise 10Hz-20MHz	6 V voltage source, 0.5 A resistive load, <3 mVrms			

1, Channels are isolated from earth ground but share a common LO.

Current Source specifications

Current Programming accuracy	Range	Programming resolution	Accuracy (1 Year) \pm (% reading+ offset)	Typical Noise (RMS) 0.1 Hz-10 Hz
	$\pm 500\text{ mA}^1$	20 μA	0.05% + 100 μA + $V_o \cdot 25\text{ } \mu\text{A}$	10 μA
	$\pm 100\text{ mA}$	4 μA	0.05% + 10 μA + $V_o \cdot 5\text{ } \mu\text{A}$	1 μA
	$\pm 10\text{ mA}$	400 nA	0.05% + 5 μA + $V_o \cdot 500\text{ nA}$	100 nA
	$\pm 1\text{ mA}$	40 nA	0.05% + 500 nA + $V_o \cdot 50\text{ nA}$	10 nA
	$\pm 100\text{ } \mu\text{A}$	4 nA	0.05% + 50 nA + $V_o \cdot 5\text{ nA}$	1 nA
	$\pm 10\text{ } \mu\text{A}$	400 pA	0.05% + 20 nA + $V_o \cdot 500\text{ pA}$	150 pA
Temperature coefficient	$\pm(0.15 \times \text{accuracy})/^{\circ}\text{C}(0^{\circ}\text{C}-18^{\circ}\text{C}, 28^{\circ}\text{C}-50^{\circ}\text{C})$			
Channel ²	CH1 to CH4			
Output power	3 W per channel and 6 W total			
Settling time	<300 μs (typical)			
Overshoot	< $\pm 0.1\%$ (Typical. Normal. Step is 10 % to 90 % range, full range, resistive load)			

1, 500mA range is available only for 6V voltage range

2, Channels are isolated from earth ground but share a common LO.



Voltage Measurement specifications

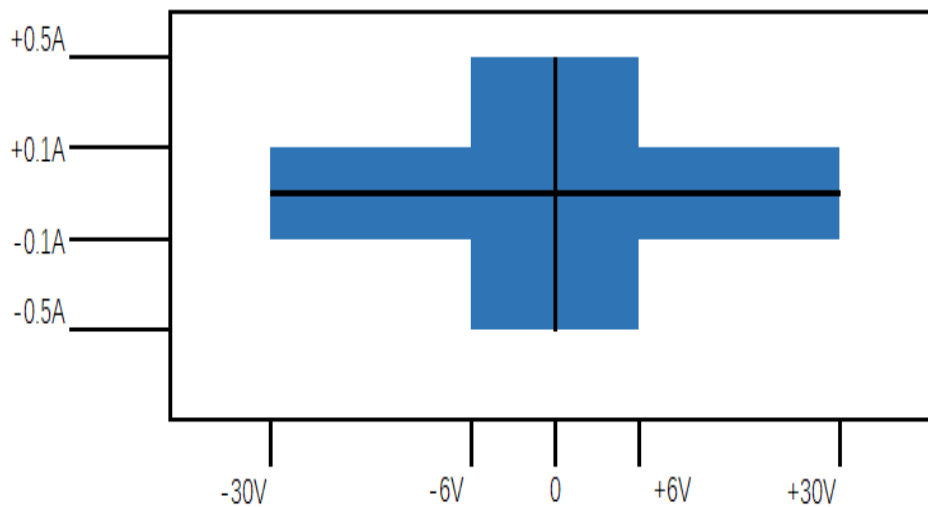
Voltage Measurement accuracy	Range	Measurement resolution	Accuracy (1 Year) ± (% reading+ offset)
	±30 V	300 μV	0.03%+4 mV
	±6 V	60 μV	0.03%+1 mV
Temperature coefficient	±(0.15 × accuracy)/°C (0°C-18°C,28°C-50°C)		

Current Measurement specifications

Current Measurement accuracy	Range	Measurement resolution	Accuracy (1 Year) ± (% reading+ offset)
	±500 mA ¹	10 μA	0.05% + 100 μA + Vo*25 μA
	±100 mA	1 μA	0.05% + 10 μA + Vo*5 μA
	±10 mA	100 nA	0.05% + 5 μA + Vo*500 nA
	±1 mA	10 nA	0.05% + 500 nA + Vo*50 nA
	±100 μA	1 nA	0.05% + 50 nA + Vo*5 nA
	±10 μA	100 pA	0.05% + 20 nA + Vo*500 pA
Temperature coefficient	±(0.15 × accuracy)/°C (0°C-18°C,28°C-50°C)		

¹500mA range is available only for 6V voltage range

I-V Out capability





Typical output settling time

Source	Range	Output settling time			Condition
		Fast ^{1,2}	Normal ¹	Slow ¹	
Voltage	30 V	<400 μ s	<1.5 ms	<2.8 ms	Time required to reach within 0.1 % of final value at open load condition. Step is 10 % to 90 % range
	6 V	<250 μ s	<780 μ s	<2.8 ms	
Current	\pm 500 mA	<50 μ s	<330 μ s	<2.5 ms	Time required to reach within 0.1 % of final value at short condition. Step is 10 % to 90 % range
	\pm 100 mA	<50 μ s	<270 μ s	<2.5 ms	
	\pm 10 mA	<50 μ s	<270 μ s	<2.5 ms	
	\pm 1 mA	<100 μ s	<290 μ s	<2.5 ms	
	\pm 100 μ A	<150 μ s	<5 ms	<2.5 ms	
	\pm 10 μ A	<250 μ s	<3 ms	<2.5 ms	

1, Output transition speed: Fast, Normal, Slow.

2, Slow mode is recommended for overshoot sensitive equipment, Fast mode may have overshoot on output in some condition

Sampling rate and NPLC setting

Setting	Range
NPLC	0.0001 PLC ~ 10 PLC
Sampling Rate	5 sps ~ 500 Ksps

Derating accuracy with PLC setting < 1 PLC

Add % of range using the following table for measurement with PLC < 1

PLC	Range			
	6 V 、 30 V	10 μ A	100 μ A to 100 mA	500 mA
0.1	0.01%	0.03%	0.01%	0.02%
0.01	0.03%	0.06%	0.02%	0.04%
0.001	0.3%	0.4%	0.3%	0.4%

Supplemental characteristics

Sensing Modes	2-wire or 4-wire (Remote-sensing) connections
Maximum sense lead resistance:	1 k Ω for rated accuracy
Max voltage between Force and Sense	2V
Maximum output voltage in output connector	>range 105%



DC floating voltage	Max ± 40 V DC between low force and chassis ground
Sweep	Sweep step time: from 20 μ s to 16 s, Max: 1024 point
Source delay	Support, it is recommended that users set appropriate source delay to obtain higher accuracy
Over temperature protection	The output will be turned off (also disable operation) when the SMU internal temperature is detected higher than 85 degrees. When the temperature returns to less than 65 degrees, operation recover
Other abnormal protection	Power reset, recover operation or hardware damage

Communication port

LAN	1000BASE-T / 100BASE-T
USB	USB 3.0 HOST (front)
	USB 3.0 DEVICE (back)

Environmental specifications

Environment	For use in indoor facilities
Operating	0 $^{\circ}$ C to +50 $^{\circ}$ C, 30 % to 70 % non-condensing
Storage	-30 $^{\circ}$ C to 70 $^{\circ}$ C, 10 % to 90 % non-condensing
Altitude	Operating: 0 m to 2000 m, Storage: 0 m to 4600 m
Power	LINE: 100-240VAC, 50/60Hz, 250W FUSE: T3.15AL 250 VAC
Warm-up	1 hour
Dimensions (mm)	404.5*217.5*105.5 (with foot pad/handle/ rotary Knob) 446*233*112 (with sheath)
Weight	Net weight 5.63Kg

Front Panel

Display	5.0" TFT color display (800x480), Capacitive touchscreen
Hardkeys	Home, Menu, Exit, Enter, Trigger, Up, Down power on, output on/off, rotary Knob
Softkeys	LCD Mapping function keys
Connectivity	USB Host, output, ground

Rear panel

Connectivity	OUTPUT interface, LAN, USB device, AC socket, Ground
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Ordering information

Power cable, USB cable, Output connector, Quick reference, U disk (including PDF manuals, quick I/V Measurement Software and drivers)

Model number	
S2021H	4-Channel Precision Source Meter, pulser



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*This information is subject to change without notice.