

**ROHDE & SCHWARZ**

Make ideas real



# POWER SUPPLIES. VERSATILE AND COMPACT.

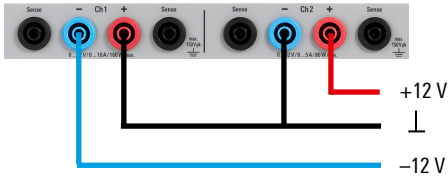


# UNIQUE FEATURES FOR BETTER RESULTS

## Galvanically isolated, floating channels

The Rohde&Schwarz power supply family consists of instruments with up to four channels. The circuitry of each individual channel is completely isolated from the others; there is no connection to the chassis ground. This makes it easy to combine the channels to drive bipolar 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.



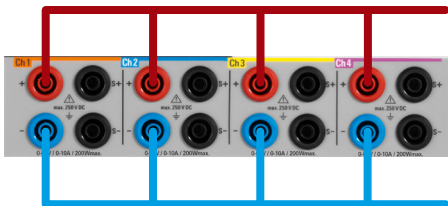
## Channels have the same voltage range

Most of the Rohde&Schwarz power supplies offer the same voltage range on all channels. You can select any channel for a specific application. Each channel can be regarded as a separate power supply.

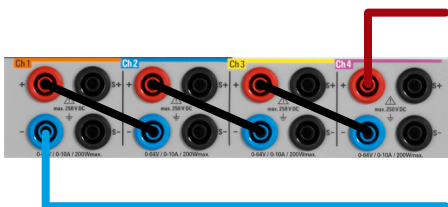
## Parallel and serial operation

Because channels are electrically equivalent, they can be combined in serial mode to achieve higher voltages. Up to 250 V can be achieved with the R&S®NGP824, for instance. In parallel mode, the channels can be bundled for higher current. As an example, up to 80 A can be achieved when all four channels of the R&S®NGP804 are combined.

The output channels can be configured in parallel to achieve higher output current, or in series for higher output voltage (example: R&S®NGP800).



Parallel operation – max. 80 A



Serial operation – max. 250 V

## Constant voltage and constant current modes

Configuring and regulating the output voltage (constant voltage mode) is the standard application for power supplies. However, all Rohde&Schwarz power supplies can also be used in constant current mode, with each channel separately configurable. If the configured current level is exceeded, current limiting ensures that only the configured current can flow. The output voltage is accordingly reduced below the configured value. This prevents damage to the test circuit in the event of a fault.

## Protection functions to safeguard instrument and DUT

Since even the most experienced user is occasionally distracted, the outputs are protected against overloading and short circuits so that the power supply will not be damaged.

Rohde&Schwarz power supplies provide multipurpose protection functions. Depending on the model, users can separately configure the following for each channel:

- ▶ Maximum current (electronic fuse, overcurrent protection, OCP)
- ▶ Maximum voltage (overvoltage protection, OVP)
- ▶ Maximum power (overpower protection, OPP)

If such a limit is reached, the affected output channel will be automatically switched off and a message will be displayed.

Even the delay time of the electronic fuses can be set. With this functionality, you can adjust the behavior of the power supply so that short current spikes do not trip the electronic fuse.

Of course the Rohde&Schwarz power supplies have internal overtemperature protection that switches the channel off if there is an imminent risk of thermal overload.

## Tracking and link functions

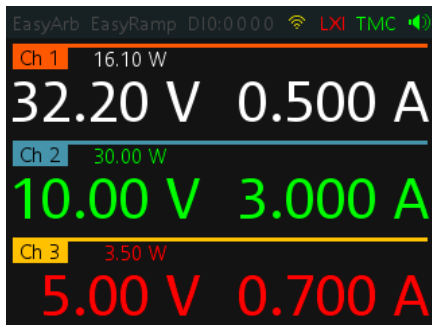
When using the instrument to supply bipolar circuits, for example, the convenient tracking function lets you vary the voltage on all channels in parallel.

The overcurrent protection can be linked to other channels (FuseLink function). It can be configured to switch off all channels when one of the channels reaches its limit value. It can also be configured so that certain channels remain active, for example to power the fan that cools the DUT.

### Color coding of operating states

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

- ▶ Active channel in constant voltage mode: green
- ▶ Active channel in constant current mode: red
- ▶ Active channel in constant resistance mode: cyan
- ▶ Inactive channel: white



The different operating conditions are indicated by colors (example: R&S®NGE103B).

### Tailored for use in labs and system racks

Rohde&Schwarz power supplies cover a wide range of applications – when used on the lab bench and when integrated into a production test system.

Remote control functions and rack adapters are essential in system applications. Rear panel connectors and, above all, the compact design are key factors for use in test systems.

The Rohde&Schwarz power supplies fulfill all these requirements – in particular the R&S®NGP800 series, which uniquely combines four electronically equivalent high-performance channels in a compact package.

### Remote sensing for more stringent accuracy requirements

There is often a significant voltage drop over the connection leads, especially in applications with high current consumption. Since power supplies usually maintain a constant output voltage, the voltage on the DUT will be lower than the voltage displayed on the instrument. Remote sensing compensates for this voltage drop over the supply leads. The voltage actually present at the load is measured by an additional pair of sense lines, and this value is used to regulate the voltage directly at the load. Depending on the model, the Rohde&Schwarz power supplies provide remote sensing for each output channel.

### Two quadrants: operates as source and sink

The specialty power supplies offer two-quadrant architecture. This feature allows them to function both as a source and a sink and simulate batteries or loads. The power supply automatically switches from supply mode to load mode. As soon as the externally applied voltage exceeds the set nominal voltage, current flows into the power supply. This is indicated by a negative current reading.

### Four quadrants: source or sink operation with arbitrary polarity

The four-quadrant architecture of the R&S®NGU401 allows it to supply positive or negative voltages or currents and can act as a source or sink in both polarities. This enables tasks such as measuring the forward and reverse characteristics of semiconductor devices in a single test operation without having to make changes to the circuit.

### Fast load regulation

Consumer electronics such as mobile phones and IoT devices require very little power in sleep mode. However, the current increases abruptly as soon as the device switches to transmit mode. A power supply used to power such DUTs must be capable of handling load changes from a few nA to the ampere range without creating voltage drops or overshoots.

The R&S®NGL/NGM/NGU power supplies have a circuit design that achieves recovery times of < 30  $\mu$ s.

### Minimum residual ripple and low noise

Advanced electronic circuitry is often very complex and sensitive to interference on the supply lines. In order to supply interference-free voltage to such sensitive DUTs, the power supplies must provide extremely stable output voltages and currents. All types of ripple and noise need to be avoided. The R&S®NGA/NGL/NGM/NGU power supplies have linear regulation and are ideal for sensitive DUTs.



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

# POWER SUPPLY PORTFOLIO



	Basic R&S® NGE102B/103B	HMC8041/8042/8043	NGA101/102/141/142
<b>Electrical specifications</b>			
Number of output channels	2/3	1/2/3	1/2
Maximum output power	66 W/100 W	100 W	40 W/80 W/40 W/80 W
Maximum output power per channel	33.6 W	100 W/50 W/33 W	40 W
Output voltage per channel	0 V to 32 V	0 V to 32 V	R&S®NGA101/102: 0 V to 35 V R&S®NGA141/142: 0 V to 100 V
Maximum output current per channel	3 A	10 A/5 A/3 A	R&S®NGA101/102: 6 A R&S®NGA141/142: 2 A
Voltage ripple and noise (20 Hz to 20 MHz)	< 1.5 mV (RMS) (typ.)	R&S®HMC8041: < 1 mV (RMS); R&S®HMC8042/43: < 450 µV (RMS)	R&S®NGA101/102: < 0.5 mV (RMS) R&S®NGA141/142: < 1.5 mV (RMS)
Current ripple and noise (20 Hz to 20 MHz)	< 2 mA (RMS) (meas.)	R&S®HMC8041: < 1.5 mA (RMS) (meas.); R&S®HMC8042/43: < 1 mA (RMS) (meas.)	< 500 µA (RMS) (meas.)
Load recovery time <sup>1)</sup>	< 200 µs (meas.)	< 1 ms (meas.)	R&S®NGA101/102: < 100 µs (meas.) R&S®NGA141/142: < 50 µs (meas.)
Programming/readback resolution			
Voltage	10 mV	1 mV	1 mV
Current	1 mA	< 1 A: 0.1 mA (R&S®HMC8041: 0.5 mA); ≥ 1 A: 1 mA	programming: 1 mA readback: 0.1 mA
Readback accuracy (± (% of output + offset))			
Voltage	< 0.1% + 20 mV	< 0.05% + 2 mV	R&S®NGA101/102: 0.02% + 5 mV R&S®NGA141/142: 0.02% + 10 mV
Current	< 0.1% + 5 mA	R&S®HMC8041: < 0.15% + 10 mA; R&S®HMC8042: < 0.05% + 4 mA; R&S®HMC8043: < 0.05% + 2 mA	< 0.03% + 500 µA
<b>Special functions</b>			
Measurement functions	voltage, current, power	voltage, current, power, energy	voltage, current, power
Protection functions	OVP, OCP, OPP, OTP	OVP, OCP, OPP, OTP	OVP, OCP, OPP, OTP
FuseLink function	●	● (R&S®HMC8042/8043)	● (R&S®NGA102/142)
Fuse delay	●	●	●
Remote sensing	–	●	●
Sink mode	–	–	–
Output delay	–	● (R&S®HMC8042/8043)	–
Trigger input/output	o/o	●/–	o/o
Arbitrary function	● (CH1: EasyArb)	● (EasyArb)	● (CH1: EasyArb)
Analog/modulation interface	–	●/–	–
Data logging	–	● (standard mode)	● (standard mode)
<b>Display and interfaces</b>			
Display	3.5" QVGA	3.5" QVGA	3.5"/QVGA
Rear panel connections	–	16-pin connector block	8-pin connector block
Remote control interfaces	standard: USB; optional: LAN, WLAN	standard: USB, LAN; R&S®HMC804x-G models with IEEE-488 (GPIB)	standard: USB, LAN optional: WLAN
<b>General data</b>			
Dimensions (W × H × D)	222 × 97 × 310 mm	222 × 97 × 291 mm	222 × 97 × 448 mm
Weight	4.9 kg/5.0 kg	2.6 kg	6.6 kg/7.0 kg/6.9 kg/7.3 kg
Rack adapter	R&S®HZC95 option	R&S®HZC95 option	R&S®HZN96 option

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

● yes    – no    o 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.



Performance HMP2020/2030	HMP4030/4040	NGP802/822/804/814/824
2/3	3/4	2/4
188 W	384 W	400 W/800 W
80 W, except R&S®HMP2020, CH1: 160 W	160 W	200 W
0 V to 32 V	0 V to 32 V	0 V to 32 V (32 V channels); 0 V to 64 V (64 V channels)
5 A, except R&S®HMP2020, CH1: 10 A	10 A	20 A (32 V channels); 10 A (64 V channels)
< 1.5 mV (RMS) (meas.)	< 1.5 mV (RMS) (meas.)	< 3 mV (RMS)
< 1 mA (RMS) (meas.)	< 1 mA (RMS) (meas.)	< 3.5 mA (RMS) (meas.)
< 1 ms (meas.)	< 1 ms (meas.)	< 400 µs (meas.)
1 mV < 1 A: 0.1 mA (10 A CH: 0.2 mA); ≥ 1 A: 1 mA	1 mV < 1 A: 0.2 mA; ≥ 1 A: 1 mA	1 mV 0.5 mA
< 0.05% + 5 mV	< 0.05% + 5 mV	< 0.05% + 5 mV (32 V channels); < 0.05% + 10 mV (64 V channels)
< 0.1% + 2 mA	< 0.1% + 2 mA	< 0.1% + 20 mA (32 V channels); < 0.1% + 10 mA (64 V channels)
voltage, current OVP, OCP, OTP	voltage, current OVP, OCP, OTP	voltage, current, power, energy OVP, OCP, OPP, OTP
•	•	•
•	•	•
•	•	•
–	–	–
–	–	•
–	–	o/o
• (EasyArb)	• (EasyArb)	• (QuickArb)
–	–	o/–
–	–	• (standard mode)
240 × 64 pixel LCD 4-pin connector block per channel	240 × 128 pixel LCD 8-pin connector block per 2 channels	TFT 5" 800 × 480 pixel WVGA touch 8-pin connector block per 2 channels
standard: USB, LAN; optional: IEEE-488 (GPIB), RS-232	standard: USB, LAN; optional: IEEE-488 (GPIB), RS-232	standard: USB, LAN; optional: WLAN, IEEE-488 (GPIB)
285 × 93 × 405 mm 7.8 kg/8.0 kg R&S®HZ42 option	285 × 136 × 405 mm 12.4 kg/12.8 kg R&S®HZIP91 option	362 × 100 × 451 mm 7.5 kg/8.0 kg R&S®ZZA-GE23 option



Specialty NGL201/NGL202	NGM201/202	NGU201/401
1/2	1/2	1
60 W/120 W	60 W/120 W	60 W
60 W	60 W	60 W
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
≤ 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
< 500 μV (RMS)	< 500 μV (RMS)	< 500 μV (RMS)
< 1 mA (RMS) (meas.)	< 1 mA (RMS) (meas.)	< 1 mA (RMS) (meas.)
< 30 μs (meas.)	< 30 μs (meas.)	< 30 μs (meas.)
1 mV/10 μV	1 mV/5 μV <sup>2)</sup>	50 μV/1 μV <sup>3)</sup>
0.1 mA/10 μA	0.1 mA/10 nA <sup>3)</sup>	100 nA/100 pA <sup>3)</sup>
< 0.02% + 2 mV	< 0.02% + 500 μV <sup>3)</sup>	< 0.02% + 500 μV <sup>3)</sup>
< 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 ● (R&S®NGL202) ● ● ●	voltage, current, power, energy OVP, OCP, OPP, OTP ● (R&S®NGM202) ● ● ●	voltage, current, power, energy OVP, OCP, OPP, OTP – ● ● ●
● (R&S®NGL202) o/o	● (R&S®NGM202) o/o	– o/o
● (QuickArb) –	● (QuickArb) –	● (QuickArb) R&S®NGU401: modulation interface
● (standard mode)	● (standard and fast mode)	● (standard and fast mode)
TFT 5" 800 × 480 pixel WVGA touch 8-pin connector block per channel	TFT 5" 800 × 480 pixel WVGA touch 8-pin connector block per channel	TFT 5" 800 pixel × 480 pixel WVGA touch 8-pin connector block
standard: USB, LAN; optional: WLAN, IEEE-488 (GPIB)	standard: USB, LAN; optional: WLAN, IEEE-488 (GPIB)	standard: USB, LAN optional: IEEE-488 (GPIB)
222 × 97 × 436 mm 7.1 kg/7.3 kg	222 × 97 × 436 mm 7.2 kg/7.4 kg	222 × 97 × 436 mm 7.1 kg
R&S®HZN96 option	R&S®HZN96 option	R&S®HZN96 option



# DIFFERENT POWER SUPPLY CLASSES



R&S®NGE103B power supply.

## Basic power supplies

- ▶ Economical, quiet and stable instruments
- ▶ For manual operation and simple computer-controlled operation
- ▶ Used in education, on the bench and in system racks



R&S®NPG804 four-channel power supply.

## Performance power supplies

- ▶ When speed, accuracy and advanced programming features are factors in test performance
- ▶ Features such as DUT protection, fast programming times and downloadable V and I sequences
- ▶ Used in labs and ATE applications



R&S®NGU401 four-quadrant source measure unit.

## Specialty power supplies

- ▶ Tailored to specific applications
- ▶ Unique features such as
  - Emulation of the unique characteristics of a battery
  - Electronic loads to accurately sink current and dissipate power in a controlled manner
- ▶ Used in labs and ATE applications

# CONNECTIVITY – EVERYTHING YOU NEED

Rohde&Schwarz power supplies offer a variety of interfaces to remotely control the instruments or to connect external devices. Depending on the model, different types of interfaces are provided.

- ▶ USB: the instrument can be controlled from external PCs. Rohde&Schwarz power supplies support VCP/CDC and some also support TMC
- ▶ LAN (Ethernet): to control the power supplies, a fixed IP address can be used or, alternatively, the DHCP function could be used to allocate dynamic IP addresses. Some instruments support LXI
- ▶ WLAN<sup>1)</sup>: this option allows the instrument to connect to a network without the need for cables
- ▶ IEEE-488: most Rohde&Schwarz power supplies can be equipped with an IEEE-488 (GPIB) interface
- ▶ RS-232: to support existing environments
- ▶ Digital in/out interfaces are provided by a selection of instruments and can be individually used as trigger inputs or outputs
- ▶ Analog/modulation input: fast and direct control of the output voltages and currents using an external control voltage

<sup>1)</sup> The WLAN functionality is not available in all regions due to country-specific regulations.

## Rohde & Schwarz

The Rohde&Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

[www.rohde-schwarz.com](http://www.rohde-schwarz.com)

### Service that adds value

- ▶ Worldwide
- ▶ Local and personalized
- ▶ Customized and flexible
- ▶ Uncompromising quality
- ▶ Long-term dependability

### Rohde & Schwarz training

[www.training.rohde-schwarz.com](http://www.training.rohde-schwarz.com)

### Rohde & Schwarz customer support

[www.rohde-schwarz.com/support](http://www.rohde-schwarz.com/support)

