

Full-range ATC communi- cations system solutions

Communications solutions
for aviation



R&S[®]VCS-4G
Departures



More than four billion air travelers each year put their faith in the quality and reliability of air traffic control. Hardly an aircraft anywhere in the world takes off or lands without relying on radiocommunications equipment from Rohde & Schwarz.



From takeoff to landing, reliable communications are the key to safety in air traffic control

For several decades now, Rohde&Schwarz has supplied radiocommunications systems for a wide range of applications in the aviation sector – from air traffic control and airport communications to airline operational communications, radio test and measurement and the calibration of the equipment used. Rohde&Schwarz has built itself a strong reputation in this safety-critical sector through the outstanding availability and performance of the systems, subsystems and equipment it supplies – a key factor today as the density of air traffic continues to increase steadily.

At the same time, we offer our customers maximum safety of investment. As an independent, global and economically robust company, Rohde&Schwarz is a dependable long-term partner for customers in the aviation sector. The company and its comprehensive portfolio of quality products and solutions possess all the relevant licenses and certifications to serve the industry's requirements.

An optimum product and service portfolio

For air traffic control agencies, airport operators, service providers and the armed forces, absolute system availability is paramount in flight operations. To meet this need, Rohde&Schwarz offers customers an optimized portfolio of solutions and services. It covers five key capabilities, described in the sections that follow:

System capabilities

Voice communications

Data communications

Networking

Radiomonitoring and radiolocation

Equipped with the latest specialist knowledge and many years of experience, our engineers design and implement air traffic control communications systems that provide exceptional availability in live operations, even in the toughest environments. They are committed to creating supremely reliable products and to providing appropriate redundancy systems. As a result, Rohde&Schwarz helps to sustain and improve the high standards of safety in international aviation.

With almost 400 000 takeoffs and landings and 32.7 million passengers in 2009, Munich airport ranks as one of the top ten aviation hubs in Europe. The airport relies on equipment from Rohde&Schwarz for reliable ground-to-air communications.



System capabilities



From complete systems to individual products

Air traffic control organizations need complete systems carefully designed to meet their needs so that they can concentrate on their core activities. The perfect integration of the equipment in these systems is crucial to achieving optimum performance.

Rohde&Schwarz provides customers a breadth and depth of system expertise accumulated over a period of several decades. The levels of service we offer encompass everything from the overall responsibility for the implementation of turnkey projects to system integration services and the supply of high-quality products.

Our system integration services are not confined purely to Rohde&Schwarz products: They also extend to third-party products that customers may need. We have long-standing partnerships with a number of suppliers – partnerships that can benefit our customers.

We also believe firmly in collaborating closely with customers and local partners to ensure that the installations we supply are optimally tailored to real-life requirements at the local, regional or national level. Here, the network of Rohde&Schwarz subsidiaries and offices around the world plays an important role: This extensive presence means we are familiar with specific local factors and requirements and can respond rapidly to customer needs, both during and after project delivery.

Our portfolio: the five pillars of systems business

Conceptual planning

- Analysis of operational and technical requirements
 - System availability
 - Redundancy concepts
 - Collocation
 - Power supply
 - Remote control and remote monitoring
 - Network technology
 - Air conditioning
 - Site selection and space requirements
 - Safety
 - Integration with voice communications and transmission systems
- Feasibility studies
- Drafting and design of the system solution
- Structured security architecture

Project management

- Project planning
- Project implementation
- Project finalization
- Factory and on-site acceptance tests

Products

- VHF/UHF and HF radios
- Voice communications systems (VCS)
- System elements such as filters, combiners, racks and antennas
- Professional mobile radio networks for ground and service personnel
- Fixed and mobile towers
- Radiomonitoring receivers and air traffic control direction finders

Communications system integration

- Integration into the nationwide communications system
- Solutions for remote operation, control and monitoring
- Assurance of high system availability
- Infrastructure and construction work

Integrated logistics

- Nationwide service and support
- Spare parts and logistics system
- Test and measurement solutions for safeguarding system availability

The perfect single-source solution for your requirements

Voice communications system (VCS)

The R&S®VCS-4G from Rohde & Schwarz is an IP-based voice communications system (VCS) that reliably connects air traffic controllers with radio sites and other area control centers (ACC). The system is highly scalable and can therefore be deployed in control towers of any size as well as in ACCs and backup systems.

Audio control units

For small-scale systems, Rohde & Schwarz offers the R&S®GB208 control unit. It can be used at controller working positions to transmit and receive on multiple channels without the need for an additional VCS.

Remote control units

Air traffic controllers can set the operating parameters on R&S®Series4200 radios quickly and directly with a device such as the R&S®GB4000T remote control unit. The radios are controlled remotely using a touchscreen.

VHF/UHF and HF radios

Rohde & Schwarz offers a full range of state-of-the-art radio families covering all of the frequency bands commonly used in aviation and ground radio (see pages 8, 9 and 20).

R&S®RCMS II remote control and monitoring system

The R&S®RCMS II remote control and monitoring system from Rohde & Schwarz offers ATC radio system operators solutions for controlling and monitoring their entire radiocommunications network, either from a single, central location or from a number of dispersed workstations.



Antennas, multicouplers, circulators

The Rohde & Schwarz portfolio also includes a wide variety of antennas and RF components (e.g. the R&S®ATCMC8/16 multicoupler), as well as relays and circulators that can be deployed as needed, depending on local conditions and requirements.

Line amplifiers

To ensure high analog and digital signal quality during transmission from controller working positions to radio sites, we offer a range of products for signal distribution, signal amplification and impedance matching such as the R&S®GH215A audio line amplifier.

System racks

At remote radio locations, all the equipment is built into preconfigured and prewired racks such as the R&S®KG4200. Redundancy solutions help to safeguard high radio channel availability.

Test and measurement solutions

Besides best-in-class radios, Rohde & Schwarz offers a comprehensive range of system products and test and measurement equipment for deploying, operating, monitoring and maintaining complete radiocommunications systems (see page 22).

Air traffic control direction finders

The latest generation of R&S®DDF04E digital direction finders for air traffic control enables users to take the bearings of multiple aircraft simultaneously using just one direction finder. This capability offers important savings in terms of space and money.

Mobile tower

One exceptional product from Rohde&Schwarz is the R&S®MX400 mobile tower, designed for use in critical situations. This tower is a turnkey, container-based air traffic control communications system – complete with everything from operator microphones to antennas. It is designed and optimized for rapid deployment and is capable of long-term operation in any weather conditions.

The mobile tower is fitted with the same advanced radios as are used in stationary installations. The tower is suitable for both military and civil use, and customers can choose which equipment they wish to have installed. Besides R&S®Series4200 radios, the tower can also be equipped with R&S®M3SR Series4400 multiband radios.



Radiomonitoring receivers

As a world-leading manufacturer of radiomonitoring equipment, Rohde&Schwarz markets numerous devices and systems for monitoring radio traffic and identifying and locating interference sources.

Test systems for servicing radio equipment

Our product portfolio includes customized test systems designed to enable fast and independent servicing and maintenance of R&S®Series4200 radios by ATC service organizations.

Safeguarding system availability

The Rohde&Schwarz approach to system design focuses on providing high-availability solutions that are based on reliable equipment and on redundancy strategies tailored to customers' needs and requirements. Besides their built-in system availability, our solutions are designed to ensure high overall lifetime availability.

Before a radiocommunications system can begin live operation, equipment needs to be calibrated and put through numerous tests. This is essential in order to ensure that equipment functions perfectly and in accordance with its intended use. Regular maintenance, too, is important to sustain system availability over the long term.

As a manufacturer of radiocommunications systems and as a world-leading vendor of RF test and measurement equipment, Rohde&Schwarz has all the expertise and skills to reliably test not just conventional analog systems but also the very latest in digital equipment and to maximize system performance. One challenge lies in ensuring that a large number of radio channels can be used concurrently without causing problems. Building an interference-free system has a lot to do with meticulous design based on years of experience. For absolute certainty, our T&M equipment can be used to verify performance.

Outside radio interference affecting a communications system and caused, for example, by short-duration emissions from faulty equipment or by unauthorized radiocommunications can be swiftly identified and eliminated using broadband radiomonitoring receivers from Rohde&Schwarz.

As a market leader in electromagnetic compatibility (EMC) test and measurement systems, we also have comprehensive expertise and the products required for measuring the mutual influence between electronic components. Customers with their own maintenance and repair facilities can find an extensive selection of measuring equipment and systems for lab and field use in the Rohde&Schwarz portfolio, including tailored test systems.

High-performance test and measurement equipment such as the R&S®EVS300 ILS/VOR analyzer helps to ensure the long-term reliability of ATC solutions.





Voice communications

VHF/UHF voice communications

R&S® Series4200

The R&S® Series4200 is our most recent generation of digital, software defined radios for civil air traffic control in the VHF band and for military air traffic control in the UHF band. The radios are capable of handling voice communications between air traffic controllers and pilots throughout every phase of a flight. The air traffic controllers are connected to the radio stations sited at airports and at remote locations over a VCS – a setup that enables comprehensive, nationwide radio coverage encompassing all flight levels.



Voice communications systems

R&S®VCS-4G

The new R&S®VCS-4G is a voice communications system that provides the entire infrastructure from the controller working positions to the radios. The R&S®VCS-4G allows communications between air traffic controllers and pilots and offers the full range of ATC features, including intercom and telephony services, as well as interworking to other ATC systems. A key advantage of this fully IP-based communications system is the high level of scalability. This makes it possible to implement configurations ranging from a single controller working position (CWP) up to a fully functional area control center (ACC). In addition, the system provides geographical redundancy.

The R&S®VCS-4G adheres to the EUROCAE standards for the use of the Internet protocol (IP) in ATC voice communications environments. Unlike TDM-based systems with additional VoIP interface, the R&S®VCS-4G has been designed as a true IP solution that takes full advantage of IP technology to provide a cost-effective, future-ready VCS solution. Besides voice communications, the R&S®VCS-4G allows the integration of additional information sources, such as video surveillance of out-of-sight areas, to improve the situational awareness of the air traffic controllers.

Exceptional reliability and low operating costs are the most important requirements to be met by radiocommunications systems. The outstanding RF characteristics of the R&S®Series4200 allow a large number of radios to be concentrated at a single location. Rohde&Schwarz can supply complete systems for radio sites, including antennas, filters, couplers and racks.

R&S®Series4200 radios are also ideal for airport apron communications. Their compact size means that they are easy to install in spite of the often cramped conditions in control towers. Plus, their ability to be operated locally as well as via a remote control unit makes them ideal for use in small-scale systems, which generally do not require a complex VCS.

The R&S®VCS-4G is a reliable, decentralized, high-availability system that can easily and flexibly integrate a variety of applications to deliver a future-ready solution above and beyond pure voice communications. By providing gateways for use with legacy radios and standard VCS, it enables smooth migration of conventional voice communications solutions to IP technology. Due to its high scalability and fully decentralized architecture, this IP-based communications system is a true pay-as-you-grow solution. The overall system costs can be reduced through the extensive use of commercial off-the-shelf (COTS) products.

R&S®GB5400 CWP Processing Unit



R&S®M3SR Series4400

The R&S®M3SR Series4400 is a VHF/UHF radio family designed for civil and military air traffic control as well as other military applications. These radios combine high modularity with outstanding technical specifications. For civil applications, the R&S®M3SR Series4400 systems were developed in line with international civil air traffic control guidelines (EN 300676) while integrating the requirements of EN 302617.

The R&S®M3SR Series4400 offers military customers a wide range of interfaces and associated proprietary frequency hopping waveforms, as well as radiocommunications schemes that conform to NATO standards. To ensure that existing R&S®M3SR Series4400 systems remain up-to-date, their functionality can be enhanced through subsequent software downloads and, if necessary, by using new hardware modules.

With this wide range of functions, the R&S®M3SR Series4400 radio family serves as a seamless communications bridge between the various military forces and civil units.



Advanced, software defined radios: the R&S®Series4200.

TETRA voice communications

The pace of change and the rapidly shifting requirements in aviation today call for adaptable mobile communications systems that can effectively support the efficient management of airport operations. The aim is to find solutions that enable the cross-functional coordination of networked services across the organization – airport ground handling services such as catering, cleaning, security and maintenance, for example.

Rohde&Schwarz Professional Mobile Radio GmbH, a Rohde&Schwarz subsidiary, is one of the world's largest manufacturers of TETRA radio network components. The product and service portfolio includes base stations and exchanges, network planning, project management, installation, startup, customer service and customer training. ACCESSNET®-T, our TETRA mobile radio system, offers a right-fit solution for networking a variety of services. In combination with the airport management system application package, the system provides a quick and easy means of dynamically defining functional groups based on the organizational structure or temporary groups based on specific tasking, and allows these groups to be addressed and organized using different call types.

TETRA systems can support an immense variety of applications by closely combining voice and data services. ACCESSNET®-T, with its open A-CAPI® application interface, is especially flexible in this regard, enabling airport operators to create truly versatile monitoring and control systems (see pages 15 and 23).

ACCESSNET®-T also scales smoothly to support airports of any size. Its outstanding reliability and smart redundancy capabilities provide the kind of high availability that is crucial in an airport environment.

Worldwide HF voice links

The R&S®M3SR Series4100 shortwave radios are a possible counterpart to the HF radios used in the air. These HF software defined radios (SDR) were developed for stationary navy and army applications as well as for civil and military air traffic control and air defense. The radios are designed to support the kinds of extreme simultaneous operation scenarios common at major airports and are therefore the ideal choice when it comes to ensuring overall system availability. They are highly advanced radios that can be adapted to changing requirements by means of software updates – a capability that offers customers exceptional flexibility when rolling out future applications based on their HF radiocommunications systems. The radios are available in various power classes up to 1 kW, and matching shortwave antenna systems are, of course, available from Rohde&Schwarz. The HF radios also have the requisite certifications to enable their use by national ATC operators.

TETRA systems for use at airports must provide high availability and flexibility.





Uninterrupted communications on long-haul flights: the R&S®XK516

Crews on long-haul flights use the R&S®XK516 shortwave transceiver to communicate with air traffic control agencies during flights over oceans and ice caps and to stay in touch with their airline from anywhere in the world. Shortwave's special propagation characteristics even enable interruption-free communications on air routes over the poles, where communications via satellite is not available. This capability means that carriers can pick the most economical routes for intercontinental services yet allow aircraft to maintain permanent contact with air traffic control. Even at longer distances from destinations, crews can request technical or logistical support from their airline well ahead of arrival so that services can be ready and waiting when the aircraft lands. This can help to cut turnaround times on the ground.

Data communications



Greater efficiency and safety

Aviation is a technology-driven industry in which data communications offer significant potential benefits, including greater safety and reliability in flight operations and more efficient operating procedures on the ground.

Rohde&Schwarz is collaborating closely with the bodies and organizations that are driving innovation in the field of data communications.

VHF and UHF data links

In the future, air traffic controllers and pilots will be able to communicate not only via voice but also by sending routine messages as data telegrams via controller pilot data link communications (CPDLC). Based on VDL mode 2 (VHF digital link) technology, CPDLC capability has already been implemented in the R&S®Series4200 radios.

The military use data links such as Link 11 and Link 22 for tactical communications. These links are supported by R&S®M3SR Series4400 radios.

Airline operational communications (AOC)

For airlines, keeping track of crews' and planes' current status and operational readiness is crucial to their ability to manage fleets efficiently. Most carriers do this using the data transmission capabilities provided by every modern aircraft. The planes report their status to airline flight operations centers, which can immediately initiate a response in the event of technical problems, delays and adverse weather conditions.

The networks that carry this data traffic are operated by commercial service providers. The R&S®Series4200 VHF radios incorporate this kind of data capability and can be configured either in the ACARS mode or in the more modern VDL mode.

VDL mode 2 solutions for SITA

SITA (Société Internationale de Télécommunications Aéronautiques) is a service provider that operates a worldwide communications network for airlines. The network enables communications between aircraft in flight or on the ground, airline operations centers and air traffic control centers. The network will be expanded and modernized over the next few years. Based on an international selection procedure, SITA chose to deploy the R&S®XU4200 VHF transceivers of the R&S®Series4200. Because the transceivers are to be installed at locations all over the globe, some remote and difficult to access, they have to be exceptionally reliable and fail-safe so as to keep the need for maintenance to a minimum. To fulfill this requirement, the transceivers are equipped with a precision oscillator that only needs calibration after 15 years of operation.

Just as airlines can use SITA to keep track of their aircraft from the ground, SITA is able to check the technical status of its global radio network at any time.

To support this capability, each R&S®Series4200 radio can be updated, monitored and remote-controlled from a SITA operations center over an IP-based network. This means that software updates and functionality upgrades – to support future data infrastructures or to roll out VHF digital link (VDL) mode 2, for instance – can be accomplished without sending out service personnel to perform the work on site. Parameters, too, can be changed and operating data such as component temperatures can be monitored and read out remotely.



SITA uses R&S®XU4200 VHF transceivers from the R&S®Series4200 in its global radio network.

Worldwide data links over shortwave radio

Parallel to data communications via satellite, shortwave radio is becoming an increasingly popular data transmission medium. Through a cleverly designed network infrastructure on the ground, with transmit/receive installations on every continent, the service provider ARINC has laid the foundations for exploiting shortwave radio and its physical properties to create a modern data communications medium.

HF data links offer clear benefits for users:

- Contact with aircraft anywhere in the world
- Unlimited availability, even over the poles
- High reliability
- Lower costs than a satellite connection

For use on board aircraft, Rohde&Schwarz and partner Honeywell offer the R&S®XK516 HF radio, which incorporates ARINC's data protocol and supports worldwide voice communications (as described on page 11).

Ready for HF data communications

The R&S®XK516 shortwave radio is designed to be installed in aircraft to enable them to reliably maintain HF data communications worldwide.



Data communications solutions with TETRA

Organizing airport operations efficiently calls for flexible, data-enabled radiocommunications solutions that allow a full range of ground services to be coordinated through a centrally managed system. TETRA-based radio systems can be customized exactly to meet this need. One of the hallmarks of our ACCESSNET®-T system is the flexibility it offers in mapping customers' operating processes to tailored data applications. One such application is the airport management system, described on page 10, which has already proven its qualities in live airport operations.

The A-CAPI® application interface allows a wealth of additional functions to be implemented, ranging from remote monitoring and remote control of technical installations to personal security applications and the tracking and transmission of personnel location data.

Smart use of ACCESSNET®-T can help to streamline operating procedures and reduce operating costs.

The ACCESSNET®-T system enables airports to centrally network all their ground services for maximum safety.



Networking



VCS integration

With national telecommunications service providers phasing out their narrowband leased lines, ATC authorities can no longer rely on these lines to interconnect their VCS and radio sites. Many ATC authorities already operate IP-based networks to transmit radar and other data. By deploying the R&S®VCS-4G, they will be able to transmit voice and data over a single, IP-based network.

Due to its high scalability and fully decentralized architecture, the Rohde&Schwarz VCS system is a true pay-as-you-grow solution. The overall system costs can be reduced through the extensive use of commercial off-the-shelf (COTS) products.

The R&S®VCS-4G supports remote control and monitoring of the R&S®Series4200 and R&S®M3SR Series4400 software defined radios as standard. Air traffic controllers can monitor the radio status and also change radio frequencies remotely if required. More remote control operations and other radio types can be integrated at any time.

Remote control and monitoring system

R&S®RCMS II

The R&S®RCMS II remote control and monitoring system enables personnel in civil and military air traffic control and in air defense to remotely control and monitor Rohde&Schwarz radios from a single location or from multiple locations across a country. The software's features include the ability to load operating parameters for various ATC scenarios and to query the technical status of the radios. In the event of an error, it can also provide exact information on the type of error and the error location. This allows precise remote diagnosis and efficient deployment of maintenance personnel. The software additionally logs operating status and error messages, allowing a detailed analysis to be carried out if necessary.

The system is scalable (which means it can support anything from a single airport all the way up to a nationwide air traffic control system) and can be adapted to meet specific customer requirements.



The R&S®RCMS II remote control and monitoring system makes it possible to control and monitor Rohde&Schwarz radios from one or more locations.

Radiomonitoring and radiolocation



Digital direction finding

In spite of today's high-precision radio navigation systems, methods of clearly identifying aircraft, and the data processing power available in control centers, situations continue to arise that call for radio direction finding and its identification capabilities. Here, modern digital radio direction finders play an indispensable role. The R&S®DDF04E, the most recent generation of air traffic control direction finders on the market, makes it possible to simultaneously take bearings on multiple channels with just one direction finder.

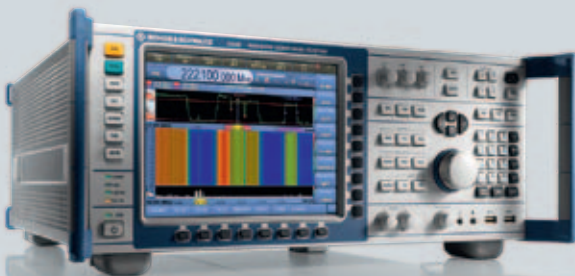
Wide-aperture DF antennas with nine antenna elements in combination with correlative interferometer direction finding provide high DF accuracy, sensitivity and immunity to reflections. The R&S®DDF04E's wideband functionality allows simultaneous direction finding on as many as 32 channels with the same high level of performance. The direction finder includes control software for the flexible management of the frequency channels.

Equipment for troubleshooting

Radio equipment is the key component in an air traffic control system and has to operate reliably 24 hours a day, seven days a week. As a system planner and integrator, Rohde&Schwarz takes every step to exclude system malfunctions as far as possible and builds redundant components into its systems to render faults harmless if they do occur. Failures or malfunctions of third-party equipment, however, are impossible to preclude or prevent. When they happen, they need to be dealt with swiftly and effectively, and this calls for a precise understanding of the nature and origin of the fault. The Rohde&Schwarz portfolio of radiomonitoring and direction finding equipment provides comprehensive and reliable tools for gathering the necessary information.

R&S®ESMD wideband monitoring receiver

The R&S®ESMD is a wideband monitoring receiver designed specifically for signal search, radiomonitoring and spectrum monitoring in line with ITU recommendations. It is equally suited for mobile and stationary use. Its operation and functionality are both optimized for monitoring. Adaptable functions make the receiver also suitable for realtime signal analysis, for example.



R&S®PR100 portable receiver

The R&S®PR100 is a portable receiver built specifically for mobile radiomonitoring applications. Its operation and functionality are optimized for monitoring. The receiver is also capable of being used in numerous other applications.



ATC portfolio

Voice communications



R&S®VCS-4G

next-generation, IP-based voice communications solution

The new R&S®VCS-4G IP-based voice communications system has been designed specifically to meet the requirements of area control centers (ACC), backup systems and airport towers. It offers the same features as conventional VCS systems, including radiocommunications, intercom and telephony.

- ▮ Fully IP-based communications solution, from the controller working position to the radio
- ▮ Compliance with the EUROCAE ED137 standard for use of VoIP in ATC environments
- ▮ Decentralized system architecture for maximum availability and pay-as-you-grow scalability
- ▮ Future-ready solution that flexibly and easily integrates a wide variety of applications above and beyond pure voice communications
- ▮ Smooth integration into existing ATC systems to safeguard capital investment
- ▮ Reduced system costs through extensive use of COTS products

Radiocommunications



R&S®Series4200

software defined radios

The R&S®Series4200 represents the latest generation of stationary, digital, software defined radios for both civil and military air traffic control. Possible applications range from small airport emergency systems requiring only a few radio channels to countrywide radiocommunications systems with several hundred radio channels.

- ▮ VHF frequency range from 112 MHz to 156 MHz
- ▮ UHF frequency range from 225 MHz to 400 MHz
- ▮ Output power of 50 W for VHF and UHF
- ▮ Automatic main/standby operation
- ▮ USB service port for configuration and software downloads
- ▮ Remote control and remote monitoring via Ethernet interface
- ▮ Suitable for data transmission in line with VDL mode 2 standard
- ▮ Connection via E1 and voice over IP



R&S®M3SR Series4100

software defined radios for HF

The R&S®M3SR Series4100 radios are software defined radios (SDR) for civil and military air traffic control, air defense, navy and army applications in the HF range.

- ▮ Frequency range from 1.5 MHz to 30 MHz
- ▮ Designed to support extreme simultaneous operation requirements
- ▮ NATO HF House embedded in software
- ▮ ALE 2G, ALE 3G
- ▮ Frequency hopping capability in line with R&S®SECOM-H
- ▮ Interfaces for NATO and non-NATO encryption devices
- ▮ Data transmission over IP
- ▮ Data rates up to 19.2 kbit/s
- ▮ MTBF > 9000 hours



R&S®M3SR Series4400 software defined radios for VHF/UHF

The R&S®M3SR Series4400 radios are software defined radios (SDR) for civil and military air traffic control, air defense and navy applications in the VHF/UHF range.

- ▮ Frequency range from 100 MHz to 512 MHz
- ▮ Designed to support extreme simultaneous operation requirements
- ▮ Frequency hopping capability in line with HAVE QUICK I/II, SATURN, R&S®SECOS
- ▮ Interfaces for NATO and non-NATO encryption devices
- ▮ IP-based remote control protocols
- ▮ Data rates up to 1.2 Mbit/s (with external modem)
- ▮ MTBF > 20000 hours



R&S®RCMS II remote control and monitoring system

R&S®RCMS II enables operators of civil and military air traffic control (ATC) and air defense systems to remotely monitor and control Rohde&Schwarz radios from one or more locations. The software's features include the ability to load operating parameters for various ATC scenarios and to query the technical status of the radios. In the event of an error, it can also provide exact information on the type of error and the error location.

- ▮ Additional hardware for remote monitoring and controlling not required at the individual radio sites
- ▮ Remote control and monitoring of civil radios and military radios with frequency hopping
- ▮ Redundant system for continuous remote control and monitoring
- ▮ Overall status reports to upper-level monitoring system via SNMP



R&S®GB4000T control unit for R&S®Series4200

The R&S®GB4000T control unit is designed for high user convenience and is used for the remote control of R&S®Series4200 radios. It is based on an industrial PC with an integrated 7" touchscreen display, which is used for entering information to control the radio. The R&S®GB4000T is connected to the radio via an IP network, allowing users to monitor the status of the radio and to set operational parameters such as frequency and output power. The R&S®GB4000T is a reliable and easy-to-use tool for air traffic controllers and helps them to accomplish their everyday tasks.

- ▮ Control of up to nine user-configurable R&S®Series4200 radios via LAN
- ▮ Display of the radio status (Go/NoGo, carrier, squelch)
- ▮ Selection of six user-configurable channels per radio
- ▮ Input and configuration via touch panel and color display
- ▮ Three user levels: controller, supervisor, administrator
- ▮ Separate, password-protected access to each user level



R&S®XK516/FK516

shortwave radio system

The R&S®XK516/FK516 is a 400W shortwave radio system designed for use in long-haul aircraft. Besides conventional voice communications, the system supports data communications in line with the ARINC 635 standard. The system consists of an R&S®XK516 radio (to be mounted in the aircraft's avionic bay) and the R&S®FK516 directional coupler, which installs in the vertical tail surfaces. The radio is controlled via an integrated HMI in the plane's cockpit.

- ▀ Frequency range from 2 MHz to 30 MHz
- ▀ Tuning increments of 100 Hz
- ▀ Transmit power of 400 W PEP
- ▀ Data transmission in line with ARINC 635
- ▀ Data rates up to 1800 bit/s
- ▀ Transceiver housing in line with ARINC 600, 6 MCU
- ▀ Digitally controlled antenna coupler with vacuum relay
- ▀ Coupler for capacitive and inductive aircraft antennas



R&S®FSH

handheld spectrum analyzer

The R&S®FSH is a rugged, compact spectrum analyzer designed for highly mobile use. Its low weight, its ease of use and the large number of measurement functions make it an indispensable tool for anyone needing an efficient measuring instrument for outdoor use.

- ▀ Frequency range from 9 kHz to 3.6 GHz or 8 GHz
- ▀ High sensitivity (< -141 dBm (1 Hz), with preamplifier < -161 dBm (1 Hz))
- ▀ Low measurement uncertainty (< 1 dB)
- ▀ Measurement functions for all important measurement tasks related to the startup and maintenance of transmitter stations
- ▀ Internal tracking generator and VSWR bridge with built-in DC voltage supply (bias)
- ▀ Two-port network analyzer
- ▀ Easy-to-replace Li-ion battery for up to 4.5 hours of operation
- ▀ Rugged, splash-proof housing for mobile use
- ▀ Easy handling due to low weight (3 kg with battery) and easy-to-reach function keys
- ▀ Saving of measurement results on SD card
- ▀ LAN and USB interfaces for remote control and transfer of measurement data
- ▀ R&S®FSH4View software for simple documentation of measurement results



R&S®FSMR

measuring receiver

All-in-one solution for the calibration of signal generators and attenuators

- ▀ Frequency range from 20 Hz to 3/26.5/50 GHz
- ▀ High level linearity of 0.005 dB deviation per 10 dB for precise calibration of level and attenuation
- ▀ Wide level measurement range from +30 dBm to -130 dBm
- ▀ Direct connection of power sensors for accurate power measurements
- ▀ Power sensor module with integrated power splitter
- ▀ Measurement of modulation depth, frequency deviation and phase deviation with < 1 % measurement uncertainty
- ▀ Audio analysis with automatic measurement of modulation frequency, THD and SINAD
- ▀ Display of audio signals and demodulated signals in frequency and time domain
- ▀ Audio input for calibration of modulation generators
- ▀ Fast RF frequency counter with 0.01 Hz resolution
- ▀ Control of all functions incl. power meter from front panel or remote control via LAN or IEC/IEEE bus
- ▀ Full-featured spectrum analyzer



R&S®EVS300

ILS/VOR analyzer

The R&S®EVS300 is a portable level and modulation analyzer designed especially for starting up, checking and maintaining ILS, VOR and marker beacon systems. Its extensive selection of software options enables users to analyze signals in the frequency and time domain without additional test and measurement equipment.

- ▀ High-precision level and modulation measurements
- ▀ GPS, trigger and remote control interfaces
- ▀ Large realtime data memory
- ▀ Two independent measurement channels (option)
- ▀ Support for R&S®NRT and R&S®NRP power sensors

TETRA communications



ACCESSNET®-T DIB-500 R4.1

TETRA base station

Its excellent performance and redundancy capabilities make the ACCESSNET®-T DIB-500 R4.1 the ideal base station to ensure radio coverage in mission-critical TETRA networks of any size. When used indoors, it perfectly complements the mobile and outdoor versions.

- ▀ RX/TX frequency ranges from 380 MHz to 486 MHz, RX from 806 MHz to 876 MHz, TX from 851 MHz to 921 MHz (others on request)
- ▀ Requirement-specific scaling from 1 to 8 TETRA carriers
- ▀ Excellent radio characteristics, outstanding receiver sensitivity
- ▀ TETRA air interface encryption (TAE), end-to-end encryption
- ▀ Transmission power settable up to 50 W at transmitter output
- ▀ Multipath reception (diversity)
- ▀ Maximum availability (e.g. fallback operation and redundant network connections)
- ▀ Complete remote monitoring and configurability

Crypto solutions



ELCRODAT 6-2

ISDN encryption system

The ELCRODAT 6-2 provides secure voice and data communications in Euro-ISDN.

- ▀ High-end encryption system for telephone, fax, data and video communications
- ▀ Online transmission of information from UNCLASSIFIED to TOP SECRET
- ▀ Two versions available: one for Euro-ISDN basic rate access and one for Euro-ISDN primary rate access



R&S®DDF04E
digital direction finder for
traffic control

The R&S®DDF04E represents the new generation of traffic control direction finders. Radio direction finding for air and maritime traffic control is performed simultaneously on multiple frequency channels using only one direction finder.

- ▮ Parallel direction finding on up to 32 channels
- ▮ Seamless coverage of a wide frequency range from 100 MHz to 450 MHz with only one DF antenna
- ▮ Future-ready due to simple change of the receive frequency and number of channels via the control software, as well as due to the forthcoming 8.33 kHz channel spacing that is already integrated
- ▮ Standard PCs, monitors and network technology for control and display
- ▮ Flexible networking of direction finder, data server and display units via Ethernet
- ▮ Output of results on radar displays and in traffic management systems via an RS-232-C or TCP/IP interface



R&S®ESMD
wideband monitoring receiver

The R&S®ESMD is a wideband monitoring receiver designed specifically for signal search, radiomonitoring and spectrum monitoring in line with ITU recommendations. It is equally suited for mobile and stationary use. Its operation and functionality are both optimized for monitoring. Adaptable functions make the receiver also suitable for realtime signal analysis.

- ▮ Frequency range from 20 MHz to 3.6 GHz, optionally 9 kHz to 26.5 GHz
- ▮ 20 MHz realtime bandwidth, optionally 80 MHz
- ▮ RF spectrum with scan rates up to 100 GHz/s (300 GHz/s with 80 MHz option)
- ▮ IF spectrum from 1 kHz to 20 MHz (optionally 80 MHz)
- ▮ Polychrome IF spectrum for reliable detection of pulsed signals
- ▮ DDCs for analyzing and recording individual communications channels (up to 1 MHz bandwidth)
- ▮ Video spectrum for displaying demodulated signals
- ▮ Separate paths for demodulation, level measurement and IF panorama
- ▮ Wideband demodulation for correct level measurement, even with extremely short pulses
- ▮ Waterfall display for all spectra
- ▮ Comprehensive preselection for optimum reception even in dense scenarios
- ▮ ITU-compliant, excellent reception performance
- ▮ Expandable platform



R&S®PR100
portable receiver

The R&S®PR100 portable receiver has been specifically designed for mobile radiomonitoring applications. The receiver's functionalities and control concept have been optimized for monitoring tasks. In addition, it can be used for a variety of other applications.

- ▮ Fast panorama scan across the entire frequency range from 9 kHz to 7.5 GHz
- ▮ 10 MHz IF spectrum and demodulation with bandwidths from 150 Hz to 500 kHz
- ▮ Spectrum and spectrogram (waterfall) display on 6.5" color screen
- ▮ Storage of measurement data to SD card in receiver
- ▮ LAN interface for remote control and data output
- ▮ Ergonomic and rugged design for portable use
- ▮ Low weight of only 3.5 kg (including battery)
- ▮ Location of emissions by means of the R&S®HE300 active directional antenna

References

The decision to award a contract for an ATC radiocommunications system to a systems supplier has to be based on trust. Before placing an order, customers need to be able to verify that a supplier has the requisite experience in delivering international projects and can provide credible references.

Rohde&Schwarz has international reference customers in the field of **air traffic control**, for example in the following countries:

- Germany
- Austria
- Switzerland
- Belgium
- Poland
- Spain
- Sweden
- France
- Russia
- Ukraine
- Kazakhstan
- Saudi Arabia
- Australia
- China
- Egypt

Reference customers for TETRA systems at airports:

- Hanover Airport
- Geneva International Airport

As a **communications service provider for airlines**, Rohde&Schwarz is currently implementing a large project for the worldwide radio network of SITA (Société Internationale de Télécommunications Aéronautiques), for example (see page 13).

Developing tomorrow's standards

Rohde&Schwarz plays an active part in numerous international standardization bodies and initiatives in order to ensure that its products and solutions remain on the cutting edge of technological advances.

National and international telecommunications standardization bodies

- European Organization for Civil Aviation Equipment (EUROCAE)
- Radio Technical Commission for Aeronautics (RTCA)
- European Telecommunications Standards Institute (ETSI)
- International Telecommunication Union (ITU)
- Participation in other European and NATO bodies involved in aviation studies and standardization initiatives

Professional mobile radio

- Member of the TETRA Association
- Member of the Board of Directors of the German Association of Professional Mobile Radio (PMeV)

References that speak for themselves: Rohde&Schwarz has completed major projects in numerous countries.



Service, logistics and support

For users, the operational readiness and availability of their radiocommunications systems are of central importance. Rohde&Schwarz has a global service, logistics and support network with subsidiaries and offices in more than 70 countries to provide local, on-site customer care.

Rohde&Schwarz offers customers flexible, individually tailored service packages spanning a product's entire life cycle and operating life to ensure maximum system availability at minimum cost. Services include:

- ▮ Definition and optimization of maintenance concepts aligned to customer-specific requirements
- ▮ Spare parts service including inventory quantity proposal and optimization of inventory locations
- ▮ Detailed system and equipment documentation
- ▮ Spare parts data and catalogs
- ▮ User and maintenance training
- ▮ Computer-based training (CBT)
- ▮ On-site repair, calibration and customer support services
- ▮ Support and test equipment (S&TE)
- ▮ Configuration and obsolescence management



Rohde&Schwarz has considerable experience in these areas of logistics and can adapt its services flexibly to meet specific customer requirements and deliver optimized support. Customers benefit from maximum system availability at minimum cost.

The Rohde & Schwarz advantage:

- ▮ Long-term trusted partnerships
- ▮ High-reliability, high-availability radiocommunications solutions
- ▮ Transparent, low life cycle costs and logistics costs



Service you can rely on

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

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