

# R&S® GV4000

## Multi-Link Controller

### High-availability ATC radio system



# R&S®GV4000 Multi-Link Controller At a glance

One of the key factors in ensuring safety in air traffic control (ATC) applications is to provide a high level of availability for the ground-to-air communication system. The R&S®GV4000 multi-link controller was developed to achieve this goal. It provides n+m redundancy for R&S®Series4200 radios, which ensures higher availability levels at lower costs compared to the traditional 1+1 redundancy.

In the past, most ATC systems used 1+1 redundancy, where each main unit had a dedicated backup unit. Today, more and more ATC authorities are employing systems with n+m redundancy, where n main units operate with m non-dedicated backup units.

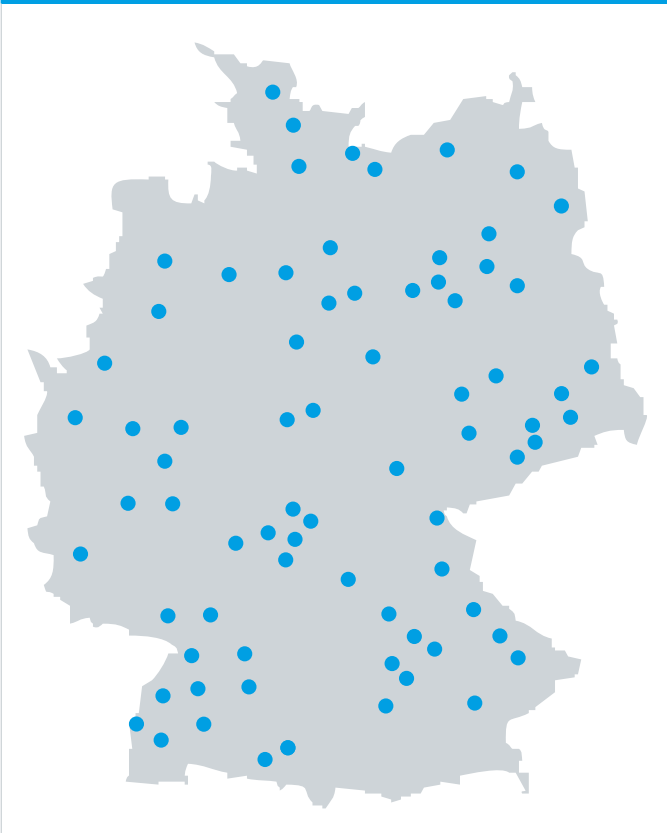
The R&S®GV4000 controls the status of up to 16 main radios and two backup radios. If a radio failure occurs in any of the 16 main radios, the R&S®GV4000 automatically switches over to one of the two standby radios. Detailed mathematical calculations show that n+m redundancy can reduce system downtime by a factor of up to six compared to standard 1+1 redundancy. The results of these calculations have been confirmed through years of field experience with systems using the R&S®GV4000 in n+m applications.

The use of n+m redundancy significantly reduces the number of radios needed. As a result, considerably less space is required at each radio site, and procurement and operating costs are lower. No modifications to the voice communication switch are needed to implement n+m redundancy with the R&S®GV4000 in existing ATC systems.

## Key facts

- Level of availability meeting or exceeding that of traditional main/standby solutions
- Reduction in the required capital investment and ongoing maintenance costs
- Less space required at each radio site
- Flexible approach for site-specific solutions

Radio sites with automatic switchover



Country-wide radio sites with automatic n+m switchover operated by the German air navigation services provider (DFS Deutsche Flugsicherung GmbH).

# R&S®GV4000 Multi-Link Controller

## Benefits and key features

### Increase in radio channel availability

- ▮ n+m redundancy with automatic switchover
  - ▮ Priority concept for switchover of radios
- ▷ [page 4](#)

### Reduction in system costs and rack space

- ▮ Reduction in capital investment and ongoing maintenance costs
  - ▮ Reduced space requirements
- ▷ [page 5](#)

### Flexible integration into existing ATC systems

- ▮ Optimal solution for each radio site
  - ▮ Integration into remote control and monitoring systems
- ▷ [page 6](#)

### Field-proven technology

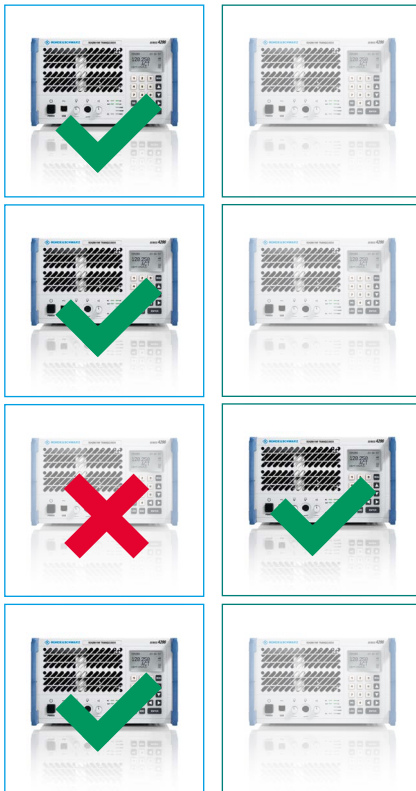
- ▮ Monitoring and control of radios via SNMP
  - ▮ Capability to operate with analog signals, including E&M
  - ▮ Simple configuration with extremely easy-to-use setup software
- ▷ [page 7](#)

## 1+1 redundancy versus n+m redundancy systems

### 1+1 redundancy

Main radios

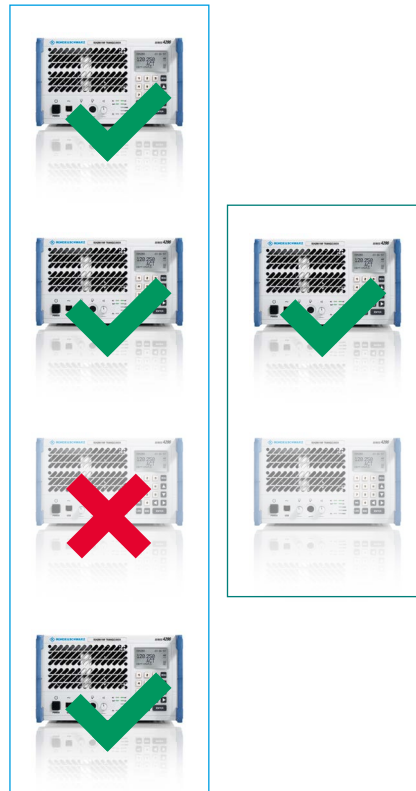
Standby radios



### n+m redundancy

Main radios

Standby radios



✓ Active radio

✗ Radio failure

# Increase in radio channel availability

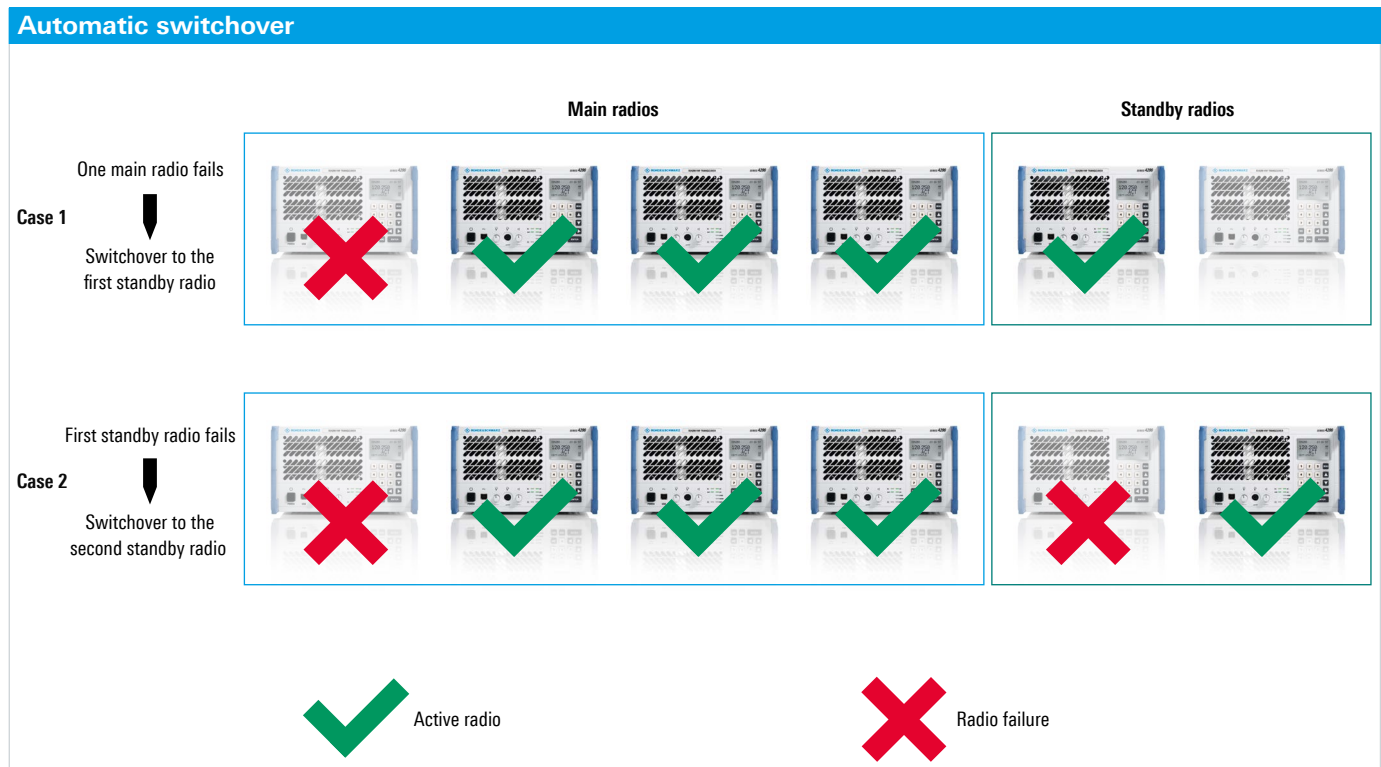
## n+m redundancy with automatic switchover

The R&S®GV4000 controls the status of up to 16 main radios and two backup radios. If any of the 16 main radios fails, the R&S®GV4000 automatically switches over to one of the two standby radios. Upon switchover, the settings for frequency, channel spacing, offset and modulation in the main radio are automatically transferred to the standby radio. If a second main radio or the first standby radio fails, it will switch over to the second standby radio and transfer its operational parameters to this second standby radio. This means that each main unit has two backup units. This double redundancy concept is one of the key reasons why n+m redundancy achieves such high levels of availability.

As the R&S®GV4000 is the key component in the n+m redundancy concept, it has been designed to have an extremely high MTBF. Even if the R&S®GV4000 fails, the main radio channels will nonetheless continue operation unaffected. The availability of the R&S®GV4000 is important solely for ensuring the availability of the standby radios.

## Priority concept for switchover of radios

When configuring the R&S®GV4000, different priorities can be assigned to each of the main radios. If two main radios fail, they will be switched over to the two standby radios. In the unlikely event that a third main radio fails, its operation will be taken over by one of the standby radios if this third main radio has a higher priority than at least one of the other failed main radios. If two main radios have the same priority, the one that failed first will continue to use the standby radio.



# Reduction in system costs and rack space

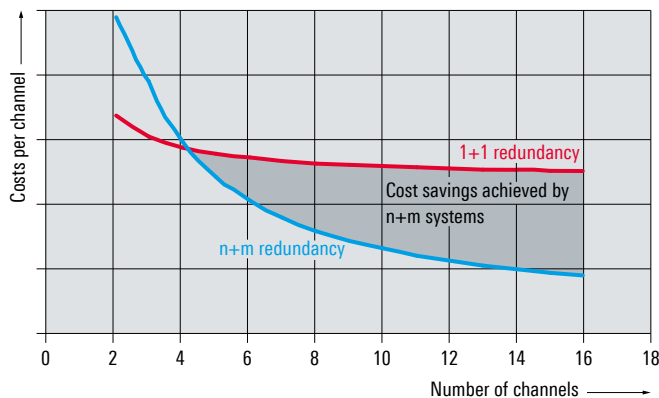
## Reduction in capital investment and ongoing maintenance costs

Rohde & Schwarz developed its n+m redundancy concept to attain a high level of availability for ATC systems using the R&S®Series4200 radios while at the same time reducing system costs. Fewer radios mean a reduction in both the required capital investment and the ongoing maintenance costs. In addition, operating costs are reduced because each site requires less electrical power.

## Reduced space requirements

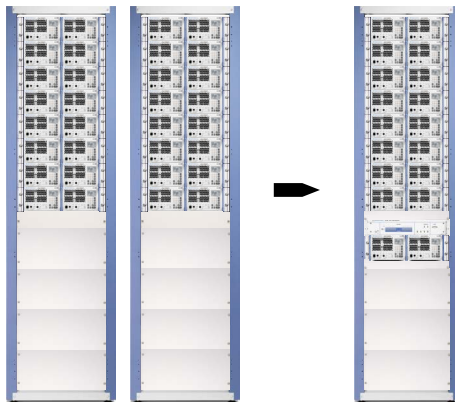
The use of n+m redundancy significantly reduces the number of radios needed. As a result, considerably less space is required at each radio site. For a system with 16 channels, the space required for 16+2 redundancy as compared with 1+1 redundancy is reduced from two racks to one.

### Investment per channel



Investment per channel with n+m redundancy versus 1+1 redundancy.

### Reduced space requirements



Reduction in the required space using the R&S®GV4000 with n+m redundancy (right) compared to a solution with 1+1 redundancy (left).

# Flexible integration into existing ATC systems

## Optimal solution for each radio site

In ATC systems, each radio site often has a different number of radio channels. To accommodate this scenario, the R&S®GV4000 multi-link controller is available in three different models:

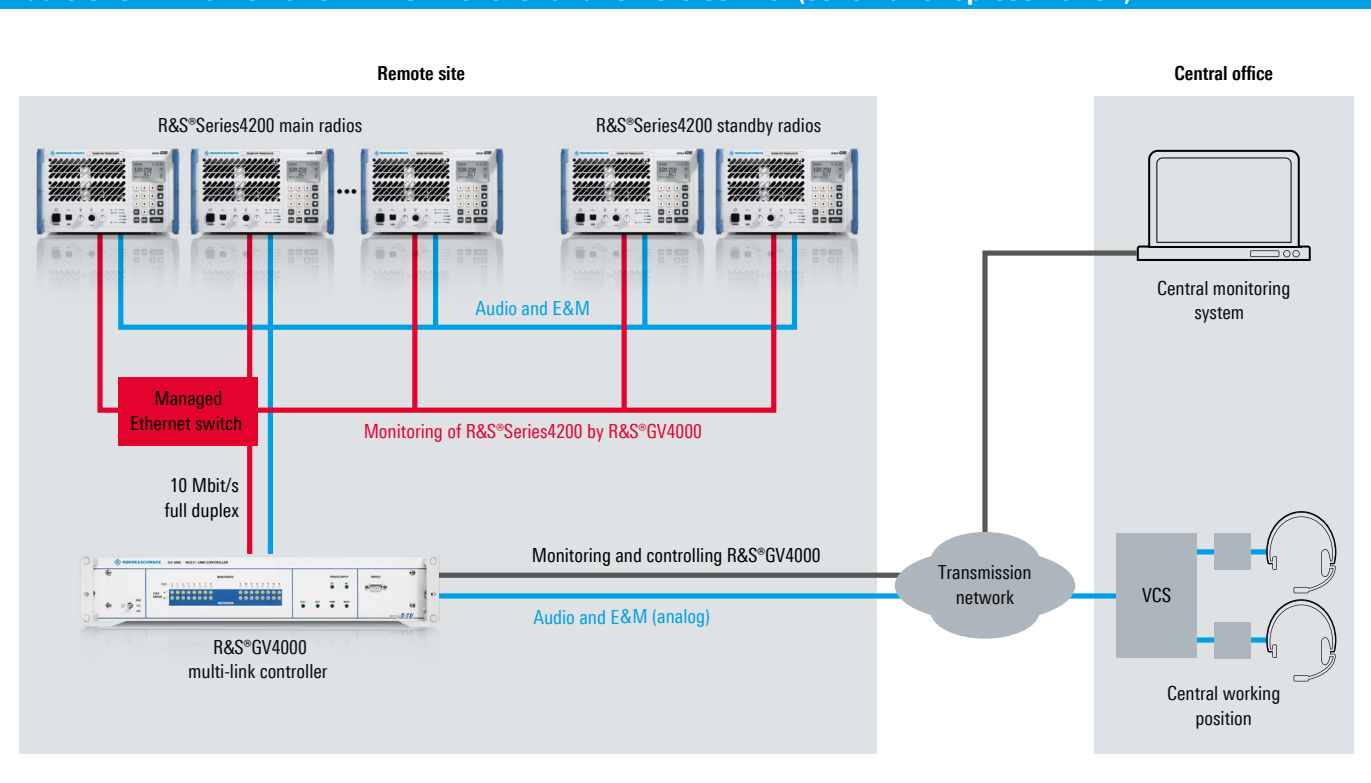
- Model .31: automatic switchover of up to eight main radios and two standby radios
- Model .32: automatic switchover of up to 16 main radios and two standby radios
- Model .33: two groups for automatic switchover, each for up to eight main radios and two standby radios

Additional radios to be installed during site extension can easily be integrated into the existing n+m automatic switchover concept using the R&S®GV4000 configuration software.

## Integration into remote control and monitoring systems

LEDs on the front of the R&S®GV4000 show which main radio is switched over to which standby radio. Furthermore, an operator at a central control and monitoring site, can see which backup radios have taken over operation for which main radios. In addition to monitoring functionality, the R&S®GV4000 can be remote-controlled from the central site so that a switchover of the radios can be triggered, for example. The connection to the central site can be implemented over an existing IP network.

### Radio site with automatic n+m switchover and remote control (schematic representation)



# Field-proven technology

## Monitoring and control of radios via SNMP

The R&S®GV4000 continuously monitors the availability of R&S®Series4200 main and standby radios via SNMPv2c. If the R&S®GV4000 detects that a radio is no longer available for operational purposes, switchover to a standby radio will be initiated.

Before switchover, the settings for frequency, channel spacing, offset and modulation in the main radio are automatically transferred to the standby radio. Subsequently, the audio and E&M signals (TX: PTT and carrier; RX: RSSI and squelch) will be switched over to the corresponding standby radio.

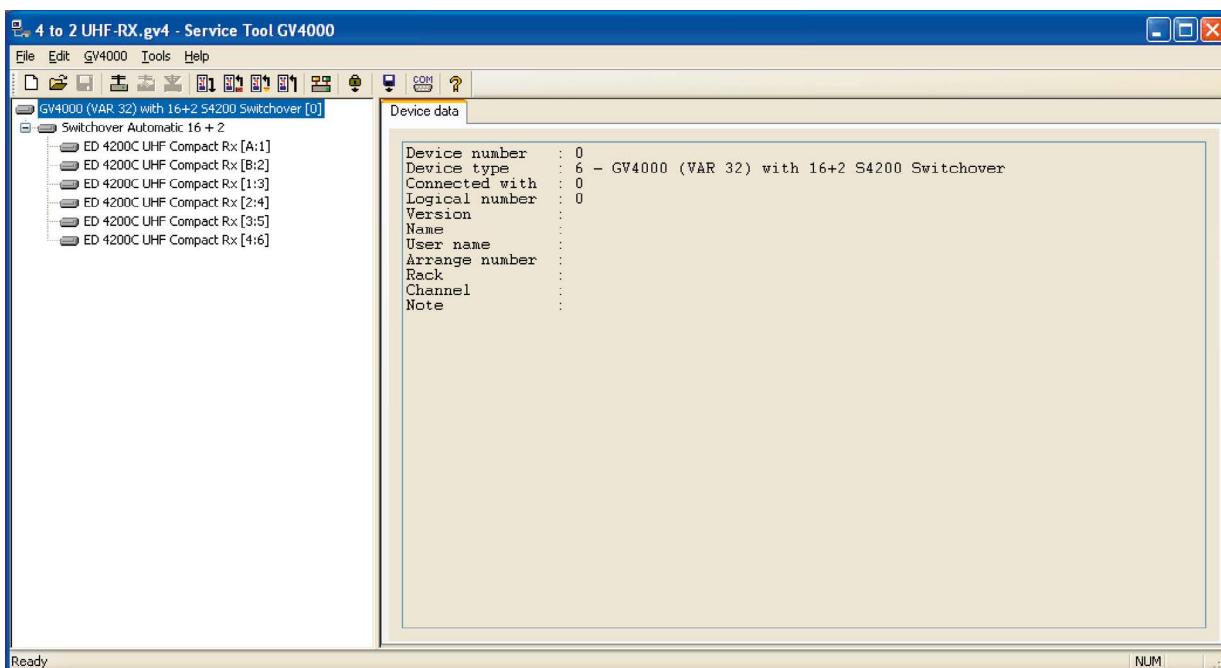
## Capability to operate with analog signals, including E&M

The R&S®GV4000 allows operation with analog E&M signals between the VCS and the R&S®Series4200 radios.

## Simple configuration with extremely easy-to-use setup software

The R&S®GV4000 can be configured by means of easy-to-use software. Using the R&S®GV4000 configuration software, parameters such as IP addresses, device types and priorities can be defined.

Example of IP configuration of a R&S®Series4200 radios in R&S®GV4000 using R&S®GV4000 configuration software.



# Model overview

The R&S®GV4000 multi-link controller can be used in systems using any R&S®Series4200 radio (R&S®SU4200, R&S®EU4200C, R&S®XU4200, R&S®SD4200, R&S®ED4200C, R&S®XD4200). All radios in the same n+m switchover group have to be of the same type.

## Model .31

The R&S®GV4000 model .31 can control up to eight R&S®Series4200 main radios. It allows the switchover to one or two R&S®Series4200 standby radios.

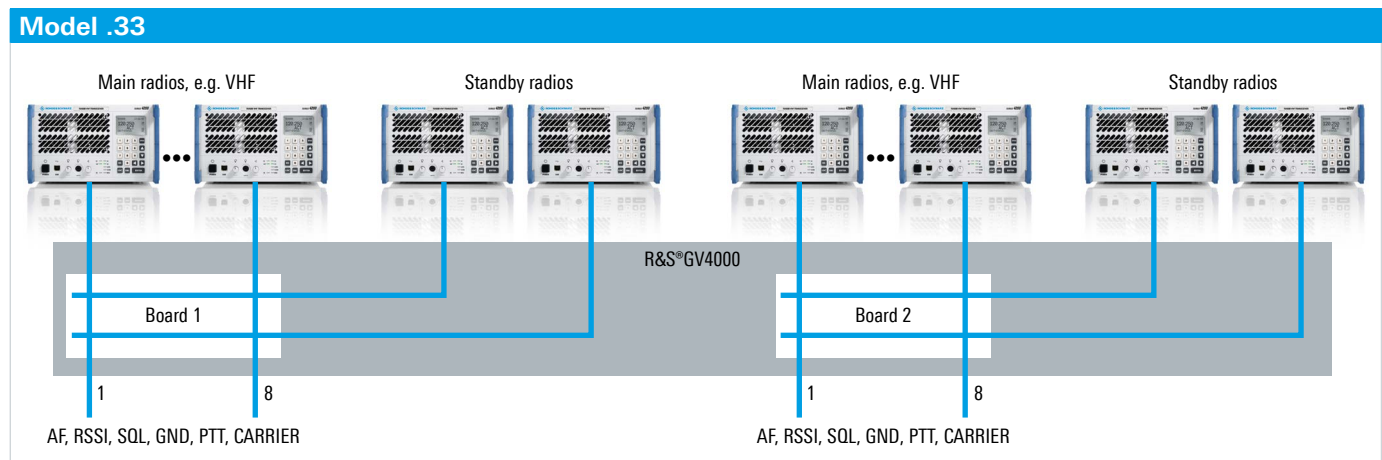
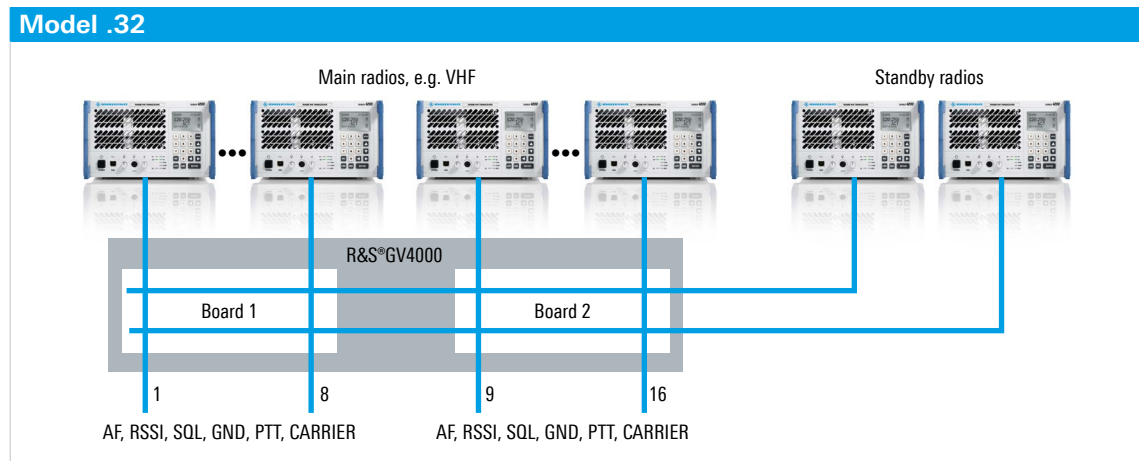
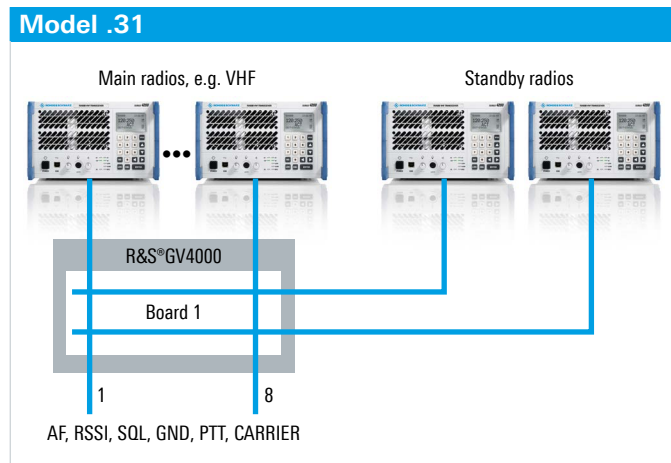
## Model .32

The R&S®GV4000 model .32 can control up to 16 R&S®Series4200 main radios. It allows the switchover to one or two R&S®Series4200 standby radios.

## Model .33

The R&S®GV4000 model .33 can control two switchover groups of up to eight R&S®Series4200 main radios. Each switchover group allows the switchover to one or two R&S®Series4200 standby radios.

Each of the groups can include a different type of radio: UHF radios can be used in the first switchover group, and VHF in the second one.







# Specifications

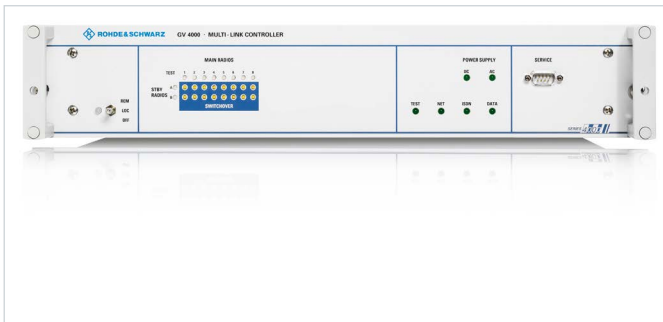
Specifications		
<b>General data</b>		
Power supply	AC supply	101 V to 127 V AC, 202 V to 253 V AC typ. 15 VA (max. 60 VA), 47 Hz to 63 Hz
	DC voltage	nom. +24 V DC, typ. 500 mA (max. 2.5 A) +19 V to +31 V DC, negative pole to ground
	DC and AC voltages	automatic AC/DC switchover
Electrical safety		EN 60950-1:2006
EMC		ETSI EN 301489-1 V1.6.1 (2005-09), ETSI EN 301489-22 V1.3.1 (2003-11), EN 55022:1998 + A1:2000 + A2:2003, EN 61000-3-2:2000 + A2:2005, EN 61000-3-3:1995 + A1:2001 + A2:2005
<b>Environmental data</b>		
Protection against foreign bodies		IP30 in line with EN 60529
Temperature range	operation	-20°C to +55°C
	storage	-40°C to +70°C
Maximum relative humidity		EN 60068-2-3
	during operation	95% at +40°C (without condensation)
	during storage	95% at +40°C
Vibration		EN 60068-2-6
	without shockmount	0.3 mm double amplitude, 2 g 10 Hz to 55 Hz, total test duration 30 min
Shock		EN 60068-2-27
	without shockmount	30 g for 11 ms, 18 shocks/three positions
Maximum altitude above sea level		EN 60068-2-40
	during operation	3500 m, test condition 700 mbar
	during transport/storage	5000 m, test condition 550 mbar -40°C, test duration 2 h
<b>Mechanical data</b>		
Dimensions (W × H × D)	including handles	483 mm × 88 mm × 502 mm (19.0 in × 3.5 in × 19.8 in)
	from rear edge of front panel	483 mm × 88 mm × 445 mm (19.0 in × 3.5 in × 17.5 in)
Weight	for the three models	approx. 8 kg (17.6 lb)
<b>Hardware and software for R&amp;S®GV4000 configuration tool</b>		
Hardware	processor	Intel Pentium D/AMD Athlon or better
	RAM	1 Gbyte or more
	hard disk	20 Mbyte free disk space
	interface	1 serial port (RS-232-C)
	cable	null-modem cable to connect the R&S®GV4000 with PC with the R&S®GV4000 configuration software
Software	operating system	Windows
	other software	VC++ 2008 SP1 Redistributable (vcredist_x86.exe) and Adobe Reader 8.0 or later for viewing online software manual

# Ordering information

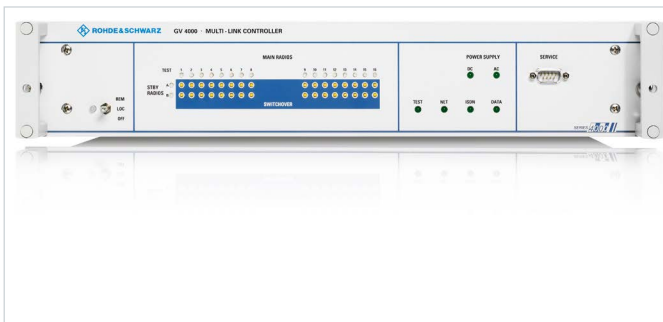
Designation	Type	Order No.
<b>Hardware</b>		
Multi-Link Controller, hardware for 8+2 radio redundancy, AC/DC, 19"; 2 HU	R&S®GV4000A	6106.8202.31
Multi-Link Controller, hardware for 16+2 radio redundancy, AC/DC, 19"; 2 HU	R&S®GV4000A	6106.8202.32
Multi-Link Controller, hardware for 2 × (8+2) radio redundancy, AC/DC, 19", 2 HU	R&S®GV4000A	6106.8202.33
<b>Software</b>		
Software for one R&S®GV4000A for n+m redundancy for R&S®Series4200 radios, including software for configuration tool	R&S®GV4000-S	6106.8319.02

The systems described are hardware- and software-configurable. The system confirmed in the order will be delivered.

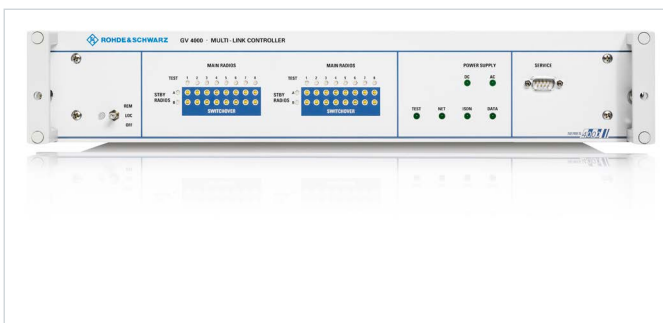
Your local Rohde&Schwarz expert will help you determine the optimum solution for your requirements and will be glad to provide you with a customized quotation. To find your nearest Rohde&Schwarz representative, visit [www.sales.rohde-schwarz.com](http://www.sales.rohde-schwarz.com)



Model .31



Model .32



Model .33

## Service that adds value

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

## About Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, radiomonitoring and radiolocation. 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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