

## N9000 Series Ultra-high Integration Dual-quadrant Modular Battery Simulator



Battery Simulator

### Product Introduction

N9000 is an ultra-high integration dual-quadrant modular battery simulator with high real-time, high-synchronous, high-power, consisting of N9000 measurement and control chassis and a variety of modules. N9000 is a standard chassis with 4U height and 19-inch width, support for the insertion of battery simulation modules, temperature simulation modules, high-voltage power supply modules and other types, the chassis can be integrated into 10 slot measurement and control modules, electrical isolation of the modules. N9000 series supports local/remote control and synchronous trigger function, which can realize multi-module high-speed synchronous control, and is widely applicable to multi-channel, high-integrity, high-power automated test and measurement scenarios.

The NB101 series is a high-precision, dual-quadrant programmable battery simulation module that supports voltage accuracy up to 0.1mV and  $\mu$ A-level current measurement. It is equipped with various test functions such as power mode, SOC simulation, sequence test, graph and fault simulation. It can meet the requirements of BMS HIL test system, AFE chip, energy storage, electric vehicle, electric two-wheeler/tricycle, base station power supply, and other multi-scenario BMS test applications.

NB102 series is a high-precision, multi-channel temperature simulation module, resistance range:  $0\Omega \sim 11.11M\Omega$ , programming accuracy up to 0.1%. The flexible design supports 12/24/36 channels with a resolution up to  $1\Omega$ , which can be widely used in simulation test scenarios such as NTC resistors and resistive sensors.

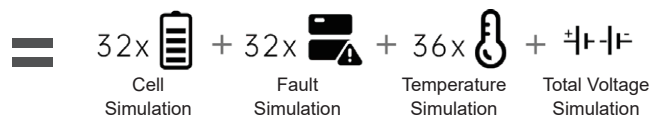
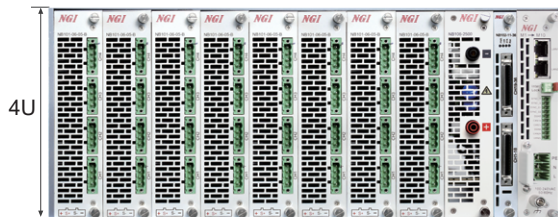
NB106 is a programmable high-voltage power supply module, the product has 1200V/2500V voltage output specifications, voltage accuracy is as high as 0.05%+0.05% F.S., supports CV, CC, SEQ, Sweep and other operating modes, and can be widely used in automotive BMS, energy storage BMS and other scenarios.

### Main Features

- ▶ High accuracy: voltage accuracy up to 0.1mV/0.5mV
- ▶ High integration: 32CH cell simulation+32CH fault simulation+36CH temperature simulation+total voltage simulation integrated in 19inch/4U chassis
- ▶ Modular design: easy for wiring and expansion
- ▶ High speed response: response time  $\leq 1ms$
- ▶ Each channel isolated, series connection available
- ▶  $\mu$ A level current measurement
- ▶ LAN port and CANFD interface; dual LAN ports, convenient for cascade application

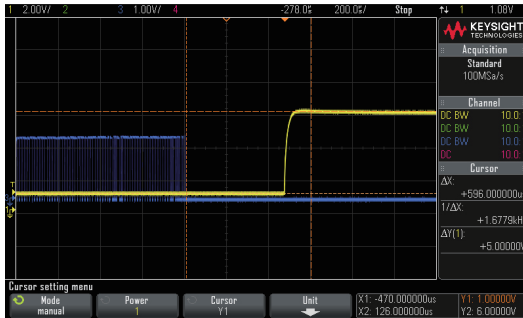
### Modular design for convenient operation and flexible expansion

N9000 is an ultra-high integration dual-quadrant modular battery simulator. The standard chassis can integrate 32 channels of single cell simulation, 32 channels of battery fault simulation and 36 channels of temperature simulation and a channel total voltage simulation, which effectively saves users' space. Single module with 4 channels for battery simulation, single module with 12/24/36 channels optional for temperature simulation, high voltage power module 1200V/2500V selectable. With multiple models, users can choose products according to the actual needs, which is convenient for subsequent expansion.



### High speed response, high speed synchronization, high throughput data

As a high real-time, high-synchronous measurement and control platform, the N9000 series supports Gigabit LAN and CANFD communication, hardware synchronous triggering and high-speed synchronous clocks, with command response time as fast as 1ms, multi-channel synchronization as fast as 200µs, which is particularly suitable for high-speed simulation test such as BMS HIL.



▲ Command response time as fast as 1ms

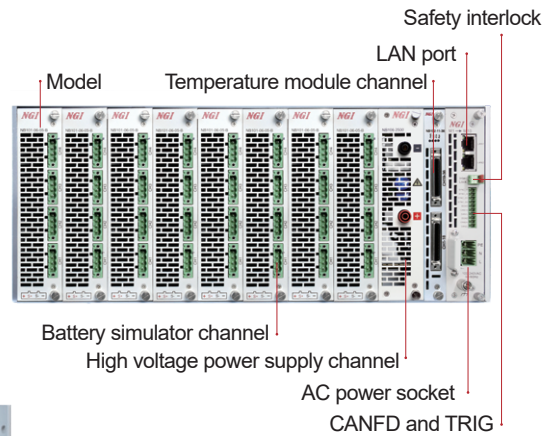
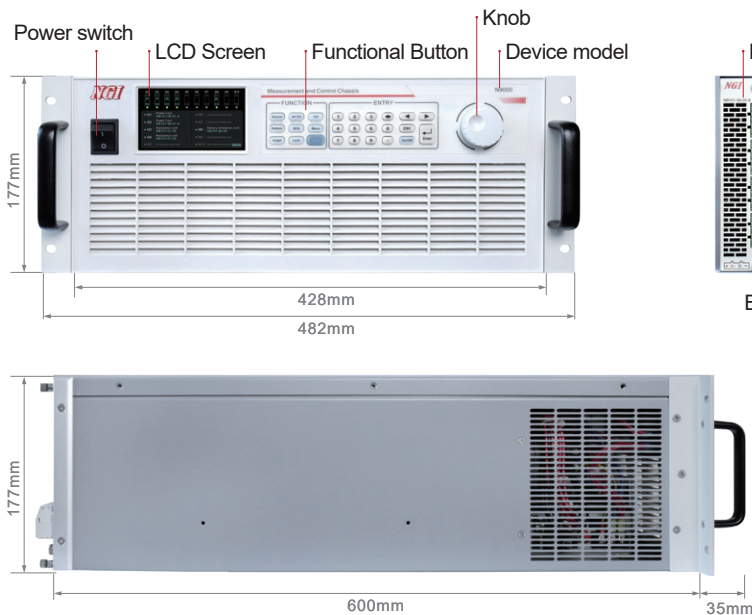


▲ channel synchronization plus rise time as fast as 65µs

### High precision, matching BMS and AFE chip trends

AFE chip is the core component of BMS, with the management getting more and more refined, the voltage acquisition accuracy of AFE chip and BMS is getting higher and higher. NGI has launched 0.1mV ultra-high precision battery simulator since 2016, which has been widely recognized by the industry and become the first choice for AFE chip testing. The modular battery simulator launched under the N9000 measurement and control platform supports 0.1mV and 0.5mV voltage accuracy, which can meet the industry's high-precision testing needs.

### Product Dimension



Battery Simulator

**Product Selection (1): 0.1mV Voltage Accuracy Battery Simulator**

Battery Simulator

Product Model	Specification	Configuration		
		Module Model	Qty	Specification
N9108-06-01	6V/±1A/8CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-01-A	2	6V/±1A/4CH
N9112-06-01	6V/±1A/12CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-01-A	3	6V/±1A/4CH
N9116-06-01	6V/±1A/16CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-01-A	4	6V/±1A/4CH
N9120-06-01	6V/±1A/20CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-01-A	5	6V/±1A/4CH
N9124-06-01	6V/±1A/24CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-01-A	6	6V/±1A/4CH
N9128-06-01	6V/±1A/28CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-01-A	7	6V/±1A/4CH
N9132-06-01	6V/±1A/32CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-01-A	8	6V/±1A/4CH
N9136-06-01	6V/±1A/36CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-01-A	9	6V/±1A/4CH
N9108-06-05	6V/±5A/8CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-05-A	2	6V/±5A/4CH
N9112-06-05	6V/±5A/12CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-05-A	3	6V/±5A/4CH
N9116-06-05	6V/±5A/16CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-05-A	4	6V/±5A/4CH
N9120-06-05	6V/±5A/20CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-05-A	5	6V/±5A/4CH
N9124-06-05	6V/±5A/24CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-05-A	6	6V/±5A/4CH
N9128-06-05	6V/±5A/28CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-05-A	7	6V/±5A/4CH
N9132-06-05	6V/±5A/32CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-05-A	8	6V/±5A/4CH
N9136-06-05	6V/±5A/36CH Battery simulator Voltage accuracy:0.1mV	N9000	1	Measurement and control chassis
		NB101-06-05-A	9	6V/±5A/4CH

**Product Selection (2): 0.5mV Voltage Accuracy Battery Simulator**

Product Model	Specification	Configuration		
		Module Model	Qty	Specification
N9008-06-01	6V/±1A/8CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-01-B	2	6V/±1A/4CH
N9012-06-01	6V/±1A/12CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-01-B	3	6V/±1A/4CH
N9016-06-01	6V/±1A/16CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-01-B	4	6V/±1A/4CH
N9020-06-01	6V/±1A/20CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-01-B	5	6V/±1A/4CH
N9024-06-01	6V/±1A/24CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-01-B	6	6V/±1A/4CH
N9028-06-01	6V/±1A/28CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-01-B	7	6V/±1A/4CH
N9032-06-01	6V/±1A/32CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-01-B	8	6V/±1A/4CH
N9036-06-01	6V/±1A/36CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-01-B	9	6V/±1A/4CH
N9008-06-05	6V/±5A/8CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-05-B	2	6V/±5A/4CH
N9012-06-05	6V/±5A/12CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-05-B	3	6V/±5A/4CH
N9016-06-05	6V/±5A/16CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-05-B	4	6V/±5A/4CH
N9020-06-05	6V/±5A/20CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-05-B	5	6V/±5A/4CH
N9024-06-05	6V/±5A/24CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-05-B	6	6V/±5A/4CH
N9028-06-05	6V/±5A/28CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-05-B	7	6V/±5A/4CH
N9032-06-05	6V/±5A/32CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-05-B	8	6V/±5A/4CH
N9036-06-05	6V/±5A/36CH Battery simulator Voltage accuracy: 0.5mV	N9000	1	Measurement and control chassis
		NB101-06-05-B	9	6V/±5A/4CH

Battery Simulator

### Product Selection (3): Temperature Simulation Module

Optional-Temperature Simulation Module			
Model	Specification	Model	Specification
NB102-01-12	1.11MΩ/1Ω/12CH	NB102-11-12	11.11MΩ/10Ω/12CH
NB102-01-24	1.11MΩ/1Ω/24CH	NB102-11-24	11.11MΩ/10Ω/24CH
NB102-01-36	1.11MΩ/1Ω/36CH	NB102-11-36	11.11MΩ/10Ω/36CH
NB102-A6-12	600kΩ/1Ω/12CH	NB102-06-12	6MΩ/10Ω/12CH
NB102-A6-24	600kΩ/1Ω/24CH	NB102-06-24	6MΩ/10Ω/24CH
NB102-A6-36	600kΩ/1Ω/36CH	NB102-06-36	6MΩ/10Ω/36CH

[Note]:  
 1. Single battery simulator supports one NB102 series module insertion.  
 2. 600kΩ, 6MΩ models support NTC short circuit simulation, NTC open circuit simulation.

### Product Selection (4): Programmable High Voltage Power Supply Module

Optional-Programmable High Voltage Power Supply Module			
Model	Specification	Model	Specification
NB106-1200	1200V/100mA/120W/1CH	NB106-2500	2500V/100mA/250W/1CH

[Note]:  
 1. NB106 series and NB101 series share the same slot, a N9000 can support up to NB106 series modules\*9pcs.

## Battery Simulator Module Specification (1)

Model	NB101-06-01-A		NB101-06-05-A	
Current	±1A/CH		±5A/CH	
Voltage	6V/CH		6V/CH	
Power	6W/CH		30W/CH	
Channels	4CH			
CV Mode				
Range	0-6V			
Setting Resolution	0.01mV			
Setting Accuracy(23±5°C)	0.1mV			
Readback Resolution	0.01mV			
Readback Accuracy(23±5°C)	0.1mV			
Temperature Coefficient(0~40°C)	20ppm/°C			
Voltage Ripple Noise	≤2mVrms			
CC Mode				
Range	-1-1A	-1~1mA	-5-5A	-1~1mA
Setting Resolution	0.1mA	0.1μA	0.1mA	0.1μA
Setting Accuracy(23±5°C)	1mA	1μA	5mA	1μA
Readback Resolution	0.1mA	0.1μA	0.1mA	0.1μA
Readback Accuracy(23±5°C)	1mA	1μA	5mA	1μA
Temperature Coefficient(0~40°C)	50ppm/°C			
Dynamic Characteristic				
Voltage Rise Time	≤40μs(No load, 10%-90% variation time)			
Voltage Rise Time	≤40μs(Pure resistive full load, 10%-90% variation time)			
Voltage Fall Time	≤100μs(No load, 90%-10% variation time)			
Voltage Fall Time	≤100μs(Pure resistive full load, 90%-10% variation time)			
Transient Recovery Time	<100μs(Pure resistive load, 10%-90% variation time)			
Fault Simulation				
Supportable Functions	Positive and negative short circuit, positive and negative open circuit, polarity reversal simulation			
Other				
Isolation(output to ground)	2500V DC			
Isolation(channel and channel)	500V DC			
Temperature	Working temperature: 0°C~40°C; Storage temperature: -20°C~60°C			
Operating Environment	Altitude: <2000m; relative humidity: 5%~90%RH (no condensation); operating air pressure: 80~110kPa			
Dimension	Single module single slot, one N9000 chassis support 9 single module insertion			
Net Weight	Approx. 1.15kg			

Note 1: For other specifications, please contact NGI.

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

## Battery Simulator Module Specification (2)

Model	NB101-06-01-B		NB101-06-05-B	
Current	±1A/CH		±5A/CH	
Voltage	6V/CH		6V/CH	
Power	6W/CH		30W/CH	
Channels	4CH			
CV Mode				
Range	0-6V			
Setting Resolution	0.1mV			
Setting Accuracy(23±5°C)	0.5mV			
Readback Resolution	0.1mV			
Readback Accuracy(23±5°C)	0.5mV			
Temperature Coefficient(0~40°C)	20ppm/°C			
Voltage Ripple Noise	≤2mVrms			
CC Mode				
Range	-1-1A	-1~1mA	-5-5A	-1~1mA
Setting Resolution	0.1mA	0.1μA	0.1mA	0.1μA
Setting Accuracy(23±5°C)	1mA	1μA	5mA	1μA
Readback Resolution	0.1mA	0.1μA	0.1mA	0.1μA
Readback Accuracy(23±5°C)	1mA	1μA	5mA	1μA
Temperature Coefficient(0~40°C)	50ppm/°C			
Dynamic Characteristic				
Voltage Rise Time	≤40μs(No load, 10%-90% variation time)			
Voltage Rise Time	≤40μs(Pure resistive full load, 10%-90% variation time)			
Voltage Fall Time	≤100μs(No load, 90%-10% variation time)			
Voltage Fall Time	≤100μs(Pure resistive full load, 90%-10% variation time)			
Transient Recovery Time	<100μs(Pure resistive load, 10%-90% variation time)			
Fault Simulation				
Supportable Functions	Positive and negative short circuit, positive and negative open circuit, polarity reversal simulation			
Other				
Isolation(output to ground)	2500V DC			
Isolation(channel and channel)	500V DC			
Temperature	Working temperature: 0°C~40°C; Storage temperature: -20°C~60°C			
Operating Environment	Altitude: <2000m; relative humidity: 5%~90%RH (no condensation); operating air pressure: 80~110kPa			
Dimension	Single module single slot, one N9000 chassis support 9 single module insertion			
Net Weight	Approx. 1.15kg			

Note 1: For other specifications, please contact NGI.

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

### Programmable Resistance Module Specification (3)

Model	Specification	Model	Specification
NB102-01-12	1.11MΩ/1Ω/12CH	NB102-11-12	11.11MΩ/10Ω/12CH
NB102-01-24	1.11MΩ/1Ω/24CH	NB102-11-24	11.11MΩ/10Ω/24CH
NB102-01-36	1.11MΩ/1Ω/36CH	NB102-11-36	11.11MΩ/10Ω/36CH
NB102-A6-12	600kΩ/1Ω/12CH <sup>1</sup>	NB102-06-12	6MΩ/10Ω/12CH <sup>1</sup>
NB102-A6-24	600kΩ/1Ω/24CH <sup>1</sup>	NB102-06-24	6MΩ/10Ω/24CH <sup>1</sup>
NB102-A6-36	600kΩ/1Ω/36CH <sup>1</sup>	NB102-06-36	6MΩ/10Ω/36CH <sup>1</sup>
Common Parameter			
Resolution	1Ω@600kΩ, 1Ω@1.11MΩ, 10Ω@6MΩ, 10Ω@11.11MΩ		
Channels	12CH/24CH/36CH optional		
Resistance Accuracy	≤2MΩ: 0.1%+Rr >2MΩ: 1%+Rr		
Residual Resistance	Typical value:3Ω (when resistance is programmed to 0Ω)		
Resistance Max. Power	0.25W		
Switch Closure Time	<1.1ms		
Switch Release Time	<0.4ms		
Expected Switch Life	Low load application: >1×10 <sup>8</sup> operations; Full load application:>1×10 <sup>6</sup> operations		
Max. Switching Voltage	125VAC, 60VDC		
Max. Switching Current	0.5A		
Temperature	Working temperature:0°C~40°C; Storage temperature: -20°C~60°C		
Operating Environment	Altitude: <2000m; relative humidity: 5%~90%RH (no condensation); operating air pressure: 80~110kPa		
Dimension	Single module ½ slot, one N9000 chassis support 9 single module insertion		
Net Weight	Approx. 1.35kg		

Note 1: 600kΩ, 6MΩ models support NTC short-circuit simulation, NTC open circuit simulation

## Programmable High Voltage Power Supply Module Specification (4)

Model	NB106-1200	NB106-2500
Current	100mA	
Voltage	1200V	2500V
Power	120W	250W
Channels	1CH	
CV Mode		
Range	0~1200V	0~2500V
Setting Resolution	100mV	
Setting Accuracy (23±5°C)	0.05%+0.05%F.S.	
Readback Resolution	10mV	
Readback Accuracy (23±5°C)	0.05%+0.05%F.S.	
Voltage Ripple <sup>[1]</sup> (20Hz~20MHz)	≤1.2Vp-p	≤2.5Vp-p
CC Mode		
Range	0~100mA	
Setting Resolution	10μA	
Setting Accuracy (23±5°C)	0.1%+0.1%F.S.	
Readback Resolution	10μA	
Readback Accuracy (23±5°C)	0.1%+0.1%F.S.	
Current Ripple (20Hz~20MHz)	≤500μArms	
Line Regulation		
Voltage	≤0.01%	
Current	≤0.05%	
Load Regulation		
Voltage	≤0.05%	
Current	≤0.05%	
Dynamic Characteristic		
Voltage Rise Time	≤100ms (No load, 10%-90% variation time)	
Voltage Rise Time	≤200ms (Pure resistive full load, 10%-90% variation time)	
Voltage Fall Time	≤200ms (No load, 90%-10% variation time)	
Voltage Fall Time	≤100ms (Pure resistive full load, 90%-10% variation time)	
Other		
Isolation	Input to ground AC 1500V; output negative to ground	
Testing Terminal	Banana Socket, 2pin	
AC Input	220V AC±10%, frequency 47Hz~63Hz	
Temperature	Working temperature: 0°C~40°C; Storage temperature: -20°C~60°C	
Operating Environment	Altitude: <2000m; relative humidity: 5%~90%RH (no condensation); operating air pressure: 80~110kPa	
Dimension	Single module single slot, one N9000 chassis support 9 single module insertion	
Net Weight	Approx. 1.33kg	Approx. 1.47kg

Note 1: When measuring voltage ripple, a capacitor must be added for filtering.

Note 2: For other specifications, please contact NGI.





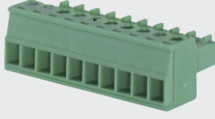

Note 3: All specifications are subject to change without notice.

## N9000 Measurement and Control Chassis Specification




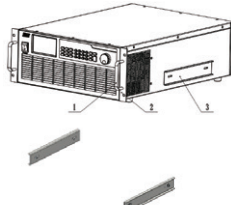
Model	N9000
Slot	Support single slot*9pcs + ½ slot*1pc
Communication Interface	LAN/CAN
AC Input	Single phase 100~240V AC, frequency 47Hz~63Hz, current ≤9A@220V, ≤18A@110V
Earth Leakage Current	<3.5mA@230VAC
Temperature	Working temperature: 0°C~40°C; Storage temperature: -20°C~60°C
Operating Environment	Altitude: <2000m; relative humidity: 5%~90%RH (no condensation); operating air pressure: 80~110kPa
Dimension	177.0mm (H) *482.0mm (W) with handle*600.0mm (D)
Net Weight	Approx. 19kg

## Accessory

### Standard

	<p><b>A1106-02 Power Cord</b> 1pc 220VAC single phase three core power cord, cord length: 2 meters One end of the national standard 10A three-plug, one end of the flat terminal</p>		<p><b>Network Cable</b> 1pc Length: 2 meters</p>
	<p><b>Channel Interface Connector</b> 1pc Port: 5.08mm 4-pin terminal</p>		<p><b>Resistor Module Connector</b> 1pc (<math>\leq 18\text{CH}</math>) / 2pcs (<math>&gt; 18\text{CH}</math>) SCSI connector: 50pin</p>
	<p><b>CAN Communication Connector</b> 1pc Port: 10 pin/3.5mm</p>		<p><b>Inter Lock Connector</b> 1pc Port: 2pin/3.5mm</p>
<p>USB flash drive 1pc (8G; contains NGI application software/programming protocols, etc.)</p>		<p>Quick Selection Guide 1set</p>	
<p>Product Performance Test Report 1set</p>			

### Optional

	<p><b>NB301-02/NB301-04 Battery Simulator Test Cable</b> NB301-02(cable length 2 meters)/NB301-04(cable length 4 meters) 1mm<sup>2</sup> Teflon cable; 4 (1CH) nylon braided sleeve, fixed with cable ties, one end 5.08mm 4-pin terminal (female), one end pin terminal (red positive and black negative distinction) with numbering tube</p>		
	<p><b>NB302-18-02/NB302-18-04 Resistance Module Test Cable</b> NB302-18-02(cable length 2 meters)/NB302-18-04(cable length 4 meters) <b>1pc (18CH and below)/2pcs (18CH and above)</b> 0.3mm<sup>2</sup> RV cable; 36 harness (18CH) nylon braided sleeve, tie down, one end SCSI connector 50pin (male), one end pin terminal with numbering tube</p>		
	<p><b>A1103-02/A1103-04 Power Supply Cord</b> A1103-02 (cable length 2 meters) /A1103-04 (cable length 4 meters) 220VAC single phase 6mm<sup>2</sup>RVV sheathed power cord, bundle of 3 cores (L/N/PE), wire length: 2/4 metres; both ends: flat terminals 3pin</p>		
	<p><b>NF00Y Kit for Rack Installation</b> Suitable for 4U height and 19-inch width models Name: Chassis rail; Material thickness: 2.0mm SGCC; Quantity: 2pcs</p>		