

R & S® ESSENTIALS

# POWER SUPPLIES TEST & MEASUREMENT



R & S® ESSENTIALS | POWER SUPPLIES | TEST & MEASUREMENT | 12.00

**ROHDE & SCHWARZ**

Make ideas real



# POWER SUPPLIES

## Number of channels

Depending on the application and requirements, you can select a power supply unit with 1, 2, 3 or 4 channels.

In many cases, a single output will be sufficient. However, multi-output supplies can deliver important advantages in applications that require, for example, +15 V and -15 V simultaneously. A multi-output supply with independently controllable outputs is usually more versatile than a set of individual supplies. Using a single multi-output supply significantly reduces costs.

## Output power

The maximum power is determined by the maximum voltage and current demanded by the device. All multichannel Rohde&Schwarz power supplies allow parallel and serial operation to achieve higher voltage/current output.

## Readback accuracy and sense lines

Modern power supplies include a multimeter that measures the voltage/current consumed by the device under test (DUT). The readback accuracy specifies the accuracy of these measurements.

The output cables that connect a power supply's output to its load have some resistance, and as current flow increases there will be a voltage drop across the cables. The sense lines connected from the supply to the load compensate for these unwanted voltage drops since the voltage can be measured directly at the DUT.

Most Rohde&Schwarz power supplies are equipped with sense lines.

## Protection functions

To safeguard the instrument and the DUT, Rohde&Schwarz power supplies provide a variety of protection functions.

Depending on the model, users can separately set the maximum current (electronic fuse, overcurrent protection, OCP), the maximum voltage (overvoltage protection, OVP) and the maximum power (overpower protection, OPP) for each channel. When such a limit is reached, the affected output channel will be switched off.

Overtemperature protection prevents the instrument from overheating.

Type	Designation	Page
R&S°NGE100B	Power supply series	27
R&S°NGA100	Power supply series	29
R&S°HMP	Power supply series	31
R&S°NGL200	Power supply series	33
R&S°NGM200	Power supply series	35
R&S°NGP800	Power supply series	37
R&S°NGU	Source measure units	39

## Power supply portfolio



	Basic units R&S®NGE102B/103B	R&S®NGA101/102/141/142	Performance units R&S®HMP2020/2030	R&S®HMP4030/4040
<b>Electrical specifications</b>				
Number of output channels	2/3	1/2	2/3	3/4
Maximum output power	66 W/100 W	40 W/80 W/40 W/80 W	188 W	384 W
Maximum output power per channel	33.6 W	40 W	80 W, except R&S®HMP2020, CH1: 160 W	160 W
Output voltage per channel	0 V to 32 V	R&S®NGA101/102: 0 V to 35 V R&S®NGA141/142: 0 V to 100 V	0 V to 32 V	0 V to 32 V
Maximum output current per channel	3 A	R&S®NGA101/102: 6 A R&S®NGA141/142: 2 A	5 A, except R&S®HMP2020, CH1: 10 A	10 A
Voltage ripple and noise (RMS) (20 Hz to 20 MHz)	< 1.5 mV (typ.)	R&S®NGA101/102: < 0.5 mV (meas.); R&S®NGA141/142: < 1.5 mV (meas.)	< 1.5 mV (meas.)	< 1.5 mV (meas.)
Current ripple and noise (RMS) (meas.) (20 Hz to 20 MHz)	< 2 mA	< 500 µA	< 1 mA	< 1 mA
Load recovery time <sup>1)</sup> (meas.)	< 200 µs	R&S®NGA101/102: < 100 µs; R&S®NGA141/142: < 50 µs	< 1 ms	< 1 ms
<b>Programming/readback resolution</b>				
Voltage	10 mV	1 mV	1 mV	1 mV
Current	1 mA	programming: 1 mA readback: 0.1 mA	< 1 A: 0.1 mA (10 A CH: 0.2 mA); ≥ 1 A: 1 mA	< 1 A: 0.2 mA; ≥ 1 A: 1 mA
<b>Readback accuracy (± (% of output + offset))</b>				
Voltage	< 0.1% + 20 mV	R&S®NGA101/102: 0.02% + 5 mV R&S®NGA141/142: 0.02% + 10 mV	< 0.05% + 5 mV	< 0.05% + 5 mV
Current	< 0.1% + 5 mA	< 0.03% + 500 µA	< 0.1% + 2 mA	< 0.1% + 2 mA
<b>Special functions</b>				
Measurement functions	voltage, current, power	voltage, current, power	voltage, current	voltage, current
Protection functions	OVP, OCP, OPP, OTP	OVP, OCP, OPP, OTP	OVP, OCP, OTP	OVP, OCP, OTP
FuseLink function	•	• (R&S®NGA102/142)	•	•
Fuse delay	•	•	•	•
Remote sensing	–	•	•	•
Sink mode	–	–	–	–
Output delay	–	–	–	–
Trigger input/output	o/o	o/o	–	–
Arbitrary function	• (CH1: EasyArb)	• (CH1: EasyArb)	• (EasyArb)	• (EasyArb)
Analog/modulation interface	–	–	–	–
Data logging	–	• (standard mode)	–	–
<b>Display and interfaces</b>				
Display	3.5" QVGA	3.5"/QVGA	240 × 64 pixel LCD	240 × 128 pixel LCD
Rear panel connections	–	8-pin connector block	4-pin connector block per channel	8-pin connector block per 2 channels
Remote control interfaces	standard: USB; optional: LAN	standard: USB, LAN	optional: USB, LAN, IEEE-488 (GPIB), RS-232	optional: USB, LAN, IEEE-488 (GPIB), RS-232
<b>General data</b>				
Dimensions (W × H × D)	222 × 97 × 310 mm	222 × 97 × 448 mm	285 × 93 × 405 mm	285 × 136 × 405 mm
Weight	4.9 kg/5.0 kg	6.6 kg/7.0 kg/6.9 kg/7.3 kg	7.8 kg/8.0 kg	12.4 kg/12.8 kg
Rack adapter	R&S®HZC95 option	R&S®HZN96 option	R&S®HZ42 option	R&S®HZP91 option

All data valid at +23°C (–3°C/+7°C) after 30 minutes warm-up time.

• yes – no ○ optional

<sup>1)</sup> 10% to 90% load change within a band of ±20 mV of set voltage.

<sup>2)</sup> In the most sensitive measurement range.



R&S®NGP802/822/804/814/824	Specialty units R&S®NGL201/NGL202	R&S®NGM201/202	R&S®NGU201/401
2/4	1/2	1/2	1
400 W/800 W	60 W/120 W	60 W/120 W	60 W
200 W	60 W	60 W	60 W
0 V to 32 V (32 V channels); 0 V to 64 V (64 V channels)	0 V to 20 V	0 V to 20 V	R&S®NGU201: 0 V to 20 V R&S®NGU401: -20 V to +20 V
20 A (32 V channels); 10 A (64 V channels)	≤ 6 V output voltage: 6 A; > 6 V output voltage: 3 A	≤ 6 V output voltage: 6 A; > 6 V output voltage: 3 A	≤ 6 V output voltage: 8 A; > 6 V output voltage: 3 A
< 3 mV (meas.)	< 500 μV (meas.)	< 500 μV (meas.)	< 500 μV (meas.)
< 3.5 mA	< 1 mA	< 1 mA	< 1 mA
< 400 μs	< 30 μs	< 30 μs	< 30 μs
1 mV	1 mV/10 μV	1 mV/5 μV <sup>2)</sup>	50 μV/1 μV <sup>3)</sup>
0.5 mA	0.1 mA/10 μA	0.1 mA/10 nA <sup>3)</sup>	100 nA/100 pA <sup>3)</sup>
< 0.05% + 5 mV (32 V channels); < 0.05% + 10 mV (64 V channels)	< 0.02% + 2 mV	< 0.02% + 500 μV <sup>3)</sup>	< 0.02% + 500 μV <sup>3)</sup>
< 0.1% + 20 mA (32 V channels); < 0.1% + 10 mA (64 V channels)	< 0.05% + 250 μA	< 0.05% + 15 μA <sup>3)</sup>	< 0.025% + 15 nA <sup>3)</sup>
voltage, current, power, energy OVP, OCP, OPP, OTP	voltage, current, power, energy OVP, OCP, OPP, OTP	voltage, current, power, energy OVP, OCP, OPP, OTP	voltage, current, power, energy OVP, OCP, OPP, OTP
•	• (R&S®NGL202)	• (R&S®NGM202)	–
•	•	•	•
•	•	•	•
–	•	•	•
•	• (R&S®NGL202)	• (R&S®NGM202)	–
o/o	o/o	o/o	o/o
• (QuickArb)	• (QuickArb)	• (QuickArb)	• (QuickArb)
o/–	–	–	R&S®NGU401: modulation interface
• (standard mode)	• (standard mode)	• (standard and fast mode)	• (standard and fast mode)
TFT 5" 800 × 480 pixel WVGA touch	TFT 5" 800 × 480 pixel WVGA touch	TFT 5" 800 × 480 pixel WVGA touch	TFT 5" 800 × 480 pixel WVGA touch
8-pin connector block per 2 channels	8-pin connector block per channel	8-pin connector block per channel	8-pin connector block
standard: USB, LAN; optional: IEEE-488 (GPIB)	standard: USB, LAN; optional: IEEE-488 (GPIB)	standard: USB, LAN; optional: IEEE-488 (GPIB)	standard: USB, LAN; optional: IEEE-488 (GPIB)
362 × 100 × 451 mm	222 × 97 × 436 mm	222 × 97 × 436 mm	222 × 97 × 436 mm
7.5 kg/8.0 kg	7.1 kg/7.3 kg	7.2 kg/7.4 kg	7.1 kg
R&S®ZZA-GE23 option	R&S®HZN96 option	R&S®HZN96 option	R&S®HZN96 option

## R&S®NGE100B Power Supply Series



Brochure



Fact sheet



### Meets your daily needs

What sets these power supplies apart from others in their class?

- ▶ All channels are galvanically isolated and earth-free
- ▶ All channels are electrically equivalent with the same voltage, current and power
- ▶ Parallel and serial operation
- ▶ Protection functions to safeguard instrument and DUT
- ▶ Tracking and link functions
- ▶ Remote control via USB interface and optional LAN

### Model overview

Model	Channel count	Max. voltage	Max. current	Max. power	Resolution
R&S®NGE102B	2	2 × 32 V	2 × 3 A	66 W	10 mV/1 mA
R&S®NGE103B	3	3 × 32 V	3 × 3 A	100 W	10 mV/1 mA

### Important facts

Specification	R&S®NGE100	Why this is important
Interface options	USB, LAN (optional) Wi-Fi (optional)	Modern and common interface capabilities allow quick and ready access to control and program the instrument.
Dimensions	½ 19" 2 HU	A small footprint for the power supply allows placement in tight lab space conditions or university settings as well as high-density manufacturing and rack applications.
Arbitrary function generation	EasyArb	Easily programmable time/voltage or time/current curves.

### Scope of delivery

- ▶ Power cable
- ▶ Quick start guide
- ▶ 3 year warranty

### Recommended options/accessories

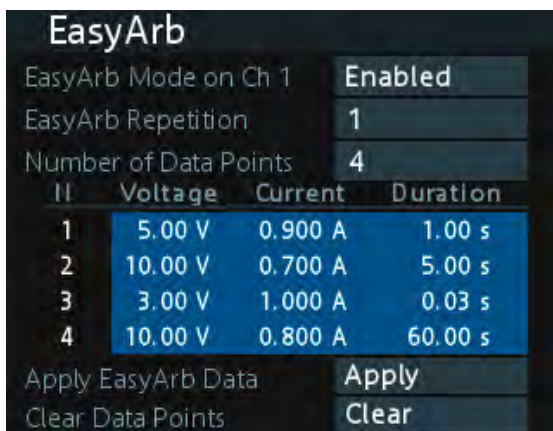
Description	Type
<b>Base unit</b>	
Two-channel power supply	R&S®NGE102B
Three-channel power supply	R&S®NGE103B
<b>Software options</b>	
Ethernet remote control	R&S®NGE-K101
Digital I/O trigger	R&S®NGE-K103
<b>System components</b>	
19" rack adapter, 2 HU	R&S®HZC95



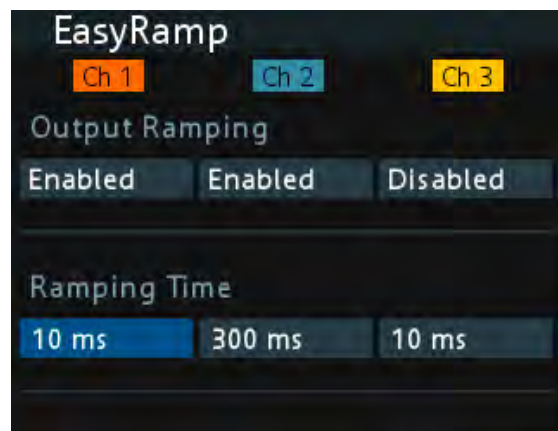
The perfect choice for:	
Education	R&D
Maintenance and repair	Manufacturing test

Your benefit	Features
Straightforward operation	All basic functions can be operated via direct keys on the front panel. The rotary knob can be used to adjust the desired voltage and current
The separate output channels can work like individual power supplies	All channels are electrically equivalent, galvanically isolated, earth-free and can be combined in serial or in parallel to achieve higher voltages or currents
Small, compact and quiet	Combination of primary transformer, secondary switching regulator and additional linear control reduces weight and size while maintaining robustness and low ripple

Power supplies



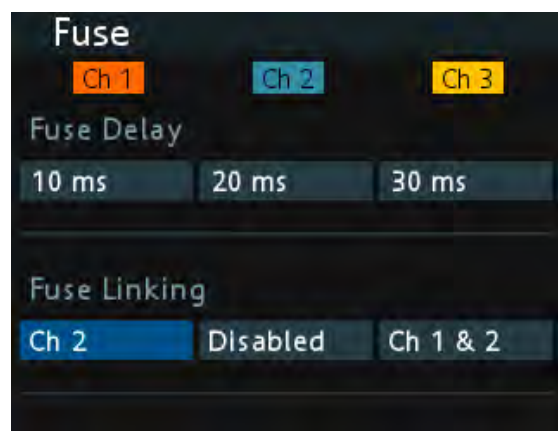
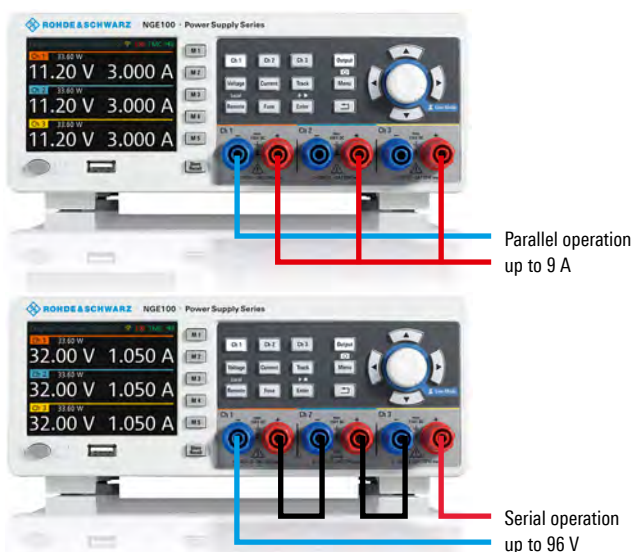
Comfort features for special applications: EasyArb allows the user to program time/voltage or time/current sequences



Comfort features for special applications: EasyRamp simulates operating conditions with controlled rise of supply voltage to prevent a sudden voltage surge

### Parallel and serial operation

Running in parallel, higher currents can be achieved; serial connected channels yield higher voltages.



Users can set the power supply so that all channels are switched off if one channel hits the limit; or it can be set to leave one channel working

## R&S®NGA100 Power Supply Series



### Linear. Accurate. Affordable.

The R&S®NGA100 power supplies are linear, compact and easy to use. All models have excellent readback accuracy with a low-current range for demanding measurements.

Features such as data logging, arbitrary waveforms, built-in statistics and remote sensing make the instruments ideal for various bench applications. Equipped with a number of different remote interfaces, including USB and Ethernet, the R&S®NGA100 power supplies are also great for automated tests. Advanced protective functions keep devices connected and power supplies safe.

### Model overview

Model	Channels	Max. output power	Max. voltage	Max. current	Ripple and noise (20 Hz to 20 MHz)	Readback accuracy
R&S®NGA101	1	40 W	35 V	6 A	< 0.5 mV (RMS), < 500 µA (RMS)	< 0.02% + 5 mV, < 0.03% + 500 µA
R&S®NGA102	2	80 W	70 V (serial)	12 A (parallel)	< 1.5 mV (RMS), < 500 µA (RMS)	< 0.02% + 10 mV, < 0.03% + 500 µA
R&S®NGA141	1	40 W	100 V	2 A	< 0.5 mV (RMS), < 500 µA (RMS)	< 0.02% + 5 mV, < 0.03% + 500 µA
R&S®NGA142	2	80 W	200 V (serial)	4 A (parallel)	< 1.5 mV (RMS), < 500 µA (RMS)	< 0.02% + 10 mV, < 0.03% + 500 µA

### Important facts

Specification	R&S®NGA100	Why this is important
Readback accuracy	<ul style="list-style-type: none"> <li>voltage                             <ul style="list-style-type: none"> <li>- R&amp;S®NGA101, R&amp;S®NGA102: &lt; 0.02% + 5 mV</li> <li>- R&amp;S®NGA141, R&amp;S®NGA142: &lt; 0.02% + 10 mV</li> </ul> </li> <li>current: &lt; 0.03% + 500 µA</li> </ul>	The R&S®NGA100 can accurately measure and replicate the actual power consumption for a device, even at low voltage and current levels. This simplifies the setup by reducing the need for external multimeters.
Ripple and noise (20 Hz to 20 MHz)	<ul style="list-style-type: none"> <li>voltage                             <ul style="list-style-type: none"> <li>- R&amp;S®NGA101, R&amp;S®NGA102: &lt; 0.5 mV (RMS)</li> <li>- R&amp;S®NGA141, R&amp;S®NGA142: &lt; 1.5 mV (RMS)</li> </ul> </li> <li>current: &lt; 500 µA (RMS)</li> </ul>	Allows the supply of interference-free voltage to sensitive DUTs with advanced electronic circuitry that is often sensitive to interference on supply lines.
Max. output power	80 W	Increased output power enables the driving of DUTs with greater power consumption.

### Scope of delivery

- ▶ Power cable
- ▶ Quick start guide
- ▶ 3 year warranty

### Recommended options/accessories

Description	Type
<b>Software options</b>	
Digital trigger I/O	R&S®NGA-K103
<b>System components</b>	
19" rack adapter, 2 HU	R&S®HZN96







The perfect choice for:	
R&D	Manufacturing
IoT and low-power designs	General purpose and education

Your benefit	Features
Linear design	The linear design of the output stages allows R&S®NGA100 power supplies to operate with minimal residual ripple and noise for extremely stable output voltage and current.
FlexPower	The R&S®NGA100 power supplies operate with maximum power at various operating points and cover far more applications than single-range power supplies.
Channel fusion	Activate channel fusion in either serial or parallel mode and the device will act like a single-channel version of itself with double voltage or current capabilities.
Low-current measurement range	IoT devices can have multiple sleep modes with very low current consumption. To accurately determine these operating states, R&S®NGA100 power supplies have a low-current measurement range.


Features




EasyRamp




Channel fusion




EasyArb




Remote sensing




Built-in measurements




Data logging




Save/recall device settings



FlexPower



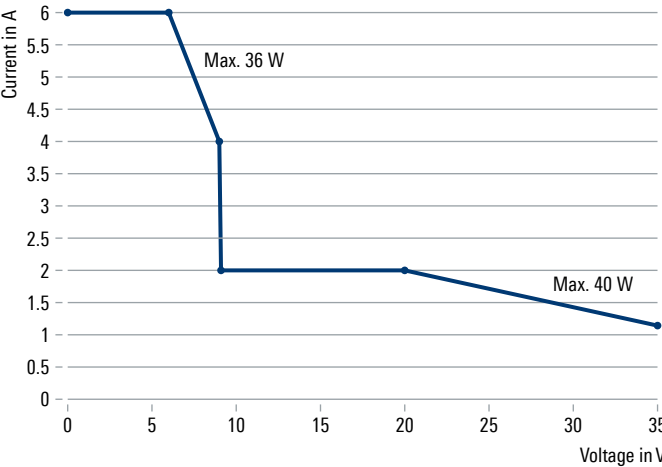
Digital trigger I/O



High accuracy

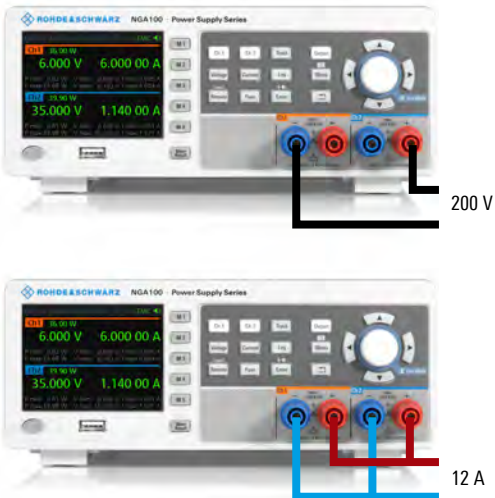
R&S®NGA101/R&S®NGA102 FlexPower curve per output

The R&S®NGA100 series operates with maximum power at various operating points and covers far more applications than single-range power supplies.



Channel fusion

Activate channel fusion in either serial or parallel mode and the device will act like a single-channel version of itself. In serial mode, the outputs are connected internally, while the parallel mode requires external wiring.



## R&S®HMP Power Supply Series



### Up to four channels in a single instrument

The R&S®HMP power supplies are primarily designed for industrial use – for production environments as well as for development labs. These rugged instruments offer high efficiency with low residual ripple and many protection functions.

- ▶ Four models: 2 or 3 channels with 188 W total output power, 3 or 4 channels with 384 W total output power
- ▶ Galvanically isolated, floating outputs with overload and short-circuit protection
- ▶ Remote sensing eliminates voltage drops on the load leads
- ▶ Comfortable programming features and 19" rack adapters ensure perfect integration into production environments

### Model overview

Model	No. of channels	Output voltage per channel	Output current per channel	Total output power	Max. output power per channel	Max. voltage in serial operation	Max. current in parallel operation
R&S®HMP2020	2		channel 1: 0 A to 10 A channel 2: 0 A to 5 A	188 W	channel 1: 160 W channel 2: 80 W	64 V	15 A
R&S®HMP2030	3	0 V to 32 V	0 A to 5 A	188 W	80 W	96 V	15 A
R&S®HMP4030	3		0 A to 10 A	384 W	160 W	96 V	30 A
R&S®HMP4040	4		0 A to 10 A	384 W	160 W	128 V	40 A

### Important facts

Specification	R&S®HMP2020/2030; R&S®HMP4030/4040	Why this is important
Number of output channels	2/3; 3/4	More channels in a compact package provide more flexibility for any specific application, especially with equal channels.
Total output power	max. 188 W; max. 384 W	With more output power, DUTs with more power consumption can be driven.
Max. output power per channel	80 W (R&S®HMP2020: 160 W); 160 W	Same output power on all channels provides more flexible configuration in specific applications.
Max. output voltage	32 V (all channels); 32 V (all channels)	With the same output voltage on each channel, there are no limitations for using channels in different applications.
Max. current per channel	5 A (R&S®HMP2020: 10 A); 10 A	With the same output current on each channel, there are no limitations for using channels in different applications.
Sense function	yes, for each channel	Sense function provides more accurate voltage at the DUT especially when high current is needed.
Dimensions (W × H × D)	285 mm × 95 mm × 405 mm; 285 mm × 136 mm × 405 mm	The size of the instrument determines how much space is left on the workbench for the measurement setup.
Weight	7.8 kg/8.0 kg; 12.4 kg/12.8 kg	If the instrument has to be used in different places, it is better to have a lighter instrument.

### Scope of delivery

- ▶ Quick start guide
- ▶ Set of power cables
- ▶ 3 year warranty

### Recommended options/accessories

Description	Type
<b>Interfaces and system components</b>	
Dual interfaces (RS-232/USB)	R&S®HO720, R&S®HO732
IEEE-488 (GPIB) interface	R&S®HO740
19" rack adapter, 2 HU, for R&S®HMP2020/HMP2030	R&S®HZ42
19" rack adapter, 4 HU, for R&S®HMP4030/HMP4040	R&S®HZIP1



The perfect choice for:	
Engineering lab	Production testing
Maintenance and repair	General purpose

Your benefit	Features
Up to 4 channels in a single compact box	Flexible configuration for any specific application, including sense lines for each channel to compensate voltage drops over the supply leads
Channels galvanically isolated and floating	Serial operation with up to 128 V or parallel operation with up to 40 A
Overcurrent protection (electronic fuse) and overvoltage protection	To safeguard the instrument and the DUT. The fuse link technology switches off all selected channels when one of them reaches its current limit
Easily programmable time/voltage or time/current curves	To vary voltage or current during a test sequence; can be programmed manually via the user interface or via the external interfaces

Power supplies



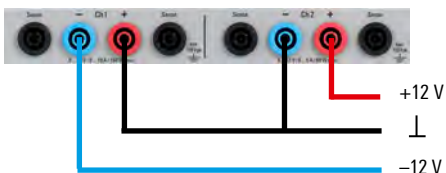
Connections for all channels – including sense lines – are also provided on the rear panel (shown here: R&S®HMP4040)

**All channels galvanically isolated and floating**

The R&S®HMP power supply family consists of instruments with two, three or four channels. The circuitry of each channel is completely isolated from the others; there is no connection to chassis ground. This makes it easy to combine the channels to drive balanced circuitries that might need +12 V/–12 V, for example, and avoids any ground problems in complex DUTs.

**Supplying balanced circuits**

Two channels can be connected together to supply balanced circuits with e.g. +12 V/–12 V.



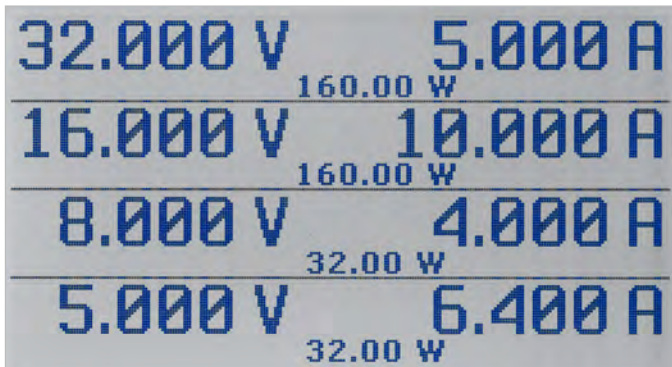
**Intuitive to use**

All basic R&S®HMP power supply functions can be operated directly via keys on the front panel. It is only necessary to use the menu level for special functions that are needed less frequently.

**Color coding of operating states**

All settings and operating conditions, including the output power and the status of the protection functions, are shown on the display and indicated by the colors of the illuminated channel keys. The colors of the illuminated keys indicate the different operating conditions:

- ▶ Active channel in constant voltage mode: green
- ▶ Active channel in constant current mode: red
- ▶ Channel in setting mode: blue



All settings and operating states are clearly visualized. Constant voltage mode is indicated by a green key, constant current mode is indicated by a red key. The key color changes to blue in setting mode.

## R&S®NGL200 Power Supply Series



### What sets these power supplies apart from others?

- ▶ Fast regulation of output voltage with minimum overshoot and very fast load recovery time
- ▶ Minimum residual ripple and noise to supply interference-free voltage to sensitive DUTs
- ▶ Readings with up to 6½ digit resolution are perfect for characterizing devices that have low power consumption in standby mode and high current in full load operation
- ▶ Two quadrants: operates as source or sink

### Model overview

Model	Number of channels	Max. output power	Output power per channel	Output voltage per channel	Output current per channel	Load recovery time	Resolution
R&S®NGL201	1	60 W	max. 60 W	0 V to 20 V	▶ ≤ 6 V: 6 A ▶ > 6 V: 3 A	< 30 µs	1 mV/0.1 mA
R&S®NGL202	2	120 W					

### Important facts

Specification	R&S®NGL200	Why this is important
Large high-resolution touchscreen	TFT 5" 800 × 480 pixels WVGA touch	Easy operation and display of a wide variety of additional information such as power values and statistics.
Various protection and safety functions	OVP, OCP, OPP, OTP, adjustable limits	Protect your DUT and the power supply.
Sense function for lead resistance compensation	▶ R&S®NGL201: front and rear panels ▶ R&S®NGL202: rear panel	Regulate the voltage directly at the load, compensating for voltage drops over the supply leads.
QuickArb	▶ dwell time: 1 ms to 10 s ▶ maximum number of points: 4096	Simulate different battery charging conditions or program very short voltage drops to test the power-up behavior of a DUT.
Remote control via various interfaces	USB, Ethernet, WLAN (optional), IEEE-488 (optional)	Key for integration into test systems and automated operation via scripts.
Fast command processing time	typ. < 6 ms	Complex measurement sequences require ever faster setting, measuring and command processing times.

### Scope of delivery

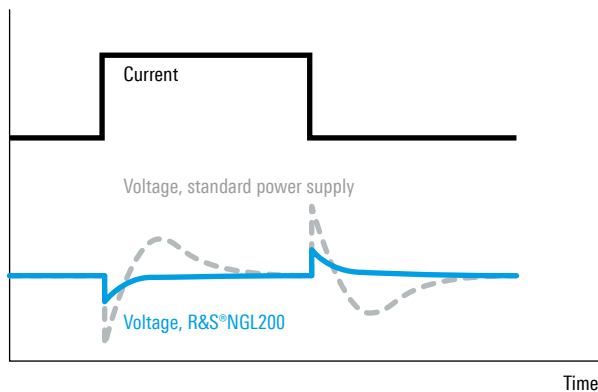
- ▶ Power cord
- ▶ Quick start guide
- ▶ 3 year warranty

### Recommended options/accessories

Description	Type
IEEE-488 (GPIB) interface	R&S®NGL-B105
Wireless LAN remote control	R&S®NGL-K102
Digital I/O trigger	R&S®NGE-K103
19" rack adapter, 2 HU	R&S®HZN96

### Optimized load recovery time

Power supplies usually respond to abrupt load changes with overshoot and slow recovery times. Thanks to specially optimized control circuits, the R&S®NGL200 series achieves recovery times of < 30 µs with minimal overshoot, making them perfect for supplying sensitive components.



The perfect choice for:	
Battery tests	Power consumption tests
Simulation of voltage drops	Supplying sensitive designs

### Overvoltage protection (OVP), overpower protection (OPP)

If the voltage/power exceeds the configured maximum value, the channel is switched off and the corresponding symbol flashes on the display.

### Overcurrent protection (electronic fuse, OCP)

The channels of R&S®NGL200 power supplies provide electronic fuses that can be set individually. If the channel current exceeds the set current, the channel is automatically switched off and a message is displayed.

### QuickArb function

The Arb function lets you configure time/voltage or time/current sequences. With up to 4096 points and a dwell time resolution of up to 1 ms, the QuickArb function sets new standards.

### Easy Ramp function

The output voltage can be increased continuously within a time frame of 10 ms to 10 s to avoid an abrupt rise of the supply voltage as is sometimes required by sensitive applications.

Your benefit	Features
Optimized load recovery time with minimal overshoot	Due to the optimized load recovery time of < 30 μs with minimal overshoot during challenging load conditions, the R&S®NGL200 is perfect when testing IoT and other battery-powered devices which require very little current in sleep mode and abruptly increase current when switching to transmit mode.
Low ripple and noise	To supply interference-free voltage to sensitive designs such as complex semiconductors and to support the development of power amplifiers and MMICs.
Sink and source operation	The linear two-quadrant output amplifier design of the R&S®NGL200 enables sink and source operation to simulate batteries and loads.
6½ digit resolution	With up to 6½ digit resolution when measuring voltage, current and power, the R&S®NGL200 is optimal for characterization of devices with low standby power consumption and high current in full load operation. It can replace an additional DMM in many applications.



Easy operation: The high-resolution capacitive touchscreen is the central operating element for R&S®NGL200 power supplies. Icons clearly show the status of the set protection levels or special functions. Active channels in constant voltage mode light up green, while red is used for constant current mode. When the channels are switched on, the key lights up blue (active).



Readings with up to 6½ digit resolution: With a resolution of up to 6½ digits when measuring voltage, current and power, the R&S®NGL200 power supplies are perfect for measurements on devices that have low power consumption in standby mode and high current in full load operation. The large high-resolution display provides a lot of additional information such as power values and statistics.



Two-quadrant operation, minimum ripple and noise: The architecture of the R&S®NGL200 power supplies allows them to function both as a source and a sink. The power automatically switches from sink and source mode. In this example, channel 2 is operating as a load. The linear design of the output stages reduces residual ripple and noise to a minimum and makes the R&S®NGL200 the perfect tool to support the development of power amplifiers and MMICs.

## R&S®NGM200 Power Supply Series



### High-speed accuracy

What sets these power supplies apart from others in their class?

- ▶ All channels are galvanically isolated and earth-free
- ▶ All channels are electrically equivalent with the same voltage, current and power
- ▶ Parallel and serial operation
- ▶ Protection functions to safeguard instrument and DUT
- ▶ Tracking and link functions
- ▶ Remote control via USB interface and optional LAN or wireless LAN, unique in this class

### Model overview

Model	Channel count	Max. output power	Output power per channel	Output voltage per channel	Output current per channel	Load recovery time	Max. readback resolution
R&S®NGM201	1	60 W	max. 60 W	0 V to 20 V	≤ 6 V: 6 A; > 6 V: 3 A	< 30 μs	1 μV/10 nA
R&S®NGM202	2	120 W	3 × 3 A				

### Important facts

Specification	R&S®NGM200	Why this is important
Number of channels	1/2	More channels provide more flexibility for any specific application.
Max. output power per channel	60 W	With more output power, DUTs with more power consumption can be driven.
Voltage ripple and noise (20 Hz to 20 MHz)	< 500 μV (RMS), < 2 mV (peak-to-peak)	Allows the instrument to supply interference-free voltage to sensitive DUTs with advanced electronic circuitry that is often sensitive to interference on the supply lines.
Load recovery time (20 mV)	< 30 μs	Important to supply DUTs when switching from low power consumption in standby mode to high current in full load operation without creating voltage drops or overshoots.
Max. measurement speed	500 000 sample/s (2 μs)	High-speed acquisition, allows detection of spikes in the microsecond range that cannot be detected with slower instruments.
Protection functions	OCP/OVP/OPP/OTP	These functions safeguard the instrument and the device under test from damage.

### Scope of delivery

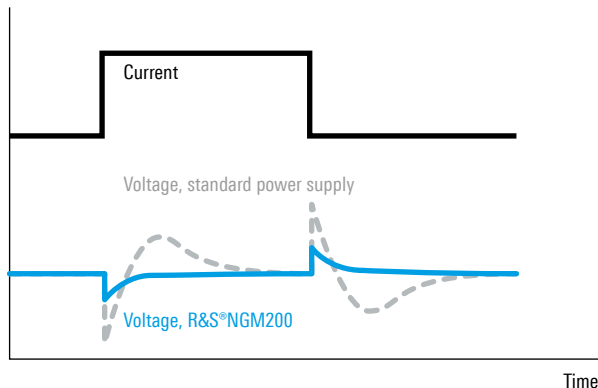
- ▶ Power cable
- ▶ Quick start guide
- ▶ 3 year warranty

### Recommended options/accessories

Description	Type
<b>Hardware option</b>	
IEEE-488 (GPIB) interface	R&S®NGM-B105
<b>Software options</b>	
Digital I/O trigger	R&S®NGM-K103
Digital voltmeter functionality	R&S®NGM-K104
Battery simulation	R&S®NGM-K106
<b>System components</b>	
19" rack adapter, 2 HU	R&S®HZN96

### Optimized load recovery time

Under challenging load conditions, most power supplies respond with slow recovery times and overshoots. Specially developed circuits in the R&S®NGM200 power supplies achieve a load recovery time of < 30 μs with minimal overshoot, making them perfect for supplying sensitive components.



The perfect choice for:	
Battery tests	Power consumption tests
Simulation of voltage drops	Supplying sensitive designs

Your benefit	Features
Minimal overshoot from abrupt load changes	<ul style="list-style-type: none"> <li>▶ Optimized load recovery time &lt; 30 μs</li> <li>▶ Handles abrupt load changes from a few μA to the ampere range without creating voltage drops or overshoots</li> </ul>
Supply interference-free voltage to sensitive designs	<p>Low ripple and noise values allow you to supply interference-free voltage to sensitive designs such as complex semiconductors and to support the development of power amplifiers and MMICs</p> <ul style="list-style-type: none"> <li>▶ Acquisition rate: up to 500 ksample/s</li> <li>▶ Voltage and current results available every 2 μs</li> <li>▶ On the two-channel R&amp;S®NGM202, data acquisition on both channels in parallel</li> </ul>
Capture fast variations in voltage/current	<ul style="list-style-type: none"> <li>▶ Simulate the actual battery output performance</li> <li>▶ Testing can be based on a selected battery model</li> <li>▶ Battery capacity, state of charge (SoC) and open circuit voltage (Voc) can be set to any state to test the device under specific circumstances</li> </ul>
Realistic battery simulation	



Readings with up to 6 ½ digit resolution: With a resolution of up to 6 ½ digits when measuring voltage, current and power, the R&S®NGM200 power supplies are perfect for characterizing devices that have low power consumption in standby mode and high current in full load operation. Two voltage measurement ranges and four current measurement ranges provide high accuracy and resolutions down to 1 μV/10 nA.

The high-resolution display provides additional information such as power values and statistics.



Two-quadrant operation, minimum ripple and noise: The architecture of the R&S®NGM200 power supplies allows them to function both as a source and a sink. The instruments automatically switch between sink and source operation. In this example, channel 2 works as a load. The linear design of the output stages reduces residual ripple and noise to a minimum and makes them perfect for the development of power amplifiers and MMICs.



Battery simulation: When battery-operated devices have to be optimized for lifecycle, the discharging behavior of the battery type needs to be considered. The battery simulator function makes it possible to simulate the real battery output performance. Testing can be based on a selected battery model, and battery capacity, SoC and Voc can be set to any state to test the device under specific circumstances. The charging behavior of a battery can also be simulated, for example when designing battery chargers. In this application, the R&S®NGM200 is used in sink mode.



Easy operation: The high-resolution capacitive touchscreen is the central operating element for the R&S®NGM200 power supplies. Icons clearly show the status of set protection levels or special functions. When the power supply is in constant voltage mode, the numbers and the keys light up green. Red is used for constant current mode. The Output button lights up blue to indicate that channels are switched on (active).

## R&S®NGP800 Power Supply Series



### Boost your efficiency with quad-core power

The R&S®NGP800 DC power supply series, comprising five models with 400 W or 800 W, provides maximum power at a variety of operating points. The two or four 200 W outputs can each supply up to 64 V or up to 20 A. Electrically equivalent and galvanically isolated outputs can be wired in series or parallel for up to 250 V or 80 A.

All R&S®NGP800 power supplies include remote sense terminals, USB and a LAN interface. A user-installable GPIB interface, a digital trigger I/O, an analog input and a wireless LAN interface are optional, making these instruments great on the bench in automated test systems.

### Model overview

Model	Channel count	Total output power	Readback resolution	Voltage per channel	Output current per channel	Output power per channel
R&S®NGP802	2	400 W	▶ voltage: 1 mV ▶ current: 0.5 mA	0 V to 32 V	20 A	200 W
R&S®NGP804	2	400 W		0 V to 32 V	20 A	200 W
R&S®NGP814	4	800 W		▶ CH1, CH2: 0 V to 32 V ▶ CH3, CH4: 0 V to 64 V	▶ CH1, CH2: 20 A ▶ CH3, CH4: 10 A	200 W
R&S®NGP822	2	400 W		0 V to 64 V	10 A	200 W
R&S®NGP824	4	800 W		0 V to 64 V	10 A	200 W

### Important facts

Specification	R&S®NGP800	Why this is important
Max. output power	400 W/800 W	For power hungry devices.
Number of outputs	2/4	Powers up to 4 DUTs simultaneously.
Max. voltage per output	32 V/64 V	Covers 48 V applications.
Max. current per output	20 A/10 A	Meets high current consumption requirements.
Max. power per output	200 W	Gets the full 200 W on each output (no shared total power among channels).
Programming resolution	1 mV/0.5 mA	Accurately sets your supply voltage and current.
Readback resolution	1 mV/0.5 mA	Replaces a DMM in many applications.
Acquisition rate	125 sample/s	Great for in-depth post analysis.
Display	5" 800 × 480 pixel touch	Enter values much faster with intuitive touch display.

### Scope of delivery

- ▶ Power cable
- ▶ Terminal blocks
- ▶ Quick start guide
- ▶ 3 year warranty

### Recommended options/accessories

Description	Type
<b>Hardware option</b>	
IEEE-488 (GPIB) interface	R&S®NG-B105
<b>Software options</b>	
Digital I/O trigger	R&S®NGP-K103
Analog input	R&S®NGP-K107
<b>System components</b>	
19" rack adapter, 2 HU	R&S®ZZA-GE23





The perfect choice for:	
R&D	Manufacturing
Automotive	General purpose

Your benefit	Features
Power four DUTs simultaneously	<ul style="list-style-type: none"> <li>▶ Up to four independent, floating outputs</li> <li>▶ All outputs galvanically isolated</li> <li>▶ Space, cost and time efficient</li> </ul>
Maximum power at various operating points	<ul style="list-style-type: none"> <li>▶ FlexPower</li> <li>▶ Up to 80 A when connected in parallel</li> <li>▶ Up to 250 V when connected in series</li> </ul>
All you need at a glance	<ul style="list-style-type: none"> <li>▶ Large high-resolution touchscreen</li> <li>▶ Built-in measurements</li> <li>▶ Detailed statistics</li> </ul>

Power supplies

### More functions



EasyRamp



Output delay



QuickArb



Remote sensing



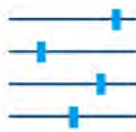
Built-in measurements



Data logging



Save/recall device settings



User adjustment



Digital trigger I/O



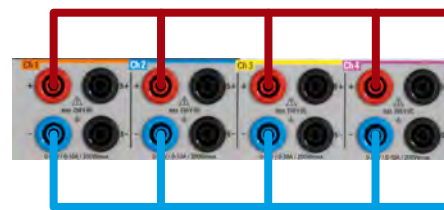
Analog input



Large high-resolution touchscreen: The home screen gives you a clear overview of all your channels. Each channel can be selected for a more detailed view with a wide variety of additional information such as statistics and icons indicating the status of set protection levels or special functions.

### Parallel and serial operation

In case your application requires more voltage or current, connect the outputs in series or parallel and get up to 250 V (R&S®NGP824) or 80 A (R&S®NGP804). Using the tracking function, voltage and current are adjusted on all selected channels simultaneously.



Parallel operation:  
max. 80 A



Serial operation:  
max. 250 V

## R&S®NGU Source Measure Units



### What sets this source measure unit apart?

- ▶ Two or four quadrants: source or sink operation with arbitrary polarity
- ▶ Minimum residual ripple and noise for interference-free voltage to sensitive DUTs
- ▶ Fast regulation of output voltage with minimum overshoot and very fast load recovery time
- ▶ Acquisition rate of up to 500 ksample/s to capture extremely fast voltage or current variations
- ▶ Voltage priority and current priority modes
- ▶ High-capacitance mode
- ▶ Modulation input (R&S®NGU401)

### Model overview

Model	Output voltage	Max. output/sink power	Max. output/sink current	Load recovery time	Max. acquisition rate	Ripple and noise
R&S®NGU201	0 V to 20 V	60 W	≤ 6 V: 8 A;	< 30 μs	500 ksample/s	< 500 μV (RMS); < 1 mA (RMS) (meas.)
R&S®NGU401	-20 V to +20 V		> 6 V: 3 A			

### Important facts

Specification	R&S®NGU	Why this is important
Quadrants	2/4	The source measure unit can function both as a source and a sink and simulate batteries or loads with two-quadrant architecture. Four-quadrant architecture units can source and sink in both polarities. This enables measuring the forward and reverse characteristics of semiconductor devices in a single test operation without changing the circuit.
Voltage ripple and noise (20 Hz to 20 MHz)	< 500 μV (RMS), < 2 mV (peak-to-peak)	The instrument can supply interference-free voltage to sensitive DUTs with advanced electronic circuitry which are often sensitive to interference on the supply lines.
Load recovery time (20 mV)	< 30 μs	Important for supplying DUTs when switching from low power consumption in standby to high current in full load operation without creating voltage drops or overshoots.
Max. measurement speed	500 000 sample/s (2 μs)	High-speed acquisition allows detection of spikes in the micro-second range that cannot be detected with slower instruments.
Protection functions	OCP/OVP/OPP/OTP	These functions safeguard the instrument and the device under test.

### Scope of delivery

- ▶ Power cable
- ▶ Quick start guide
- ▶ 3 year warranty

### Recommended options/accessories

Description	Type
<b>Options</b>	
Digital trigger I/O	R&S®NGU-K103
Digital voltmeter function	R&S®NGU-K104
IEEE-488 (GPIB) interface	R&S®NGU-B105
Battery simulation	R&S®NGU-K106
<b>System components</b>	
19" rack adapter, 2 HU	R&S®HZN96



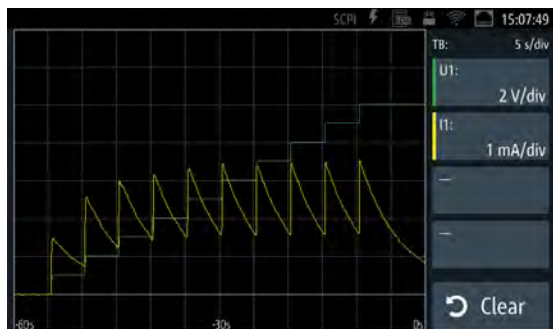
<b>The perfect choice for:</b>	
High-precision source and sink measurements	Material and component tests
Supplying bipolar voltages	Simulation of voltage drops
Battery tests	Power consumption tests

Your benefit	Features
Minimal overshoot from abrupt load changes	<ul style="list-style-type: none"> <li>▶ Optimized load recovery time of &lt; 30 μs</li> <li>▶ Handles abrupt load changes from a few nA to the ampere range without creating voltage drops or overshoots</li> </ul>
Analyze fast variations in voltage/current	<ul style="list-style-type: none"> <li>▶ Acquisition rate of up to 500 ksamples/s</li> <li>▶ Voltage and current results available every 2 μs</li> </ul>
Supply positive and negative voltages and currents	<ul style="list-style-type: none"> <li>▶ Four-quadrant operation allows the R&amp;S®NGU401 to act as a source or sink in both polarities</li> <li>▶ Enables tasks such as measuring the forward and reverse characteristics of semiconductor devices in a single test operation without changes to the circuit</li> </ul>
Can act as an AC source	<ul style="list-style-type: none"> <li>▶ The R&amp;S®NGU401 source measure unit provides a modulation input to connect an arbitrary generator. The output follows the modulation input signal, the instrument acts as an AC source and simulates glitches and unstable conditions</li> </ul>

Power supplies



Two quadrants: operates as source and sink: The two-quadrant architecture of this source measure unit can function both as a source and a sink and simulate batteries and loads. The source measure unit automatically switches from source mode to sink mode. As soon as the externally applied voltage exceeds the set nominal voltage, current flows into the instrument, as indicated by a negative current reading. The linear design of the output stages reduces residual ripple and noise to a minimum.



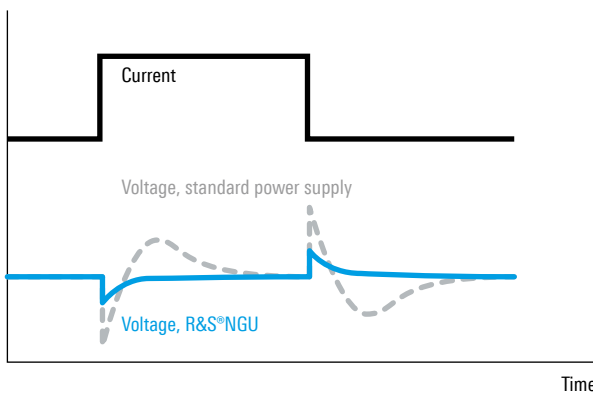
High-resolution graphical display of data: Here, the charging current of a capacitor is displayed while the voltage is increased stepwise. Up to four measurement functions can be selected and plotted against time, while minimum and maximum values can also be marked.



Four quadrants: source or sink operation with arbitrary polarity: The R&S®NGU401 can supply positive and negative voltages and currents with its four-quadrant architecture and can act as a source or sink in both polarities.

### Optimized load recovery time

Under challenging load conditions, most power supplies respond with slow recovery times and overshoots. Specially developed circuits in the R&S®NGU source measure units achieve a load recovery time of < 30 μs with minimal overshoot, making them perfect for supplying sensitive components.



**Rohde & Schwarz representative**



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