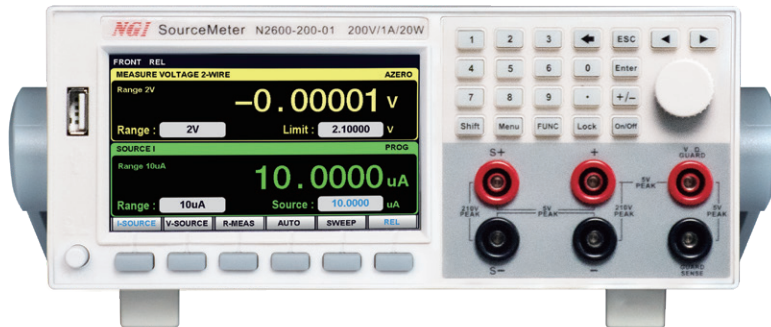


N2600 Series High Precision Source Meter (SMU)



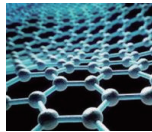
Product Introduction

N2600 series is a digital source meter developed by NGI, which closely combines the functions of high-accuracy source and high-accuracy measurement. It integrates 5 functions (voltage source, current source, I/V/R measurement) in one instrument. The measurement range covers 1100V to 1 μ V, 10A to 10pA, 200M Ω to 10 $\mu\Omega$. The maximum pulse output current can be up to 10A. The measurement resolution is 6 $\frac{1}{2}$ digits. The basic accuracy can reach 100 μ V, 600pA, 300 $\mu\Omega$. N2600 series has built-in constant voltage source, constant current source, resistance measurement, sweep mode, signal generator, synchronous trigger, function calculator, etc., and provides PC application software for free. It can be widely used in characteristic analysis and production testing of components and modules in communication, semiconductor, computer, automotive and medical industries.

Application Fields

• Nanomaterial and device

- Graphene
- Carbon nanotube
- Nanowire



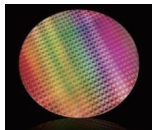
• Semiconductor assembly test

- Diode, Zener diode, LED, laser diode
- BJT, MOSFET, SiC, GAN, etc.
- IC chip



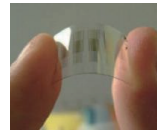
• Energy efficiency and lighting

- LED/AMOLED
- Photovoltaic/solar cell
- Battery, DC-DC converter



• Organic material and device

- Electronic ink
- Printed electronics



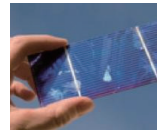
• Passive component, sensor

- Resistor, rheostat, thermistor, switch
- Photoelectric sensor, sensor



• Material property analysis

- Resistivity
- Hall effect



Main Features

- ▶ 5 in 1 (voltage source, current source, I/V/R measurement)
- ▶ Wide measurement range, 1100V to 1 μ V, 10A to 10pA, 200M Ω to 10 $\mu\Omega$
- ▶ Supporting pulse mode, minimum pulse width 150 μ s ^[1]
- ▶ Basic accuracy up to 100 μ V, 600pA, 300 $\mu\Omega$
- ▶ Maximum sampling rate 100ksps
- ▶ Source and sink (4-quadrant) operation
- ▶ 2/4/6-wire resistance measurement
- ▶ Free PC application software, providing function calculator
- ▶ Supporting linear staircase sweep, logarithmic staircase sweep and custom sweep
- ▶ 4.3 inch LCD screen, simple operation interface, easy to use
- ▶ SEQ test function and I-V characteristic analysis
- ▶ Supporting signal generator and square wave
- ▶ Digital I/O and external trigger control
- ▶ LAN port, RS232 interface
- ▶ Supporting SCPI protocol
- ▶ Front USB port, supporting screenshot storage

Remark[1]: Only N2610-100-03 supports this function.

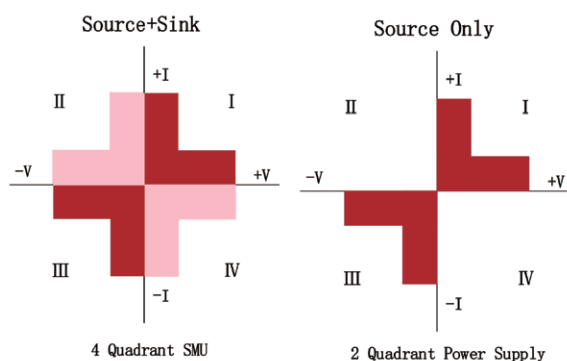
5 in 1 (voltage source, current source, I/V/R measurement)

N2600 series adopts a standard 1/2 19-inch 2U chassis. Integrating source and measure circuits into a compact standalone instrument greatly reduces test system development, setup and maintenance time, while saving test bench space and reducing the overall purchase cost.

The precision coupling feature of N2600 Series SMU offers many advantages over discrete instruments. While providing accurate output voltage and current sources, it can measure current, voltage and resistance, and has a high test response speed, which can protect the DUT from being damaged under occasional overload, thermal runaway, etc.

Four-quadrant operation as source or load

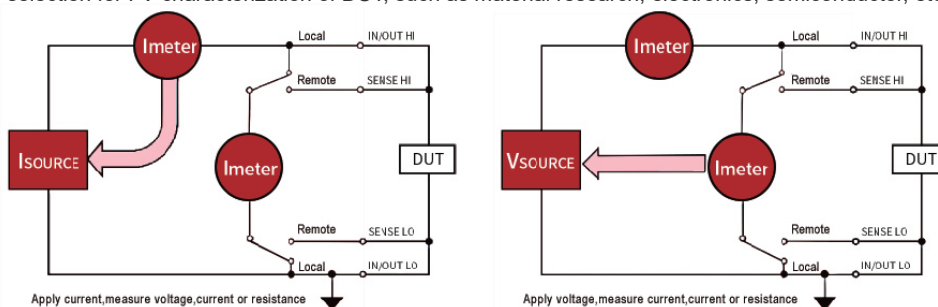
Four quadrants: The power quadrant refers to the quadrant diagram formed with voltage as X-axis and current as Y-axis. In the first and third quadrants, voltage and current go same direction, and SMU supplies power to DUT, which is called the source mode. In the second and fourth quadrants, voltage and current go reverse direction, DUT discharges to SMU, and SMU passively absorbs the incoming current and provides a return path for the current, which is called the sink mode.



I-V characteristics

Usually, I-V characterization of a DUT requires the use of highly sensitive ammeter, voltmeter, voltage source, and current source. The process of programming, synchronizing, connecting, measuring, and analyzing each of these instruments is complex, time-consuming, and takes up excessive test bench space.

N2600 series can greatly simplify the test process and reduce test bench space occupation. N2600 provides 4-quadrant operation. When operating in 1st and 3rd quadrant, N2600 acts as a power source to output power to the DUT. When operating in 2nd and 4th quadrant, N2600 acts as a sink (load) to absorb energy. In source or sink mode, N2600 can measure voltage, current, and resistance, making it an ideal selection for I-V characterization of DUT, such as material research, electronics, semiconductor, etc.



Power envelope

Different from traditional matrix power supply, under the same power, on N2600, users can choose high voltage and low current or low voltage and high current output according to actual needs. The source/sink limit of N2600 are also different by choosing different specifications.

N2600-020-01 source/sink limit: $\pm 21\text{V} @ \pm 1.05\text{A}$

N2600-200-01 source/sink limit: $\pm 21\text{V} @ \pm 1.05\text{A}$

N2600-1000-01 source/sink limit: $\pm 21\text{V} @ \pm 1.05\text{A}$

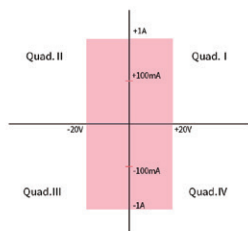
N2610-100-03 source/sink limit: $\pm 21\text{V} @ \pm 3.15\text{A}$

$\pm 210\text{V} @ \pm 105\text{mA}$

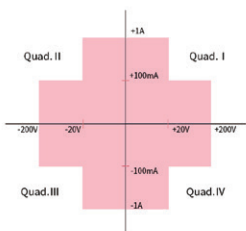
$\pm 1100\text{V} @ \pm 21\text{mA}$

$\pm 105\text{V} @ \pm 1.05\text{A}$

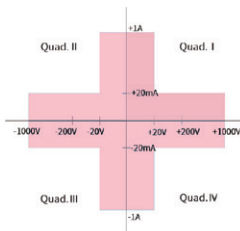
$\pm 105\text{V} @ \pm 10.5\text{A}$ (pulse mode only)



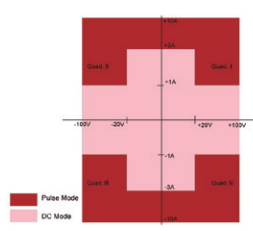
▲ N2600-020-01
Power Envelope



▲ N2600-200-01
Power Envelope



▲ N2600-1000-01
Power Envelope

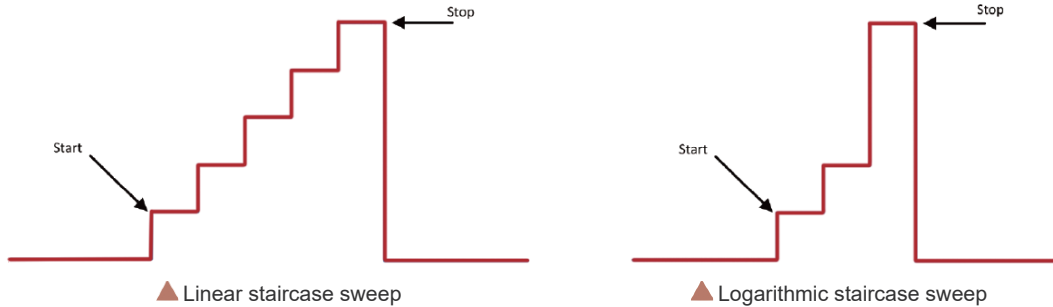


▲ N2610-100-03
Power Envelope

Various sweep modes

N2600 supports linear staircase sweep, logarithmic staircase sweep, custom sweep and built-in sweep. The sweep mode runs automatically after setting the functional relation and protection point, which greatly speeds up the test efficiency. The sweep can be set up to single-event or continuous operation, making N2600 ideal for I/V, I/R, V/I, and V/R characterization.

- Linear staircase sweep: sweep from start level to end level in equal linear steps
- Logarithmic staircase sweep: sweep on a log scale with a specified number of steps per decade
- Custom sweep: allow user-defined setting
- Built-in sweep: 100 settings are stored in the system for call.



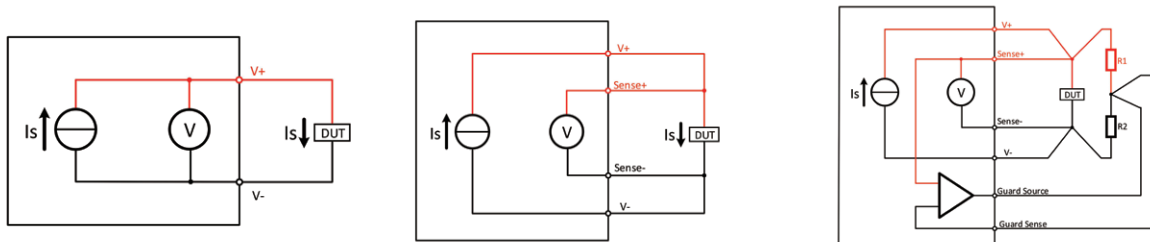
2/4/6-wire resistance measurement

N2600 SMU integrates a high-precision digital multimeter function, which not only supports high-precision voltage and current measurement, but also supports 2/4/6-wire resistance measurement, which is suitable for various test scenarios.

2-wire resistance measurement is suitable for test scenarios where the resistance of the test leads is much smaller than the resistance to be measured, regardless of the voltage drop loss caused by the test leads.

4-wire resistance measurement is suitable for measuring low-value resistances. N2600 SMU has an auto-correction function that eliminates test lead effects.

6-wire resistance measurement: When the measured resistance is connected in parallel with other resistances, the other resistances will shunt and affect the test. N2600 SMU uses 6-wire resistance measurement to enable in-situ measurement of resistors on the PCB.



Automation to improve production test efficiency

N2600 SMU provides high-precision voltage and current sources while making high-precision measurements, without changing connections or using additional devices, which greatly improves production test efficiency. At the same time to meet the throughput requirements of production applications, N2600 has many built-in functions to run complex test sequences without using the slow computer control or GPIB communication.

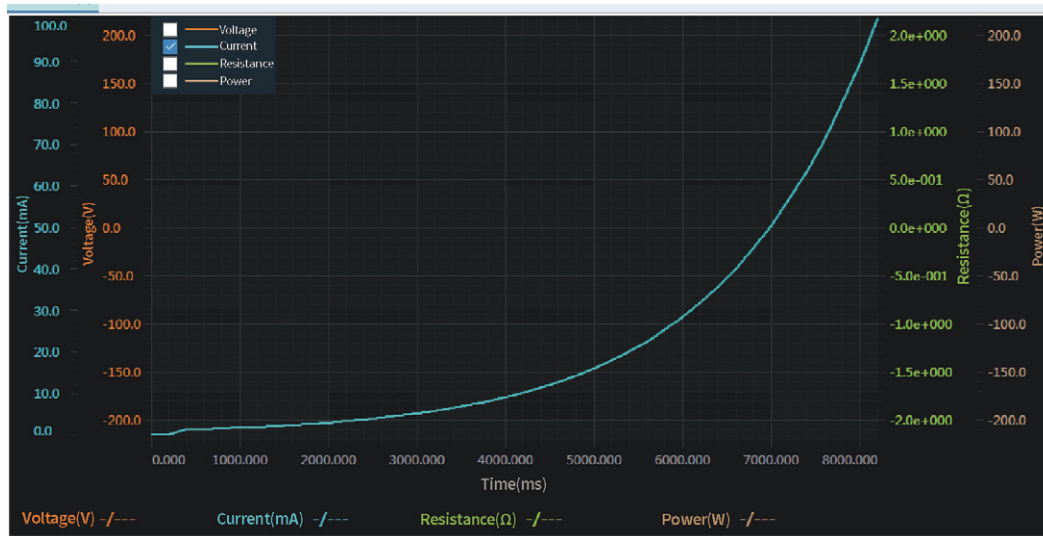
Big LCD screen

N2600 SMU is equipped with a 4.3-inch LCD screen. Compared with traditional VFD screens, LCD screens have the advantages of low power consumption, small size and low radiation. At the same time, combined with professional interface design, N2600 is easy to use, and the readback display is intuitive and comprehensive.



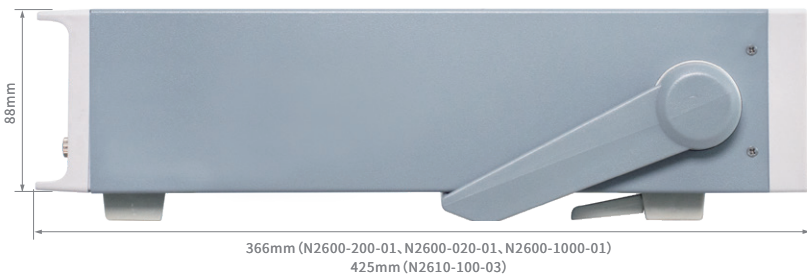
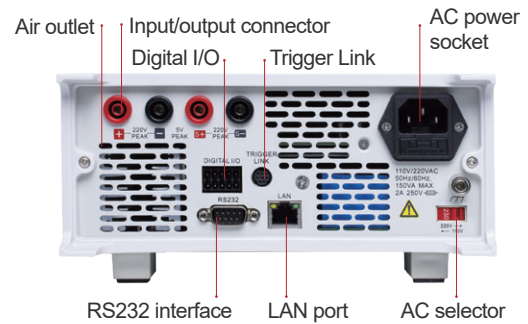
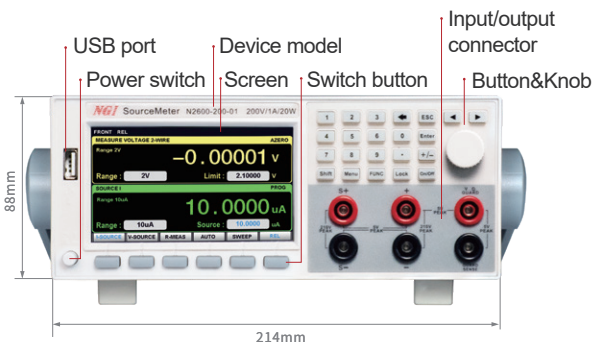
Remote control for easy system integration

NGI provides users with a free PC application software, which can meet the testing needs of various application scenarios. N2600 SMU is equipped with LAN port and RS232 interface, and supports SCPI/Modbus commands.



▲ PC Application Software

Product Dimension



Technical Data Sheet (1)

Model	N2600-1000-01				
Specification	1000V/1A/20W				
Screen	LCD				
Channels	1CH				
Digits	6½				
Quadrant	4				
Voltage	Range	Setting Resolution	Setting Accuracy (23±5℃)	Readback Resolution	Readback Accuracy (23±5℃)
	1000V	1mV	0.02%+100mV	10mV	0.02%+50mV
	20V	100μV	0.02%+2.4mV	100μV	0.02%+1mV
	2V	10μV	0.02%+600μV	10μV	0.012%+300μV
	200mV	1μV	0.02%+600μV	1μV	0.012%+300μV
Voltage Ripple Noise	<5mVrms(Typical) (10Hz~20MHz)				
Current	Range	Setting Resolution	Setting Accuracy (23±5℃)	Readback Resolution	Readback Accuracy (23±5℃)
	1A	10μA	0.2%+600μA	10μA	0.2%+570μA
	100mA	1μA	0.066%+20μA	1μA	0.055%+6μA
	20mA	100nA	0.045%+4μA	100nA	0.035%+1.2μA
	1mA	10nA	0.034%+200nA	10nA	0.027%+60nA
	100μA	1nA	0.031%+20nA	1nA	0.025%+6nA
	10μA	100pA	0.033%+2nA	100pA	0.027%+700pA
	1μA	10pA	0.035%+600pA	10pA	0.029%+300pA
Resistance	Range	Readback Current Range		Readback Resolution	Readback Accuracy
	2Ω	1A		10μΩ	0.2%+0.0003Ω
	20Ω	100mA		100μΩ	0.11%+0.006Ω
	200Ω	10mA		1mΩ	0.09%+0.1Ω
	2kΩ	1mA		10mΩ	0.08%+0.6Ω
	20kΩ	100μA		100mΩ	0.07%+6Ω
	200kΩ	10μA		1Ω	0.07%+60Ω
	2MΩ	1μA		10Ω	0.12%+600Ω
	20MΩ	1μA		100Ω	0.12%+2.4kΩ
200MΩ	0.1μA		1kΩ	0.66%+24kΩ	
Load Regulation	Voltage:200mV ranges≤0.03%, other ranges≤0.01%		Current:10μA ranges≤0.02%, other ranges≤0.01%		
Voltage Slew	20V@ 0.08V/μs±30%		1000V@ 0.5V/μs±30%		
Current Slew	1A@0.1A/μs±20%		100mA@0.008A/μs±20%		
Source/Sink Limit	±21V@±1.05A		±1100V@±21mA		
Temperature Coefficient	30ppm/°C				
Transient Response Time	≤30μs				
Maximum Sampling Rate	100ksps				
Output	Range	Typical Output Settling Time		Test Condition	
Voltage Source	1000V	<1200μs		10% to 90% voltage variation time under open-circuit & no-load condition	
	20V	<375μs			
	2V	<37μs			
	200mV	<20μs			
Current Source	1A	<10μs		10% to 90% current variation time under output short-circuit condition	
	100mA	<20μs			
	20mA	<30μs			
	1mA	<300μs			
	100μA	<1ms			
	10μA	<5ms			
	1μA	<5ms			

Model	N2600-1000-01
Protection	OVP, OCP, OTP, OPP
Common Mode Voltage	250V DC
Sweep	1ms step
Square-wave Generator	Maximum frequency up to 5kHz
Auto Range	Yes
Delay Measurement	Yes
Poweroff Memory	Yes
Protocol	SCPI/Modbus
Interface	Standard: LAN/RS232, optional: GPIB
AC Input	Single phase, 110/220V AC±10%, frequency 47Hz~63Hz (AC voltage switch between 110V and 220V)
Temperature	Operating temperature:0℃~40℃, storage temperature:-20℃~60℃
Operating Environment	Altitude <2000m, relative humidity:5%~90%RH(non-condensing), atmospheric pressure:80~110kPa
Net Weight	Approx.3kg
Dimension	2U, 88.0(H)*214.0(W)*366.0(D)mm

Note 1: For other specifications, please contact NGI.

Note 2: All specifications are subject to change without notice.

Technical Data Sheet (2)

Model	N2610-100-03				
Specification	100V/3A/100W(pulse mode:1000W)				
Screen	LCD				
Channels	1CH				
Digits	6½				
Quadrant	4				
Voltage	Range	Setting Resolution	Setting Accuracy (23±5℃)	Readback Resolution	Readback Accuracy (23±5℃)
	100V	1mV	0.02%+12mV	1mV	0.015%+5mV
	20V	100μV	0.02%+2.4mV	100μV	0.015%+1mV
	2V	10μV	0.02%+600μV	10μV	0.012%+300μV
	200mV	1μV	0.02%+600μV	1μV	0.012%+300μV
Voltage Ripple Noise	<2mVrms(Typical) (10Hz~20MHz)				
Current	Range	Setting Resolution	Setting Accuracy (23±5℃)	Readback Resolution	Readback Accuracy (23±5℃)
	10A ^[1]	100μA	0.089%+5.9mA	10μA	0.082%+1.71μA
	3A	100μA	0.059%+2.8mA	10μA	0.052%+1.71μA
	1A	10μA	0.067%+900μA	10μA	0.06%+570μA
	100mA	1μA	0.066%+20μA	1μA	0.055%+6μA
	10mA	100nA	0.045%+2μA	100nA	0.035%+600nA
	1mA	10nA	0.034%+200nA	10nA	0.027%+60nA
	100μA	1nA	0.031%+20nA	1nA	0.025%+6nA
	10μA	100pA	0.033%+2nA	100pA	0.027%+700pA
Resistance	Range	Readback Current Range		Readback Resolution	Readback Accuracy
	2Ω	1A		10μΩ	0.17%+0.0003Ω
	20Ω	100mA		100μΩ	0.10%+0.003Ω
	200Ω	10mA		1mΩ	0.08%+0.03Ω
	2kΩ	1mA		10mΩ	0.07%+0.3Ω
	20kΩ	100μA		100mΩ	0.06%+3Ω
	200kΩ	10μA		1Ω	0.07%+30Ω
	2MΩ	1μA		10Ω	0.11%+300Ω
	20MΩ	1μA		100Ω	0.11%+1kΩ
Load Regulation	Voltage:each range* 0.01%+100μV			Current:each range* 0.01%+100pA	
Line Regulation	Voltage:each range* 0.01%			Current:each range* 0.01%	
Voltage Slew	20V@0.08V/μs±30%			100V@0.25V/μs±20%	
Source/Sink Limit	±3.15A@±21V		±1.05A@±105V		±10.5A@±105V(pulse mode only)
Source/Sink Limit	±21V@±3.15A		±105V@±1.05A		±105V@±10.5A(pulse mode only)
Temperature Coefficient	30ppm/℃				
Transient Response Time	≤30μs				
Maximum Sampling Rate	100ksps				
Output	Range	Typical Output Settling Time		Test Condition	
Voltage Source	100V	<375μs		10% to 90% voltage variation time under open-circuit & no-load condition	
	20V	<195μs			
	2V	<20μs			
	200mV	<20μs			
Current Source	3A	<375μs		10% to 90% current variation time under output short-circuit condition	
	1A	<195μs			
	100mA	<20μs			
	10mA	<20μs			
	1mA	<20μs			
	100μA	<20μs			
	10uA	<20us			

Model	N2610-100-03
Protection	OVP, OCP, OTP, OPP
Common Mode Voltage	125V DC
Sweep	1ms step
Auto Range	Yes
Delay Measurement	Yes
Poweroff Memory	Yes
Protocol	SCPI/Modbus
Interface	Standard: LAN/RS232, optional: GPIB
AC Input	Single phase, 110/220V AC $\pm$ 10%, frequency 47Hz~63Hz (AC voltage switch between 110V and 220V)
Temperature	Operating temperature:0℃~40℃, storage temperature:-20℃~60℃
Operating Environment	Altitude <2000m, relative humidity:5%~90%RH(non-condensing), atmospheric pressure:80~110kPa
Net Weight	Approx.3kg
Dimension	2U, 88.0(H)*214.0(W)*425.0(D)mm

Remark 【1】 : 10A range is only for pulse mode.

Additional pulse mode source specifications:

Pulse width definition: Pulse width refers to the time from 90% rising edge to 90% falling edge.

Minimum pulse programming resolution: 10 μ s

Pulse width programming accuracy: $\pm$ 5 μ s

Minimum pulse width: 150 μ s

Maximum pulse width: 2.5ms for 10A range, 5ms for other ranges

Pulse width jitter: 50 μ s

Maximum duty cycle: 8% for 10A range, 100% for other ranges

Note 1: For other specifications, please contact NGI.

Note 2: All specifications are subject to change without notice.

Technical Data Sheet (3)

Model	N2600-200-01				
Specification	200V/1A/20W				
Screen	LCD				
Channels	1CH				
Digits	6½				
Quadrant	4				
Voltage	Range	Setting Resolution	Setting Accuracy (23±5℃)	Readback Resolution	Readback Accuracy (23±5℃)
	200V	1mV	0.02%+20mV	1mV	0.02%+20mV
	20V	100μV	0.02%+2mV	100μV	0.02%+2mV
	2V	10μV	0.02%+200μV	10μV	0.02%+200μV
	200mV	1μV	0.02%+100μV	1μV	0.02%+100μV
Voltage Ripple Noise	<2mVrms(Typical) (10Hz~20MHz)				
Current	Range	Setting Resolution	Setting Accuracy (23±5℃)	Readback Resolution	Readback Accuracy (23±5℃)
	1A	10μA	0.05%+500μA	10μA	0.05%+500μA
	100mA	1μA	0.02%+20μA	1μA	0.02%+20μA
	10mA	100nA	0.02%+2μA	100nA	0.02%+2μA
	1mA	10nA	0.02%+200nA	10nA	0.02%+200nA
	100μA	1nA	0.02%+20nA	1nA	0.02%+20nA
	10μA	100pA	0.02%+2nA	100pA	0.02%+2nA
	1μA	10pA	0.02%+600pA	10pA	0.02%+600pA
Resistance	Range	Readback Current Range		Readback Resolution	Readback Accuracy
	2Ω	1A		10μΩ	0.2%+0.0003Ω
	20Ω	100mA		100μΩ	0.05%+0.003Ω
	200Ω	10mA		1mΩ	0.05%+0.03Ω
	2kΩ	1mA		10mΩ	0.05%+0.3Ω
	20kΩ	100μA		100mΩ	0.05%+3Ω
	200kΩ	10μA		1Ω	0.05%+30Ω
	2MΩ	1μA		10Ω	0.1%+300Ω
	20MΩ	1μA		100Ω	0.1%+2kΩ
200MΩ	100nA		1kΩ	0.7%+20kΩ	
Load Regulation	Voltage:200mV ranges≤0.03%, other ranges≤0.01%			Current:1μA/1A ranges≤0.02%, other ranges≤0.01%	
Voltage Slew	20V@ 0.08V/μs±20%			200V@ 0.5V/μs±20%	
Current Slew	1A@0.12A/μs±20% (resistive load)			100mA@0.008A/μs±20% (resistive load)	
Source/Sink Limit	±21V@±1.05A			±210V@±105A	
Temperature Coefficient	40ppm/°C				
Transient Response Time	≤30μs				
Maximum Sampling Rate	100ksps				
Output	Range	Typical Output Settling Time		Test Condition	
Voltage Source	200V	<375μs		10% to 90% voltage variation time under open-circuit & no-load condition	
	20V	<195μs			
	2V	<20μs			
	200mV	<20μs			
Current Source	1A	<10μs		10% to 90% current variation time under output short-circuit condition	
	100mA	<20μs			
	10mA	<15μs			
	1mA	<300μs			
	100μA	<1ms			
	10μA	<5ms			
	1μA	<5ms			

Model	N2600-200-01
Protection	OVP, OCP, OTP, OPP
Common Mode Voltage	250V DC
Sweep	1ms step
Square-wave Generator	Maximum frequency up to 5kHz
Auto Range	Yes
Delay Measurement	Yes
Poweroff Memory	Yes
Protocol	SCPI/Modbus
Interface	Standard: LAN/RS232, optional: GPIB
AC Input	Single phase, 110/220V AC±10%, frequency 47Hz~63Hz (AC voltage switch between 110V and 220V)
Temperature	Operating temperature:0℃~40℃, storage temperature:-20℃~60℃
Operating Environment	Altitude <2000m, relative humidity:5%~90%RH(non-condensing), atmospheric pressure:80~110kPa
Net Weight	Approx.3kg
Dimension	2U, 88.0(H)*214.0(W)*366.0(D)mm

Note 1: For other specifications, please contact NGI.

Note 2: All specifications are subject to change without notice.

Technical Data Sheet (4)

Model	N2600-020-01				
Specification	20V/1A/20W				
Screen	LCD				
Channels	1CH				
Digits	6½				
Quadrant	4				
Voltage	Range	Setting Resolution	Setting Accuracy (23±5℃)	Readback Resolution	Readback Accuracy (23±5℃)
	20V	100μV	0.02%+2mV	100μV	0.02%+2mV
	2V	10μV	0.02%+200μV	10μV	0.02%+200μV
	200mV	1μV	0.02%+100μV	1μV	0.02%+100μV
Voltage Ripple Noise	<2mVrms(Typical) (10Hz~20MHz)				
Current	Range	Setting Resolution	Setting Accuracy (23±5℃)	Readback Resolution	Readback Accuracy (23±5℃)
	1A	10μA	0.05%+500μA	10μA	0.05%+500μA
	100mA	1μA	0.02%+20μA	1μA	0.02%+20μA
	10mA	100nA	0.02%+2μA	100nA	0.02%+2μA
	1mA	10nA	0.02%+200nA	10nA	0.02%+200nA
	100μA	1nA	0.02%+20nA	1nA	0.02%+20nA
	10μA	100pA	0.02%+2nA	100pA	0.02%+2nA
	1μA	10pA	0.02%+600pA	10pA	0.02%+600pA
Resistance	Range	Readback Current Range		Readback Resolution	Readback Accuracy
	2Ω	1A		10μΩ	0.2%+0.0003Ω
	20Ω	100mA		100μΩ	0.05%+0.003Ω
	200Ω	10mA		1mΩ	0.05%+0.03Ω
	2kΩ	1mA		10mΩ	0.05%+0.3Ω
	20kΩ	100μA		100mΩ	0.05%+3Ω
	200kΩ	10μA		1Ω	0.05%+30Ω
	2MΩ	1μA		10Ω	0.1%+300Ω
	20MΩ	1μA		100Ω	0.1%+2kΩ
200MΩ	100nA		1kΩ	0.7%+20kΩ	
Load Regulation	Voltage:200mV ranges≤0.03%, other ranges≤0.01%		Current:1μA/1A ranges≤0.02%, other ranges≤0.01%		
Voltage Slew	20V@ 0.08V/μs±20%				
Current Slew	1A@0.12A/μs±20% (resistive load)				
Source/Sink Limit	±21V@±1.05A				
Temperature Coefficient	40ppm/℃				
Transient Response Time	≤30μs				
Maximum Sampling Rate	100ksps				
Output	Range	Typical Output Settling Time		Test Condition	
Voltage Source	20V	<195μs		10% to 90% voltage variation time under open-circuit & no-load condition	
	2V	<20μs			
	200mV	<20μs			
Current Source	1A	<10μs		10% to 90% current variation time under output short-circuit condition	
	100mA	<20μs			
	10mA	<15μs			
	1mA	<300μs			
	100μA	<1ms			
	10μA	<5ms			
1μA	<5ms				

Model	N2600-020-01
Protection	OVP, OCP, OTP, OPP
Common Mode Voltage	250V DC
Sweep	1ms step
Square-wave Generator	Maximum frequency up to 5kHz
Auto Range	Yes
Delay Measurement	Yes
Poweroff Memory	Yes
Protocol	SCPI/Modbus
Interface	Standard: LAN/RS232, optional: GPIB
AC Input	Single phase, 110/220V AC±10%, frequency 47Hz~63Hz (AC voltage switch between 110V and 220V)
Temperature	Operating temperature:0℃~40℃, storage temperature:-20℃~60℃
Operating Environment	Altitude <2000m, relative humidity:5%~90%RH(non-condensing), atmospheric pressure:80~110kPa
Net Weight	Approx.3kg
Dimension	2U, 88.0(H)*214.0(W)*366.0(D)mm

Note 1: For other specifications, please contact NGI.

Note 2: All specifications are subject to change without notice.