

# R&S® NGE100

## Power Supply Series

### Reduced to the max



# R&S®NGE100

## Power Supply Series

### At a glance

The R&S®NGE100 power supply series consists of robust, high-performance, affordable instruments. They offer high efficiency combined with low ripple plus a variety of comfort functions that are not usually found in this class of power supplies.

The R&S®NGE100 power supply series consists of the R&S®NGE102 two-channel power supply and the R&S®NGE103 three-channel power supply. Both instruments provide up to 33.6 W output power per channel.

| Model overview             | R&S®NGE102  | R&S®NGE103  |
|----------------------------|-------------|-------------|
| Number of output channels  | 2           | 3           |
| Max. output power          | 66 W        | 100 W       |
| Output power per channel   | max. 33.6 W | max. 33.6 W |
| Output voltage per channel | 0 V to 32 V | 0 V to 32 V |
| Output current per channel | 0 A to 3 A  | 0 A to 3 A  |

Unlike most power supplies in this class, the R&S®NGE100 power supplies feature 100% electrically equivalent output channels. All outputs are earth-free and short-circuit-proof. The output channels can be combined in serial or in parallel to achieve higher voltages or higher currents (up to 96 V/9 A using all three channels of the R&S®NGE103).

All basic functions of the R&S®NGE100 power supplies can be operated via direct keys on the front panel. The rotary knob plays the central role in adjusting the voltage and

current and setting the limits for the multi-purpose protection functions. The operating conditions of all channels are displayed on the screen simultaneously. Active channels are indicated by the illuminated channel key. Active outputs are shown in green when working in constant voltage mode and in red when working in constant current mode. Inactive outputs are displayed in yellow.

To safeguard the instrument and the device under test (DUT), the R&S®NGE100 power supplies provide a variety of protection functions. For each channel, users can separately set the maximum current (electronic fuse, overcurrent protection, OCP), the maximum voltage (overvoltage protection, OVP) or the maximum power (overpower protection, OPP). If such a limit is reached, the affected output channel will be switched off. Overtemperature protection (OTP) prevents overheating of the instrument.

In industrial applications, power supplies are often installed in 19" racks. The R&S®HMC95 rackmount kit allows the power supplies to be mounted in racks, including in combination with R&S®HMC test instruments. The R&S®NGE100 power supplies can be remotely controlled via USB or optionally via Ethernet or even via wireless LAN.

#### Key facts

- R&S®NGE102 with two or R&S®NGE103 with three channels
- Max. output power of 66 W with R&S®NGE102, 100 W with R&S®NGE103 (33.6 W per channel)
- Max. output voltage of 32 V per channel (up to 64 V/96 V in serial operation)
- Max. output current of 3 A per channel (up to 6 A/9 A in parallel operation)
- Electronic fuse (OCP), overvoltage protection (OVP), overpower protection (OPP), overtemperature protection (OTP)
- USB interface (VCP/TMC), optional LAN (LXI), optional wireless LAN
- Optional digital I/O (4bit)



# R&S®NGE100

## Power Supply Series

### Benefits and key features

#### Meets your daily needs

- ▮ All channels are galvanically separated and earth-free
- ▮ All channels are electrically equivalent with the same voltage, current and power
- ▮ Parallel and serial operation through V/I tracking
- ▮ Short-circuit-proof outputs
- ▮ Protection functions to safeguard instrument and DUT
- ▮ Modern architecture; small, compact and quiet
- ▮ Tailored to be used in education, labs and system racks

► [page 4](#)

#### Easy operation

- ▮ Straightforward operation
- ▮ Color-coding of operating conditions
- ▮ Comfort features for special applications
- ▮ Tracking and link functions
- ▮ Five memory keys to save/recall instrument settings

► [page 5](#)

#### Connectivity – everything you need

- ▮ Front connectors with 4 mm screw-type sockets
- ▮ USB interface (virtual COM port and TMC class)
- ▮ LAN interface (LXI) with integrated web server (R&S®NGE-K101 option)
- ▮ Wireless LAN, unique in this class (R&S®NGE-K102 option)
- ▮ Digital trigger in/out (4-bit) on the rear (R&S®NGE-K103 option)

► [page 6](#)

#### Different classes of power supplies



##### Basic power supplies

- ▮ Affordable, quiet and stable instruments
- ▮ For manual and simple computer-controlled operation
- ▮ In applications where speed and accuracy are a low consideration
- ▮ Used in education, on the bench and in system racks

Shown here: [R&S®NGE100 power supply series](#).



##### 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

Shown here: [R&S®HMP2030/HMP4030 programmable three-channel power supplies](#).



##### Specialty power supplies

- ▮ Tailored to specific applications
- ▮ Unique capabilities such as
  - Emulating the unique characteristics of a battery
  - Includes electronic loads to accurately sink current and dissipate power in a controlled manner
- ▮ Used in labs and ATE environments

Shown here: [R&S®HM8143 three-channel arbitrary power supply](#).

# Meets your daily needs

## All channels galvanically separated and earth-free

The R&S®NGE102 and R&S®NGE103 power supplies offer the choice between 2 or 3 channels. The circuitry of each single channel is completely separated 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.

## All channels are electrically equivalent with the same voltage, current and power

In contrast to other power supplies on the market, the R&S®NGE100 power supplies feature electrically identical channels. Offering the same voltage, current and power, there is no limitation in selecting a channel for a specific application. Every single channel can be seen as a separate power supply.

## Parallel and serial operation through V/I tracking

Because all channels are electrically equivalent, they can be combined in serial mode to achieve higher voltages. Up to 96 V can be achieved with the R&S®NGE103, up to 64 V with the R&S®NGE102. In parallel mode, the channels can be bundled for higher current. Up to 6 A can be achieved when combining two channels. Using all three channels of the R&S®NGE103, even 9 A are possible.

## Short-circuit-proof outputs

Whatever might happen when unskilled students gain their first experience in practical work with electronics, all outputs of the R&S®NGE100 power supply series are short-circuit-proof and will therefore not be damaged.

## Protection functions to safeguard instrument and DUT

Multi-purpose protection functions are not standard in power supplies in the basic class. Here again, the R&S®NGE100 power supply series raises the bar. For each channel, users can separately set the:

- 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 (FUSE, OVP or OPP) will be displayed. The overcurrent protection can be linked to other channels (FuseLink function). In this case, all linked channels will be switched off as soon as one of the linked channels reaches a limit.

Even the delay time of the electronic fuses can be set. With this functionality, users can define the behavior of the power supply to prevent too early switch-off due to a short current spike.

Naturally the R&S®NGE100 power supplies come with internal overtemperature protection to switch off the instrument in the case of pending thermal overload.

## Modern architecture, small, compact and quiet

Universal power supplies need to fulfill many demands:

- They have to work reliably even in countries with unstable electricity. The primary transformer in the R&S®NGE100 maintains stable operation due to its low-pass behavior
- Power supplies should be small and compact. The secondary switching regulator makes the R&S®NGE100 work very effectively. It reduces weight and size and requires a lower fan speed, which results in low noise
- Power supplies should provide stable output voltages/ currents with low ripple. This is realized by using linear control circuitry for stabilization

## Tailored to be used in education, labs and system racks

Power supplies in the basic class offer the functionality you need in daily work – and with the R&S®NGE100 power supply series – even a bit more. Students should find all the functions they need for training, but should not be confused by exotic functions. Used in standard applications on the bench, power supplies should be affordable and robust, offering the necessary accuracy and speed. If the instrument is to be installed in a rack, remote control and rack integration are recommended. The R&S®NGE100 power supply series fulfills all these requirements.



Tailored to be used in education, labs and system racks.

# Easy operation

## Straightforward operation

All basic R&S®NGE100 power supply functions can be operated via direct keys on the front panel – no need to maneuver through a jungle of menus. Just press the "Voltage" key, select an output channel and use the rotary knob or the arrow keys to adjust the desired voltage in steps down to 10 mV. A constant output current can be similarly set in steps down to 1 mA.

If channels need to be operated simultaneously, for example to increase the voltage of a device from  $\pm 12$  V to  $\pm 15$  V, press the "Track" key, select the two channels for positive and negative voltage and adjust the two voltages. The rotary knob will adjust the two voltages symmetrically. Activating or deactivating the electronic fuses is just as easy – by simply pressing one key on the front panel.

## Color-coding of operating conditions

All operating conditions are shown clearly on the 3.5" QVGA display (320 × 240 pixel), including the output power and the status of any protective functions. Colors indicate the different operating conditions:

- Active outputs are shown in green when working in constant voltage mode and in red when working in constant current mode
- Inactive outputs are displayed in yellow. Whenever a channel is in the setting mode, the display color changes to blue



The different operating conditions are marked by colors: constant voltage operation is indicated in green, constant current operation in red, inactive channels are shown in yellow, blue indicates that the channel is in setting mode.

## Comfort features for special applications

Some applications require that the user vary the voltage or the current during a test sequence, for example to simulate different charging conditions of a battery. Here, the EasyArb function is a comfortable solution that is not usually found in basic class power supplies. EasyArb allows the user to program time/voltage or time/current sequences, either manually via the user interface, or via the external interfaces.

Sometimes test sequences have to simulate operating conditions where the abrupt rise of the supply voltage has to be avoided. The EasyRamp function of the R&S®NGE100 power supply series offers the solution. The output voltage can be increased continuously within a 10 ms to 10 s time frame. Of course the EasyArb and EasyRamp functions can both be controlled manually or via remote control.



Executed protection functions are always displayed on the screen.

## Tracking and link functions

The separate output channels can function as individual power supplies, but demonstrate their versatility when combined. Running in parallel, higher currents can be achieved; serial connected channels yield higher voltages. The tracking function allows the user to vary the voltage on all channels in parallel for very convenient operation.

The link function of the electronic fuse makes the instrument even more versatile. Users can set up the power supply so that all channels are switched off if one channel hits its limit. Or it can be set up to leave one channel working, for example to keep the fan powered to cool down the DUT. The status of fuses and all other protection functions is always shown on the display.

## Five memory keys to save/recall instrument settings

Frequently used instrument settings can easily be stored/recalled via five memory keys on the front panel.

# Connectivity – everything you need

## Front connectors with 4 mm screw-type sockets

The output connectors on the front of the R&S®NGE100 power supplies can hold 4 mm banana plugs or they can clamp stripped cables as very often seen in educational applications. The design of the connectors is robust enough to survive generations of students.

## USB interface (virtual COM port and TMC class)

Via the USB interface, the instrument can be controlled from external PCs.

## LAN interface (LXI) with integrated web server (R&S®NGE-K101 option)

In addition to the standard USB connector, the R&S®NGE100 power supplies offer an optional Ethernet interface, which can be activated by the customer using a key code that has to be ordered separately. This option allows the user to remotely control all instrument parameters. A fixed IP address can be used, or, alternatively, DHCP function might be used to allocate dynamic IP addresses. The Ethernet function offers a web server that can be used by standard web browsers (i.e. Internet Explorer).

The R&S®NGE100 power supply series is LXI certified in line with version 1.4 (LXI Core 2011).

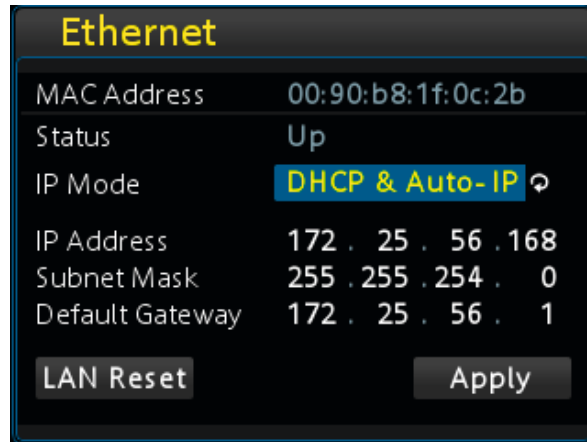
## Wireless LAN, unique in this class (R&S®NGE-K102 option)

An alternative to remotely controlling the R&S®NGE100 power supply series is to use the wireless LAN interface. Activated by a key code (option to be ordered separately), the wireless LAN module supports the CLIENT mode, meaning the instruments automatically connect to a network. Other power supplies or other test instruments can also be connected. Using a browser, all connected instruments can be operated via the web. In a typical student class, it enables the teacher to control all of the students' instruments or to set them to defined start conditions.

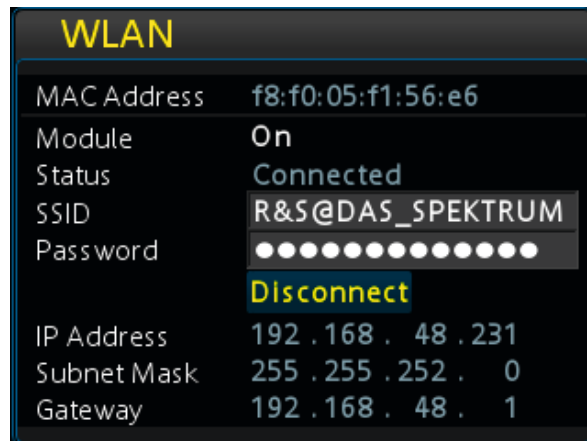
Note: The wireless LAN functionality is not available in all regions due to country-specific regulations.

## Digital trigger in/out (4-bit) on the rear (R&S®NGE-K103 option)

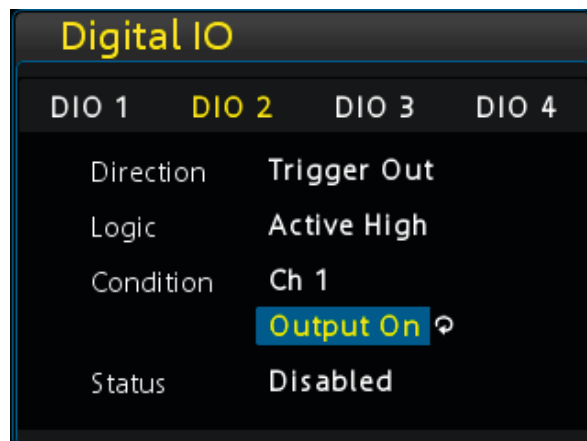
Another option for the R&S®NGE100 power supply series is a set of a 4-bit digital in/out interfaces that can be individually used as trigger inputs or outputs. Similar to the other options, the hardware of the R&S®NGE-K103 option is already installed, the functionality is activated with a key code.



LAN interface (LXI) with integrated web server (R&S®NGE-K101 option).



Wireless LAN, unique in this class (R&S®NGE-K102 option).



Here, channel 1 of the optional digital I/O interface is used as a trigger input.

# Specifications

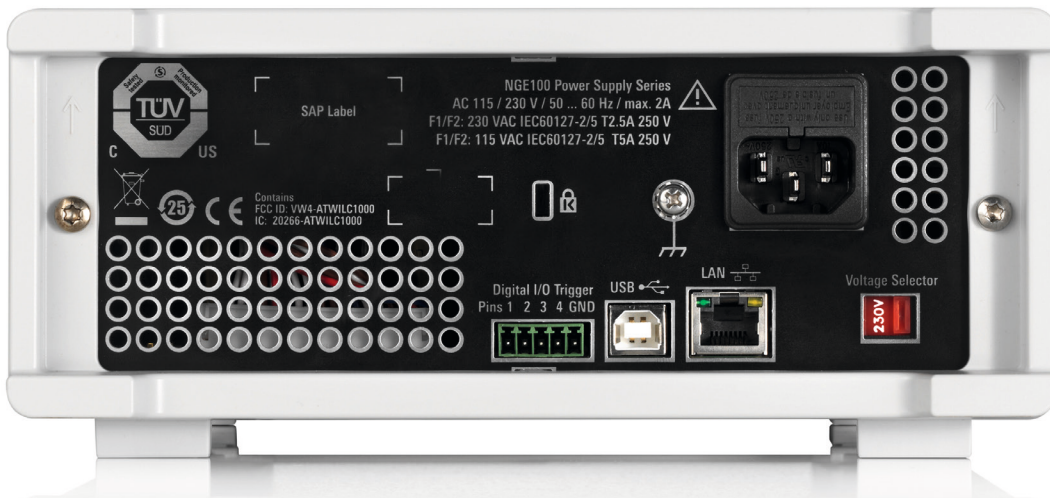
All data is valid at +23°C after 30 minutes warm-up time.

| Electrical data                                                                     |                                                                    |                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------|
| Number of output channels                                                           | R&S®NGE102                                                         | 2                                                    |
|                                                                                     | R&S®NGE103                                                         | 3                                                    |
| Total output power                                                                  | R&S®NGE102                                                         | 66 W                                                 |
|                                                                                     | R&S®NGE103                                                         | 100 W                                                |
| Maximum output power                                                                | per channel                                                        | 33.6 W                                               |
| Output voltage                                                                      | per channel                                                        | 0 V to 32 V                                          |
| Output current                                                                      | per channel                                                        | 0 A to 3 A                                           |
| Line and load regulation                                                            |                                                                    |                                                      |
| Constant voltage mode                                                               | $\pm$ (% of output + offset)                                       | < 0.1 % + 20 mV                                      |
| Constant current mode                                                               | $\pm$ (% of output + offset)                                       | < 0.1 % + 5 mA                                       |
| Voltage ripple                                                                      | 20 Hz to 20 MHz; at $V = 16$ V, $I = I_{\max}/2$                   | typ. < 1.5 mV (RMS)<br>typ. < 20 mV ( $V_{pp}$ )     |
| Current ripple                                                                      | 20 Hz to 20 MHz; at $V = 16$ V, $I = I_{\max}/2$                   | typ. < 2 mA (RMS)                                    |
| Recovery time                                                                       | 10% to 90% load change within a band of $\pm 20$ mV of set voltage | 200 $\mu$ s                                          |
| Setting accuracy (+23°C –3°C/+7°C)                                                  |                                                                    |                                                      |
| Voltage                                                                             | $\pm$ (% of output + offset)                                       | < 0.1 % + 30 mV                                      |
| Current                                                                             | $\pm$ (% of output + offset)                                       | < 0.1 % + 5 mA                                       |
| Readback accuracy (+23°C –3°C/+7°C)                                                 |                                                                    |                                                      |
| Voltage                                                                             | $\pm$ (% of output + offset)                                       | < 0.1 % + 20 mV                                      |
| Current                                                                             | $\pm$ (% of output + offset)                                       | < 0.1 % + 5 mA                                       |
| Resolution                                                                          |                                                                    |                                                      |
| Voltage                                                                             |                                                                    | 10 mV                                                |
| Current                                                                             |                                                                    | 1 mA                                                 |
| Maximum voltage to earth                                                            |                                                                    | 150 V DC                                             |
| Maximum reverse voltage                                                             |                                                                    | 33 V                                                 |
| Maximum inverse voltage                                                             |                                                                    | 0.4 V                                                |
| Maximum permitted current in case of inverse voltage                                |                                                                    | 3 A                                                  |
| Temperature coefficient (per °C)                                                    | $\pm$ (% of output + offset)                                       | voltage: < 0.02 % + 5 mV<br>current: < 0.02 % + 3 mA |
| Output voltage overshoot when a channel is active and the mains power is turned off |                                                                    | < 100 mV                                             |
| Command processing time                                                             |                                                                    | $\leq 30$ ms                                         |
| Programming time (within 1 % of final value)                                        |                                                                    |                                                      |
| Positive voltage change                                                             | no load                                                            | 10 ms + command processing time                      |
|                                                                                     | full load (resistive)                                              | 10 ms + command processing time                      |
| Negative voltage change                                                             | no load                                                            | 500 ms + command processing time                     |
|                                                                                     | full load (resistive)                                              | 10 ms + command processing time                      |
| Overvoltage protection                                                              |                                                                    | adjustable for each channel                          |
| Overpower protection                                                                |                                                                    | adjustable for each channel                          |
| Electronic fuse                                                                     |                                                                    | adjustable for each channel                          |
| Response time                                                                       | $(I_{\text{load}} > I_{\text{resp}} \times 2)$                     | < 10 ms                                              |
| Response time of linked channels                                                    |                                                                    | < 100 $\mu$ s + response time of linked channel      |
| Fuse delay time                                                                     | adjustable for each channel                                        | 10 ms to 10 s (10 ms steps)                          |
| Overtemperature protection                                                          |                                                                    | yes                                                  |
| Energy meter                                                                        |                                                                    | yes                                                  |
| Output ramp function (EasyRamp)                                                     |                                                                    | yes                                                  |
| EasyRamp time                                                                       |                                                                    | 10 ms to 10 s                                        |

| Electrical data               |                 |                                                                              |
|-------------------------------|-----------------|------------------------------------------------------------------------------|
| Trigger input                 |                 |                                                                              |
| Minimum trigger interval      |                 | 10 ms                                                                        |
| Trigger response time         |                 | < 100 ms                                                                     |
| Trigger level                 |                 | TTL                                                                          |
| Edge direction                |                 | rising, falling                                                              |
| Arbitrary function (EasyArb)  |                 |                                                                              |
| Parameter                     |                 | voltage, current, time                                                       |
| Maximum number of points      |                 | 128                                                                          |
| Dwell time                    |                 | 10 ms to 600 s                                                               |
| Repetition mode               |                 | continuous or burst mode with 1 to 255 repetitions                           |
| Trigger                       |                 | manually, remote control or via optional trigger input (R&S®NGE-K103 option) |
| Interfaces                    |                 |                                                                              |
| Front panel connectors        | channel outputs | 4 mm screw-type sockets                                                      |
| Remote interfaces             | standard        | USB-TMC, USB-CDC (virtual COM)                                               |
|                               | optional        | LAN (LXI), R&S®NGE-K101                                                      |
|                               | optional        | Wireless LAN, R&S®NGE-K102                                                   |
| Trigger and control interface | optional        | Digital I/O, R&S®NGE-K103                                                    |

| General data                     |                                                                                 |                                                           |
|----------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------|
| Mains nominal voltage            | AC                                                                              | 115/230 V (±10%) 50/60 Hz                                 |
| Power consumption                | maximum input power                                                             | 180 W                                                     |
| Mains fuses                      | 115 V AC                                                                        | IEC 60127-2/5 T 5 A 250 V                                 |
|                                  | 230 V AC                                                                        | IEC 60127-2/5 T 2.5 A 250 V                               |
| Temperature                      | operating temperature range                                                     | 0°C to +40°C                                              |
|                                  | storage temperature range                                                       | –20°C to +70°C                                            |
| Humidity                         | noncondensing                                                                   | 5% to 80%                                                 |
| Display                          |                                                                                 | 3.5", QVGA                                                |
| Rackmount capability             | ½ 19"                                                                           | R&S®HXC95 option                                          |
| Dimensions                       | W × H × D                                                                       | 222 mm × 88 mm × 280 mm<br>(8.74 in × 3.46 in × 11.02 in) |
| Weight                           | R&S®NGE102                                                                      | 4.4 kg (9.70 lb)                                          |
|                                  | R&S®NGE103                                                                      | 4.5 kg (9.92 lb)                                          |
| Recommended calibration interval | operation 40 h/week in the full range of the specified environmental conditions | 1 year                                                    |

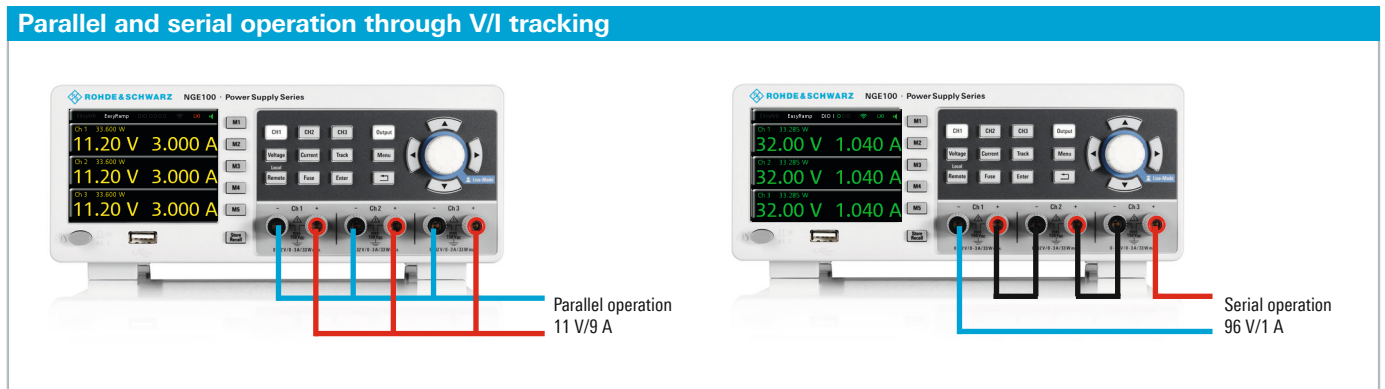
Rear view of the R&S®NG100 series.



# Ordering information

| Designation                            | Type         | Order No.    |
|----------------------------------------|--------------|--------------|
| <b>Base unit</b>                       |              |              |
| Two-Channel Power Supply               | R&S®NGE102   | 5601.1414.02 |
| Three-Channel Power Supply             | R&S®NGE103   | 5601.1414.03 |
| <b>Accessories supplied</b>            |              |              |
| Set of power cables, quick start guide |              |              |
| <b>Software options</b>                |              |              |
| Ethernet Remote Control                | R&S®NGE-K101 | 5601.2204.03 |
| Wireless LAN Remote Control            | R&S®NGE-K102 | 5601.2210.03 |
| Digital Trigger I/O                    | R&S®NGE-K103 | 5601.2227.03 |
| <b>System components</b>               |              |              |
| 19" Rack Adapter, 2 HU                 | R&S®HZC95    | 5800.2054.02 |

| <b>Warranty</b>                                        |         |                                                         |
|--------------------------------------------------------|---------|---------------------------------------------------------|
| Base unit                                              |         | 3 years                                                 |
| <b>Options</b>                                         |         |                                                         |
| Extended Warranty, one year                            | R&S®WE1 | Please contact your local Rohde & Schwarz sales office. |
| Extended Warranty, two years                           | R&S®WE2 |                                                         |
| Extended Warranty with Calibration Coverage, one year  | R&S®CW1 |                                                         |
| Extended Warranty with Calibration Coverage, two years | R&S®CW2 |                                                         |



## Service that adds value

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

## 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.

## Sustainable product design

- ▮ Environmental compatibility and eco-footprint
- ▮ Energy efficiency and low emissions
- ▮ Longevity and optimized total cost of ownership

Certified Quality Management

**ISO 9001**

Certified Environmental Management

**ISO 14001**

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R&S®NGE100 Power Supply Series

Data without tolerance limits is not binding | Subject to change

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