

# Ступенчатые аттенюаторы RSC



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# R&S®RSC

## Step Attenuator

### At a glance

The R&S®RSC is a switchable, mechanical step attenuator. It is available in various models with different upper frequency limits (6 GHz or 18 GHz), maximum attenuation ranges and minimum settable step sizes. The R&S®RSC can also control external step attenuators with frequency ranges from DC to 40 GHz or 67 GHz.

The R&S®RSC step attenuator is an ideal choice in all applications that call for precise signal levels. Operation is intuitive, and all settings are visible at a glance. Featuring high attenuation accuracy and high linearity, the R&S®RSC delivers reliable results and ensures stable conditions for the test setup. This simplifies work for developers of RF components.

In automated test systems, the R&S®RSC stands out for its high repeatability of 0.02 dB, long life and high reliability with specified 10 million switching cycles. Various frequency ranges from DC to 6 GHz, 18 GHz, 40 GHz and 67 GHz are available to meet the requirements of wireless communications, electronic products and aerospace and defence.

The R&S®RSC is available with one internal step attenuator and can be equipped with up to four additional external step attenuators.

The R&S®RSC offers a wide scope of functions, including frequency response correction and display of attenuation deviation relative to a nominal value. Moreover, it can display an overall attenuation value, taking into account further test setup components such as high-power attenuators. The R&S®RSC thus covers a broad range of applications from power measurements to high-precision calibration.

Its low weight and compact dimensions make the R&S®RSC ideal for flexible applications in the lab. The step attenuator can be manually operated via its front-panel keypad or a mouse. The built-in screen shows current device settings at a glance. The R&S®RSC takes up just half a rack width (½ 19"). It can be delivered with RF connectors optionally on the front or rear panel. Various interfaces (IEC/IEEE, LAN and USB) are available for remote control. These features make the device ideally suited for system applications as well.

#### Key facts

- Step attenuators with frequency ranges up to 6 GHz, 18 GHz, 40 GHz and 67 GHz
- Maximum attenuation ranges up to 139.9 dB, 115 dB and 75 dB
- Minimum step sizes of 0.1 dB, 1 dB and 5 dB
- Control of one internal plus up to four external step attenuators by a single R&S®RSC
- Outstanding accuracy due to frequency response correction and user calibration



# R&S®RSC

## Step Attenuator

### Benefits and key features

#### Designed to meet individual application requirements

- ▮ R&S®RSC with internal step attenuator
  - ▮ R&S®RSC with external step attenuator/s
  - ▮ Easy integration into automated test systems
- ▷ [page 4](#)

#### Intuitive operation and straightforward display

- ▮ Key parameters at a glance
  - ▮ Automatic detection and individual configuration of external step attenuators
- ▷ [page 5](#)

#### Always the correct signal level

- ▮ High attenuation accuracy
  - ▮ Exceptional repeatability of 0.02 dB
  - ▮ High maximum input level and good matching
  - ▮ Fast switching times and wear-free use in production
  - ▮ Diverse correction modes
    - Frequency response correction
    - Absolute or relative attenuation display
    - Display of overall attenuation including external components
- ▷ [page 6](#)

Models					
	Attenuation	Resolution	Frequency	Connectors	Order No.
<b>Step attenuators</b>					
R&S®RSC, model .02	base unit without internal step attenuator; specifications depend on step attenuators connected				1313.8004.02
R&S®RSC, model .03	0 dB to 139 dB	1 dB	DC to 6 GHz	type N (f) connectors on front panel	1313.8004.03
R&S®RSC, model .13	0 dB to 139 dB	1 dB	DC to 6 GHz	type N (f) connectors on rear panel	1313.8004.13
R&S®RSC, model .04	0 dB to 139.9 dB	0.1 dB	DC to 6 GHz	type N (f) connectors on front panel	1313.8004.04
R&S®RSC, model .14	0 dB to 139.9 dB	0.1 dB	DC to 6 GHz	type N (f) connectors on rear panel	1313.8004.14
R&S®RSC, model .05	0 dB to 115 dB	5 dB	DC to 18 GHz	type N (f) connectors on front panel	1313.8004.05
R&S®RSC, model .15	0 dB to 115 dB	5 dB	DC to 18 GHz	type N (f) connectors on rear panel	1313.8004.15
<b>External step attenuators</b>					
R&S®RSC-Z405	0 dB to 75 dB	5 dB	DC to 40 GHz	2.92 mm (f)	1313.9952.02
R&S®RSC-Z675	0 dB to 75 dB	5 dB	DC to 67 GHz	1.85 mm (f)	1314.0065.02

# Designed to meet individual application requirements

The R&S®RSC is available in various models to meet specific needs.

## R&S®RSC with internal step attenuator

The R&S®RSC's internal step attenuator comes in various models with upper frequency limits of 6 GHz or 18 GHz and maximum attenuation ranges up to 115 dB, 139 dB or 139.9 dB with step sizes of 5 dB, 1 dB and 0.1 dB respectively. The RF connectors can optionally be provided on the front or rear panel.

## R&S®RSC with external step attenuator/s

External step attenuators are available with frequency ranges from DC to 40 GHz or 67 GHz. The R&S®RSC can control up to four external step attenuators via USB. The R&S®RSC automatically detects the step attenuators connected to it and configures them to user specifications. If an internal step attenuator is not needed, an inexpensive basic R&S®RSC model is also available to carry out solely control tasks.

## Easy integration into automated test systems

The R&S®RSC has a USB, a LAN and an IEC/IEEE bus interface for remote control on its rear panel, as well as one USB connector for a mouse or keyboard. The R&S®RSC supports the remote control command set used with other step attenuators, i.e. the R&S®RSG, R&S®RSP and R&S®DPSP, and can even be set to be command-compatible with these devices.

External R&S®RSC step attenuators



## Connection of an external step attenuator (schematic representation)



# Intuitive operation and straightforward display

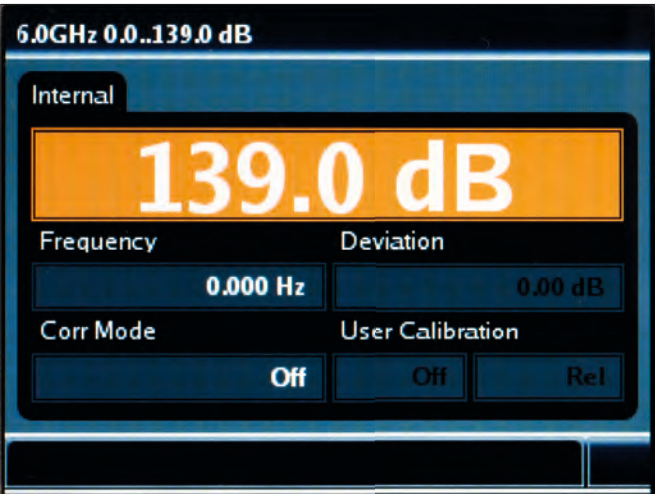
### Key parameters at a glance

The R&S®RSC displays the current attenuation, the frequency-dependent attenuation deviation and the selected correction mode in an easy-to-read form separately for each step attenuator. Settings can easily be changed via the front-panel keys or a mouse. All settings related to remote control, correction mode and correction data are stored in setup files and can be called up as required.

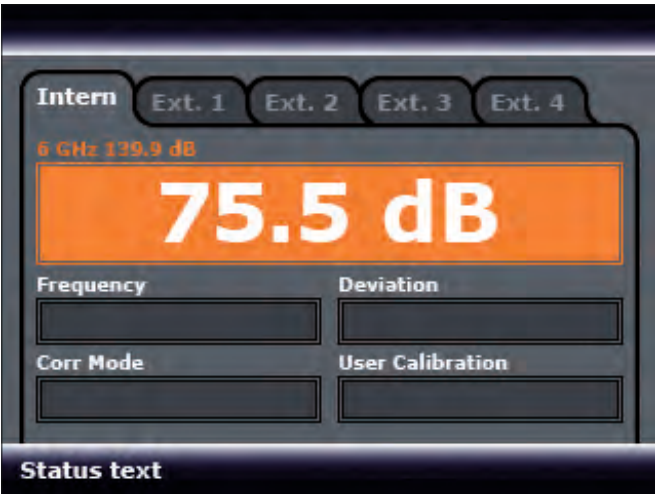
### Automatic detection and individual configuration of external step attenuators

The R&S®RSC automatically detects external step attenuators connected to it. Users can configure each step attenuator individually after selecting it from the row of tabs on the screen. Complete setups can be saved to the R&S®RSC's internal memory or a USB stick. Frequently used setups are thus immediately available. This is also beneficial for infrequent R&S®RSC users, as they can download error-free setups for various applications.

The R&S®RSC screen: display of nominal attenuation, frequency (for frequency response correction), attenuation deviation and correction mode.



Automatic detection and display of external step attenuators.





# Always the correct signal level

The R&S®RSC's excellent RF data and diverse correction modes ensure correct signal levels at all times.

## High attenuation accuracy

The frequency response is determined during production individually for each internal and external step attenuator, and the resulting data is saved to the R&S®RSC memory. This is a key prerequisite for achieving high attenuation accuracy.

## Exceptional repeatability of 0.02 dB

The R&S®RSC reliably delivers the required attenuation values even after a large number of switching cycles.

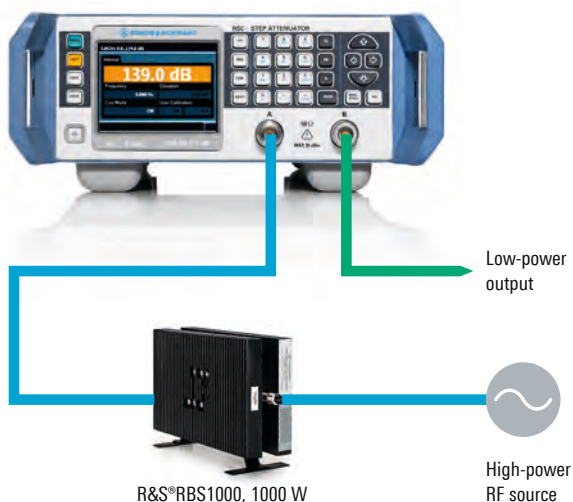
## High maximum input level and good matching

The ruggedly designed R&S®RSC can be used to attenuate even high powers without requiring a high-power attenuator. It has a maximum input level of 1 W in CW mode and 200 W in pulsed mode (for pulses < 10  $\mu$ s). Offering good matching of up to 20 dB and beyond, the R&S®RSC ensures constant measurement conditions for the device under test (DUT) during level changes.

## Fast switching times and wear-free use in production

The R&S®RSC features fast switching times of below 30 ms and an operating life of 10 million cycles. These excellent characteristics make it ideal for use in production, ensuring constant high throughput and high availability, and minimizing total cost of ownership (TCO).

### Configuration of the R&S®RSC for high-power attenuation



If a high-power attenuator (such as the R&S®RBS1000, 1000 W) is connected upstream of the R&S®RSC, the R&S®RSC can display the attenuation for the overall test setup consisting of the R&S®RSC, the R&S®RBS1000 and cables.

## Diverse correction modes

Users can choose among the following correction modes:

### Frequency response correction

Based on the stored calibration data, the R&S®RSC corrects the attenuation frequency response using the minimum available attenuation step size. It also displays the residual attenuation deviation (after frequency response correction) for the respective nominal frequency.

### Absolute or relative attenuation display

Attenuation can be displayed relative to the attenuation at 0 dB or as an absolute value taking into account the 0 dB offset.

### Display of overall attenuation including external components

The R&S®RSC can include the attenuation or gain introduced by further components of a test setup in an overall attenuation value. A typical application is to include cable losses in the overall attenuation.

Moreover, external high-power attenuators can be used to reduce high powers to a level that can be handled by the R&S®RSC. The R&S®RSC can then be used to fine-tune attenuation.

The R&S®RSC offers various ways to take into account external attenuation:

- Offset: external attenuation is specified and taken into account as a constant offset value
- A(f): external attenuation is described by and taken into account as a CSV file
- Full: overall attenuation of a test setup including the R&S®RSC and external components is described by a CSV file; equivalent to re-normalizing the R&S®RSC



The R&S®RSC offers diverse correction modes, including frequency response correction or taking into account external components such as a high-power attenuator in an overall attenuation value. External attenuation is taken into account using either a constant offset value or a file containing the external component's frequency-dependent attenuation values.

# Specifications in brief

## Internal step attenuators

Order No.		<b>1313.8004.03</b> <b>1313.8004.13</b>	<b>1313.8004.04</b> <b>1313.8004.14</b>	<b>1313.8004.05</b> <b>1313.8004.15</b>
Frequency range		DC to 6 GHz	DC to 6 GHz	DC to 18 GHz
Attenuation range		0 dB to 139 dB	0 dB to 139.9 dB	0 dB to 115 dB
Connectors		type N (f)		
Minimum attenuation step size		1 dB	0.1 dB	5 dB
Matching	up to	> 20 dB	> 20 dB	> 20 dB
Attenuation uncertainty (relative to attenuation at 0 dB)	up to	< 0.2 dB + 1% of attenuation value	< 0.07 dB + 0.5% of attenuation value (corrected)	< 0.6 dB + 1% of attenuation value
Repeatability		typ. 0.02 dB		
Maximum power-handling capability	CW	1 W		
	pulse < 10 μs	200 W		
Maximum voltage	pulse < 10 μs	150 V		
Operating life		> 10 × 10 <sup>6</sup> switching cycles		
Switching speed		< 25 ms	< 25 ms	< 30 ms

## External step attenuators

Order No./Type		<b>1313.9952.02/R&amp;S®RSC-Z405</b>	<b>1314.0065.02/R&amp;S®RSC-Z675</b>
Frequency range		DC to 40 GHz	DC to 67 GHz
Attenuation range		0 dB to 75 dB	0 dB to 75 dB
Connector		2.92 mm (f)	1.85 mm (f)
Minimum attenuation step size		5 dB	5 dB
Matching	up to	> 20 dB	> 20 dB
Attenuation uncertainty (relative to attenuation at 0 dB)	up to	< 0.5 dB	< 0.5 dB
Repeatability		typ. 0.02 dB	
Maximum power-handling capability	CW	1 W	
	pulse < 10 μs	200 W	
Maximum voltage	pulse < 10 μs	150 V	
Operating life		> 10 × 10 <sup>6</sup> switching cycles	
Switching speed		< 30 ms	



# Ordering information

Designation	Type	Order No.
Step Attenuator, control of external step attenuators only (without internal step attenuator)	R&S®RSC	1313.8004.02
Step Attenuator, 0 dB to 139 dB, 1 dB steps, DC to 6 GHz, including control of external step attenuators	R&S®RSC type N (f) connectors on front panel	1313.8004.03
	R&S®RSC type N (f) connectors on rear panel	1313.8004.13
Step Attenuator, 0 dB to 139.9 dB, 0.1 dB steps, DC to 6 GHz, including control of external step attenuators	R&S®RSC type N (f) connectors on front panel	1313.8004.04
	R&S®RSC type N (f) connectors on rear panel	1313.8004.14
Step Attenuator, 0 dB to 115 dB, 5 dB steps, DC to 18 GHz, including control of external step attenuators	R&S®RSC type N (f) connectors on front panel	1313.8004.05
	R&S®RSC type N (f) connectors on rear panel	1313.8004.15
External Step Attenuator, 0 dB to 75 dB, 5 dB steps, DC to 40 GHz, can be controlled by the R&S®RSC <sup>1)</sup>	R&S®RSC-Z405	1313.9952.02
External Step Attenuator, 0 dB to 75 dB, 5 dB steps, DC to 67 GHz, can be controlled by the R&S®RSC <sup>1)</sup>	R&S®RSC-Z675	1314.0065.02
Control Cable, for connecting an external step attenuator to the R&S®RSC	R&S®RSC-Z41	1314.0136.02
Control Cable, for connecting an external step attenuator to a PC	R&S®RSC-Z42	1314.0142.02
Rackmount Kit, for installing another 2 HU, ½ depth device	R&S®ZZA-KN22	1175.3210.00
Rackmount Kit, for installing an extra plug-in slot	R&S®ZZA-KN23	1175.3227.00

<sup>1)</sup> Does not include the R&S®RSC-Z41 or R&S®RSC-Z42 control cable.

Service options		
Extended Warranty, one year	R&S®WE1	Please contact your local sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty, three years	R&S®WE3	
Extended Warranty, four years	R&S®WE4	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Calibration Coverage, three years	R&S®CW3	
Extended Warranty with Calibration Coverage, four years	R&S®CW4	
Extended Warranty with Accredited Calibration Coverage, one year	R&S®AW1	
Extended Warranty with Accredited Calibration Coverage, two years	R&S®AW2	
Extended Warranty with Accredited Calibration Coverage, three years	R&S®AW3	
Extended Warranty with Accredited Calibration Coverage, four years	R&S®AW4	

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