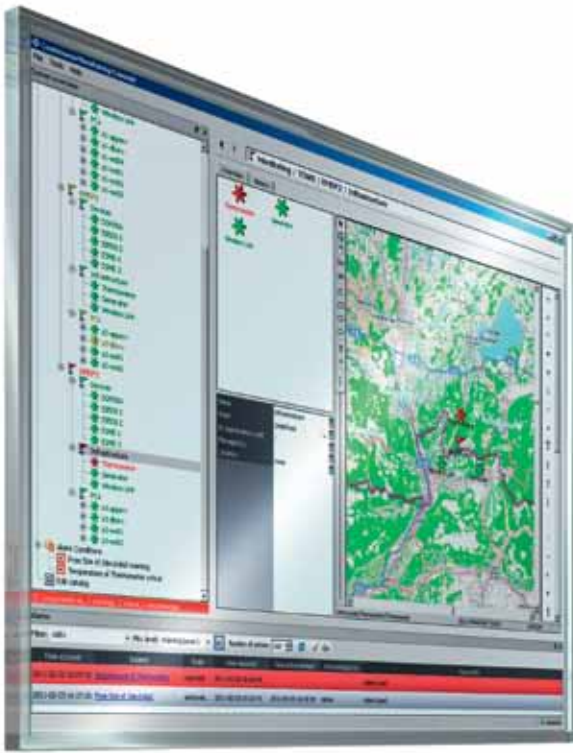


# R&S®RA-CM Continuous Monitoring Software

## Status monitoring of complex COMINT systems



# R&S®RA-CM Continuous Monitoring Software At a glance

The R&S®RA-CM continuous monitoring software serves two purposes: First, it fully automatically monitors complex communications intelligence (COMINT) systems and outputs warnings and alarms to operators if system components approach or reach critical operating states. Second, it assists maintenance personnel in pinpointing sources of error, thus enabling efficient fault diagnosis.

Complex COMINT systems are made up of a large number of components, including sensors, system devices, PCs/ servers, software applications, databases, infrastructure and network components. Monitoring the operating status of the main system components is vital to ensure smooth and uninterrupted system operation. This is where the R&S®RA-CM continuous monitoring software comes in. This software, which is part of the R&S®RAMON software family, is typically used to monitor complex COMINT sys-

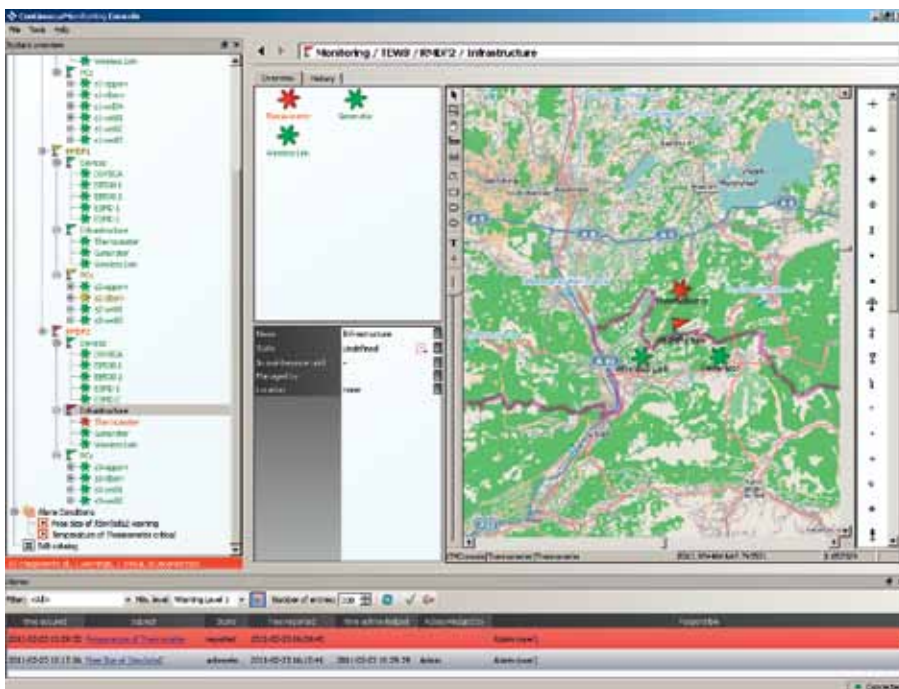
tems, which include a large number of components that may be distributed over multiple locations. R&S®RA-CM is also suitable for monitoring unattended small systems or remote sensors.

R&S®RA-CM's main purpose is to monitor system parameters. It measures parameters and compares results against user-defined thresholds. If a measured value exceeds or falls below a predefined threshold, R&S®RA-CM generates a warning or an alarm that is output acoustically and optically at the operator's workstation. R&S®RA-CM can also automatically generate a text message or an e-mail to inform the operator of a critical condition. A warning or an alarm will be output, for example, if a defined temperature is exceeded in an unattended shelter or if a server's hard disk attains a defined filling level. An alarm will be generated upon failure of a device, a data link, or a door contact in an unattended shelter.

R&S®RA-CM offers a wide range of analysis tools. For example, measured values can be shown versus time, or database searches can be performed using defined filter criteria. This helps the system administrator carry out maintenance work and identify frequently occurring errors.

## Key facts

- Remote monitoring of all relevant system parameters of complex COMINT systems
- Management of threshold values for the generation of warnings and alarms
- Representation of measured values versus time
- Extensive database searches
- Forwarding of status information via text messages or e-mail



# R&S®RA-CM

## Continuous Monitoring Software

### Benefits and key features

#### Continuous monitoring of complex COMINT systems

- Central management of system parameters of complex COMINT systems (HF/VHF/UHF/SHF and SatMon)
- One software module for monitoring a variety of system parameters
- Long-term storage of system parameters
- Quick overview of system status

▷ [page 4](#)

#### Evaluation of status information of complex COMINT systems

- Definition of thresholds
- Early detection and signaling of critical states and conditions
- Representation of measured values and their characteristics versus time

▷ [page 8](#)

#### Powerful interfaces

- Full integration into COMINT systems (HF/VHF/UHF/SHF and SatMon)
- Hierarchical databases in distributed systems
- Report generation

▷ [page 10](#)

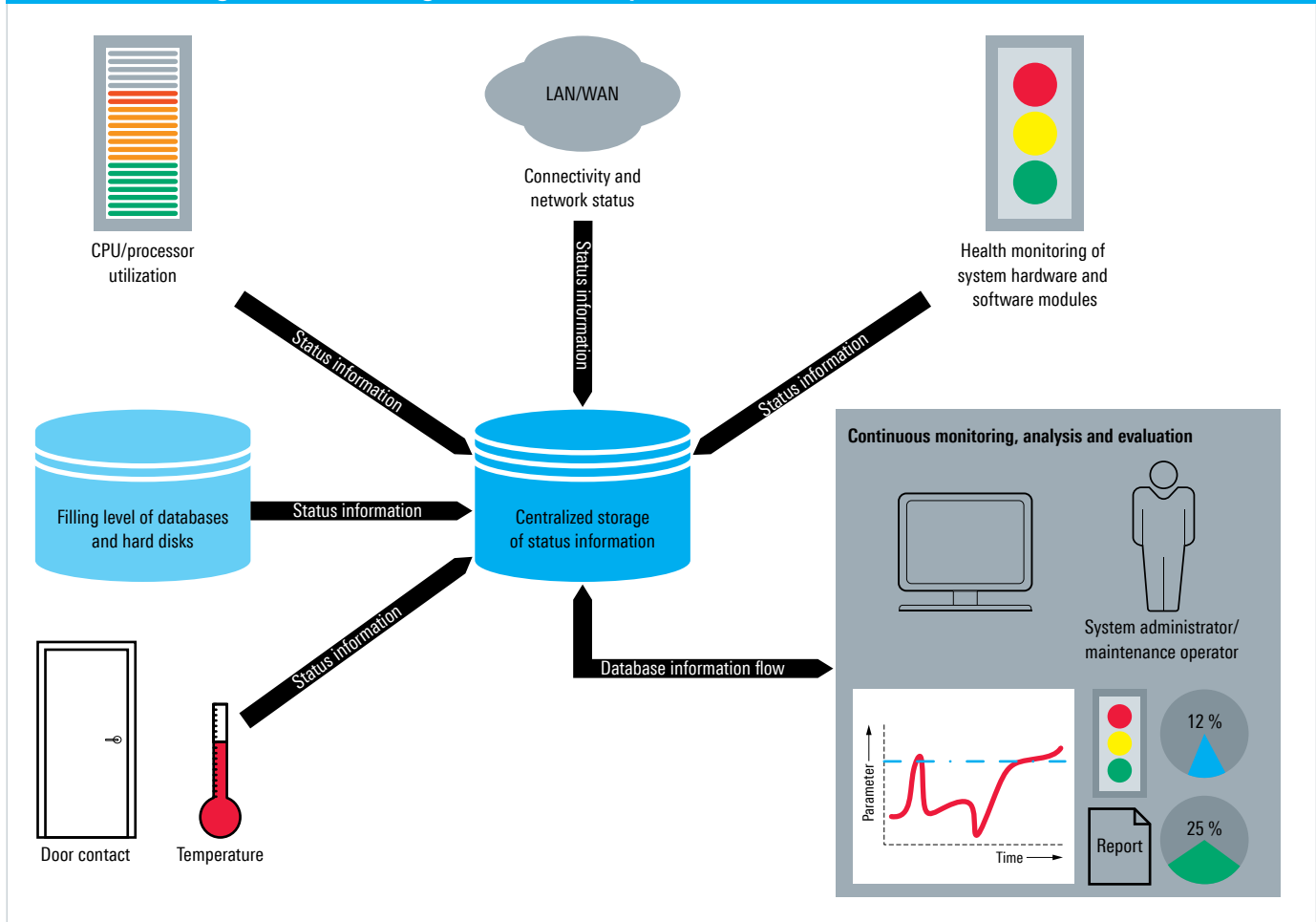
# Continuous monitoring of complex COMINT systems

## Central management of system parameters of complex COMINT systems (HF/VHF/UHF/SHF and SatMon)

Complex COMINT systems include a large number of components that interact with one another and mutually influence each other. Important components and associated operating states are listed below:

- General equipment status (e.g. door contacts, temperature, humidity, smoke detectors, air pressure, fuel level indicator, power supply)
- Storage media and databases (e.g. free capacity of external and internal storage media, free virtual memory capacity, database status)
- Processors (e.g. utilization of operator PCs, system servers, database servers, or processor clusters)
- Network (e.g. accessibility of system components/ IP addresses, availability of transmission bands for microwave, SatCom or other, wirebound networks, loading of network links)
- Equipment hardware (e.g. status information about receivers, direction finders, demodulators or analyzers, BITE)
- System software (e.g. status information about drivers, processes)

### Centralized storage and monitoring of all relevant system conditions



R&S®RA-CM collects the above status information and stores it continuously to a central database.

### One software module for monitoring a variety of system parameters

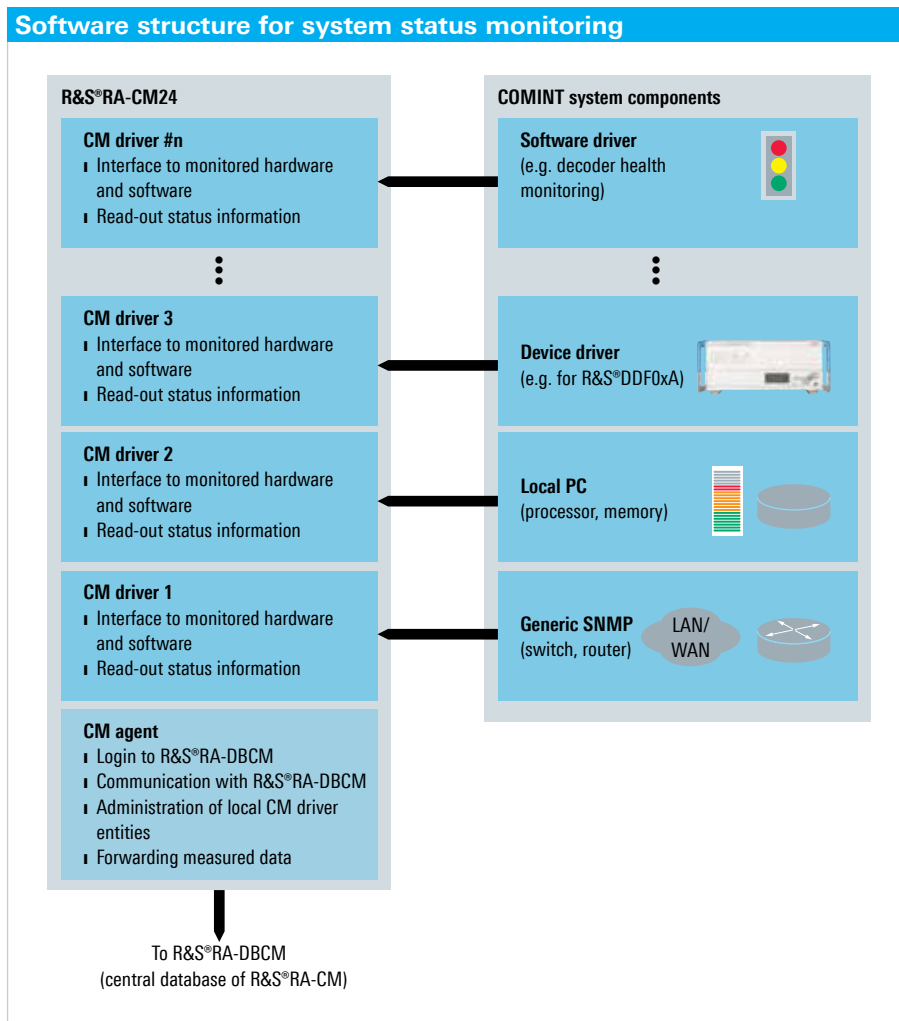
The R&S®RA-CM24 software module provides the interface between the central database of the R&S®RA-CM continuous monitoring software and the components of the monitored system. The software module consists of an agent and associated drivers.

The agent is a service that manages all local continuous monitoring (CM) drivers, handles data exchange with the R&S®RA-DBCM database and automatically registers with this central database.

A CM driver is a software module that provides the interface to a monitored device or software application, reads relevant status information from the device or application and forwards this information to the agent. The agent transfers the information to the local database allocated to it. Usually, one CM driver handles one object (device or software application) to be monitored.

The agent compares the incoming data against preconfigured thresholds. If a measured value exceeds or falls below a predefined threshold, the agent outputs a message to the local database.

System administrators can edit the thresholds stored in the R&S®RA-DBCM central database via a user interface.



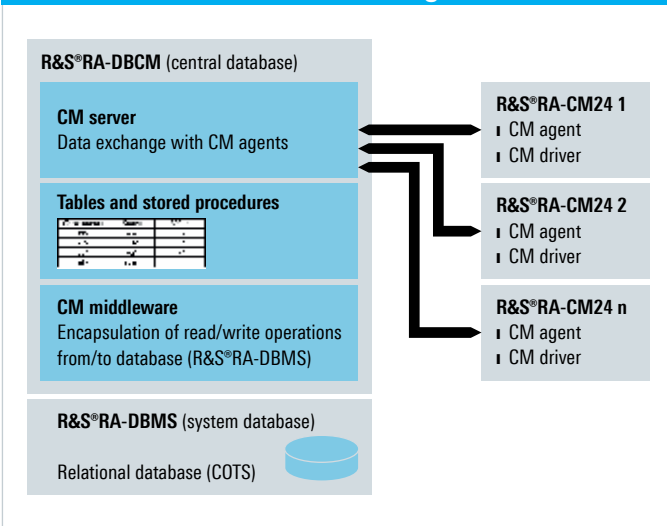
## Long-term storage of system parameters

R&S®RA-DBCM is the server component of the R&S®RA-CM continuous monitoring software. It is an instance running in the R&S®RA-DBMS system database. This is a relational database system that can be implemented, for example, as an Oracle or PostgreSQL database. R&S®RA-DBCM includes the following components:

- Database schema
- CM server components for data exchange with the CM agents (agent configuration and measured values)
- Middleware (encapsulation of read/write operations from/to database)

The measured values delivered by the drivers via the agents are stored to the R&S®RA-DBCM central database. If measured values exceed or fall below preconfigured thresholds, a warning or an alarm is output.

## Software structure for data storage



### Quick overview of system status

The R&S®RA-CM continuous monitoring software is controlled via the R&S®RA-CMCON graphical user interface. This operator console displays all user inputs and information output made by the software. Plus, it provides an overview of the current COMINT system status.

The lower figure shows a typical semi-mobile COMINT system, in this case made up of three geographically distributed subsystems. The system stations are visualized as a tree (left) and on a map (right). Maps are displayed using the optional R&S®MapView geographical information software, which can be displayed as an additional window on the R&S®RA-CMCON graphical user interface.

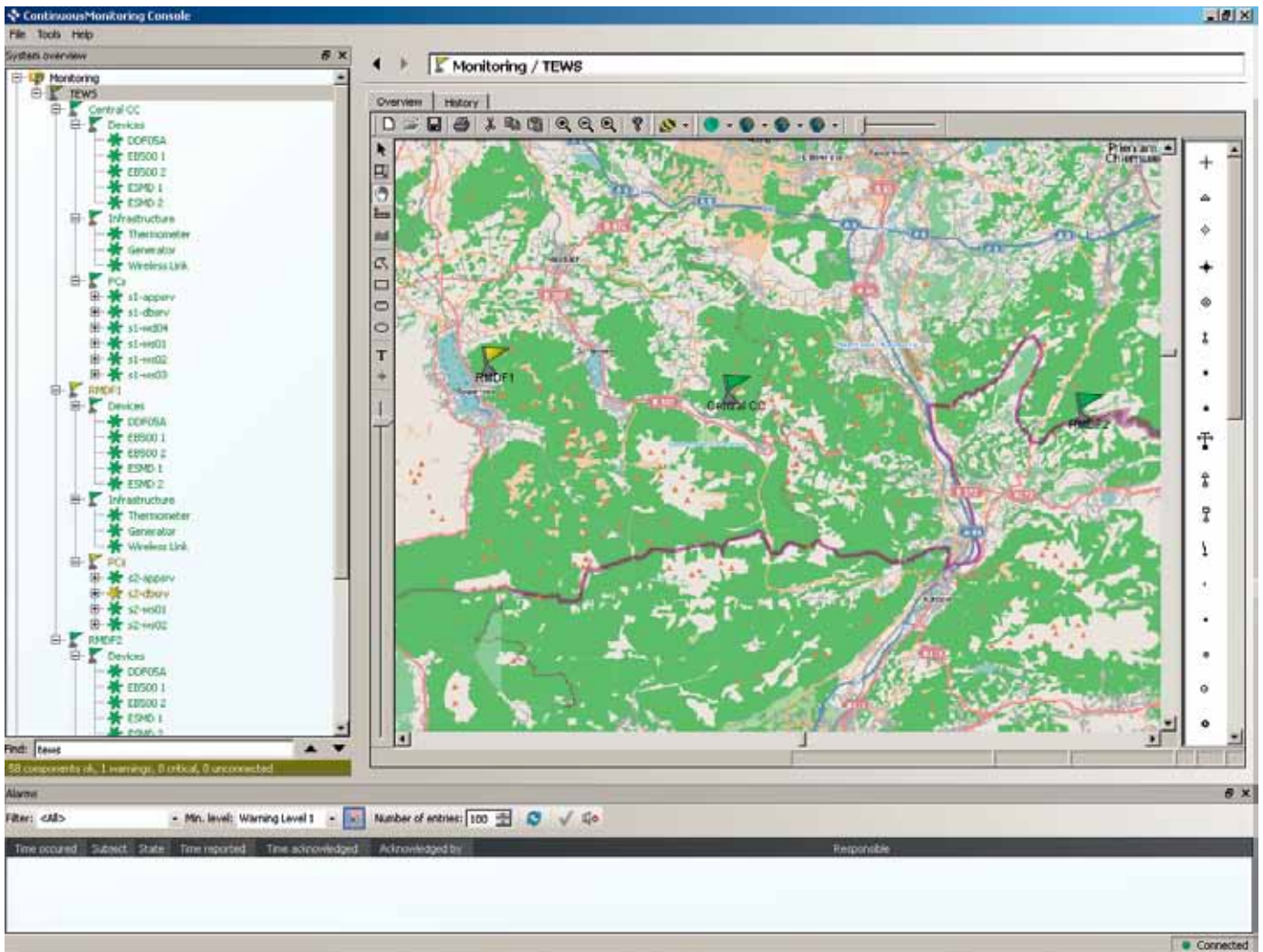
The COMINT system elements (stations, hardware/software components) are represented by icons both in the tree structure and in the map. The color of an icon indicates the overall status of the corresponding element. Green indicates that all parameters of an element are within nominal range, yellow that parameter values exceed or fall below predefined thresholds (which will trigger a warning), and red signals a critical violation of predefined thresholds (which will trigger an alarm). If a specific component or station is not accessible because it has been deactivated for maintenance work or a data link is interrupted, for example, the corresponding icon is gray.

If a station icon is red, the user can display detailed status information for all components of that station in order to pinpoint the cause of error.



Signaling of operating states with different colors.

Overview of system components (tree) and geographical distribution of a semi-mobile COMINT system.



# Evaluation of status information of complex COMINT systems

## Definition of thresholds

Via the R&S®RA-CMCON graphical user interface, the user can define thresholds for the output of warnings and alarms to signal critical operating conditions. This includes defining a hysteresis loop. This can be done either by entering numerical values or by positioning lines in a hysteresis diagram. The hysteresis effect is utilized to reduce the volume of status information that is output. If measured values accumulate around a defined threshold, this would lead to repeated warnings or alarms. This is avoided by adding a defined hysteresis for the measured values.

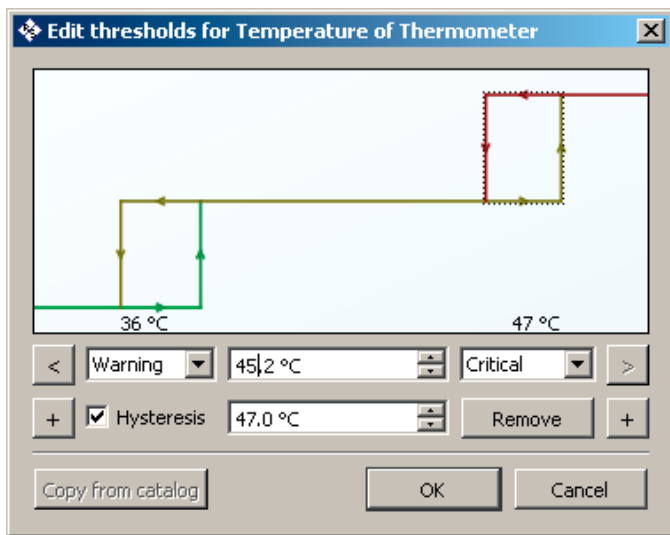
## Early detection and signaling of critical states and conditions

Failure of a single system component can affect a number of subsequent components and thus impair or render impossible operation of a subsystem or the system as a whole. This applies in particular to communications components (such as routers) in distributed systems and to PCs (such as application or database servers).

It is therefore crucial that errors be corrected within the shortest possible time. Especially during the night, monitoring systems may only be partially staffed or unattended. R&S®RA-CM offers the option of notifying operators via text messages or e-mail, which can be individually configured. Warnings and alarms will reach the staff in charge even if they are not at their workstations.

Users can also define a script (shell script or batch file) to be executed in response to a warning or an alarm.

Simple threshold definition (with hysteresis): In this example, the user has defined an alarm to be output if the room temperature reaches +47.0°C. The alarm is not to be reset until the temperature has dropped to +45.2°C.



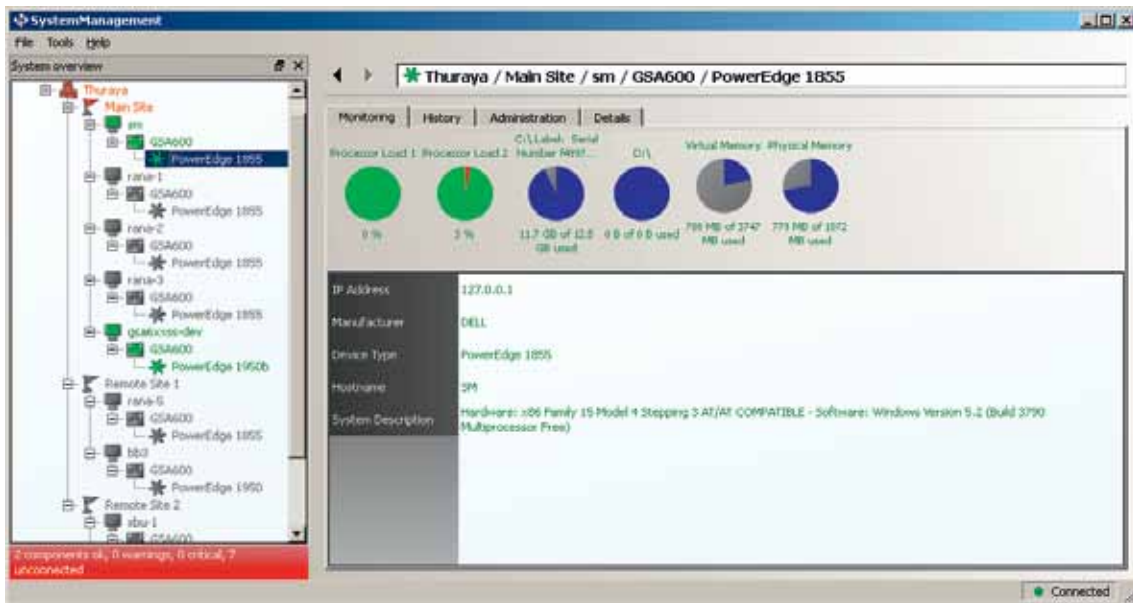
Configuration of text message or e-mail for status signal notification.



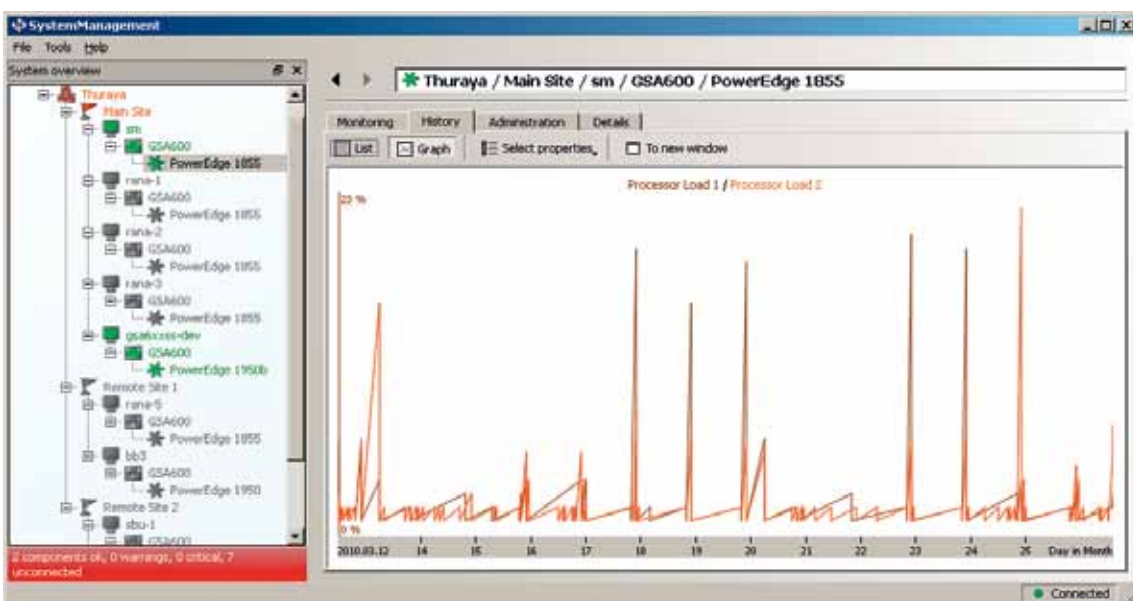
## Representation of measured values and their characteristics versus time

The software allows the detailed representation of results for hardware components such as PCs. The user selects a component from the tree structure on the left. Detailed results can be displayed instead of or in addition to the map. Measured values can be shown as a pie chart indicating status information. Alternatively, the characteristic of a measured quantity versus time can be displayed.

Display of a PC's processor, hard disk and RAM utilization.



Display of processor utilization versus time.



# Powerful interfaces

## Full integration into COMINT systems (HF/VHF/UHF/SHF and SatMon)

Benefits for the user:

- After installation: extensive self-configuration of the drivers/agents of the R&S®RA-CM continuous monitoring software (detection of hardware and software components of the monitored system, registration with the database application)
- Full support of Rohde&Schwarz equipment (e.g. sensors) (support of system devices from other manufacturers if equipped with suitable SNMP interface)
- Use of R&S®MapView geographical information software for map display of system status (map can be displayed as an additional window on the graphical user interface)
- Central user management for configuring access rights and monitoring access to R&S®RA-CM's graphical user interfaces and databases (allowing access for threshold configuration for authorized users only, for example, or allowing limited status display for a specific subsystem for operators at remote stations)

## Hierarchical databases in distributed systems

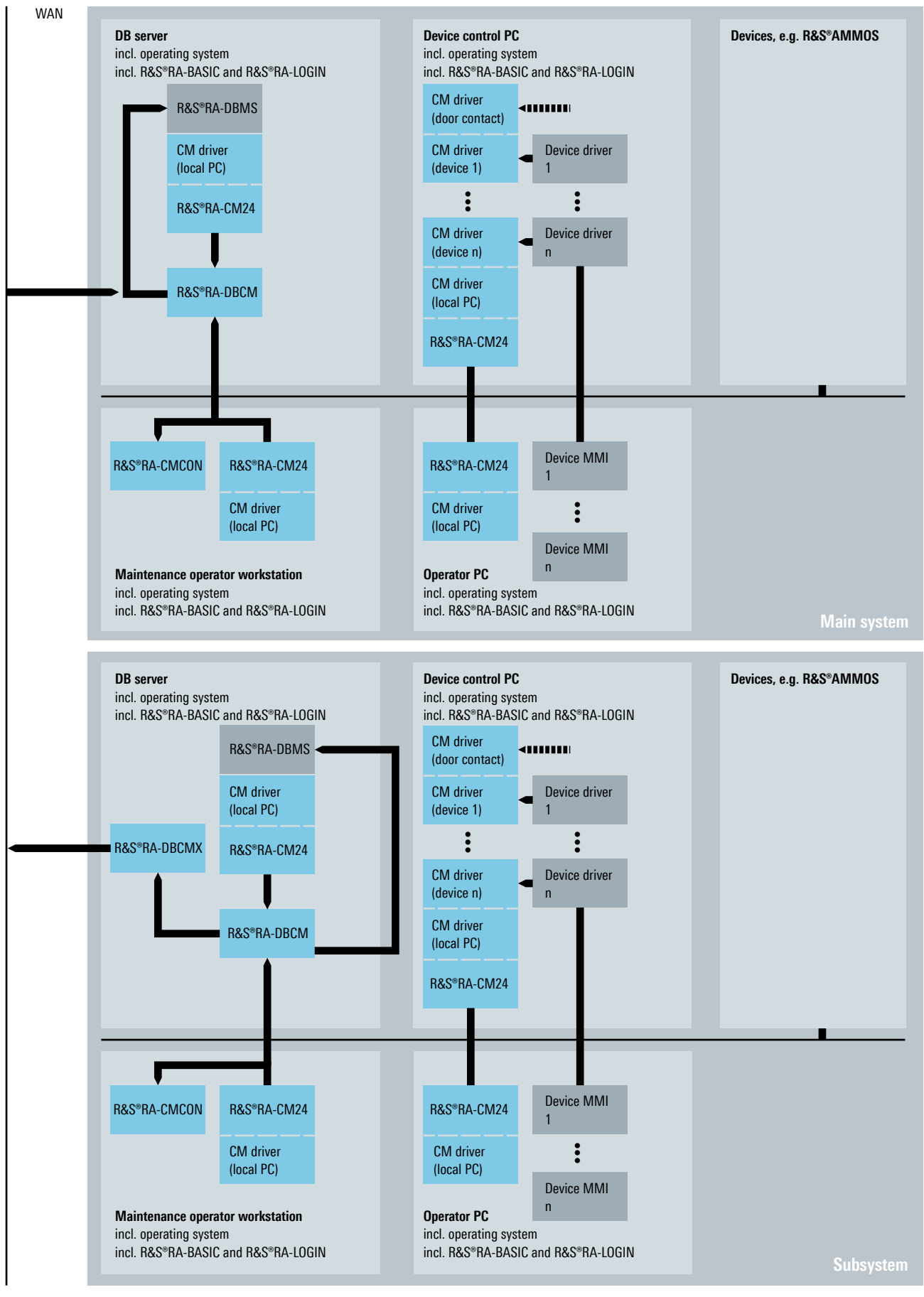
Large, nationwide systems often include remote, possibly semi-mobile stations. In many cases, these stations are not permanently connected to a central station via a dedicated line. At such remote stations, the R&S®RA-CM drivers write their data to a local database. Data alignment between the remote station and the central station takes place when a data link between the two stations has been established. Data alignment is performed using the optional R&S®RA-DBCMx software module and involves data transfer in both directions. Status information is transferred from the remote station to the central station and stored in the central database. In the reverse direction, i.e. from the central station to the remote station, evaluation results and modifications to threshold values or other configuration parameters are transferred.

## Report generation

The R&S®RA-CM can optionally be equipped with an interface to the R&S®RA-REP ReportEdit software (software module from the R&S®RAMON family). Via this interface, users can generate reports. For example, a system administrator can create a report informing the supervisor that a subsystem should be temporarily taken out of service because of critical ambient conditions.

Status information and measured values from the remote station's local database can be dragged and dropped to a report window on the R&S®RA-CM's graphical user interface. The same can be done with manually entered text or a screenshot of the map display. The complete set of data is transferred to R&S®RA-REP at the press of a button. The report editor formats the report, makes additions where necessary, and forwards it to the person in charge (COMINT system operator).

**Example of a COMINT system distributed across multiple locations**



# Example configuration

## Example configuration for monitoring a small COMINT system

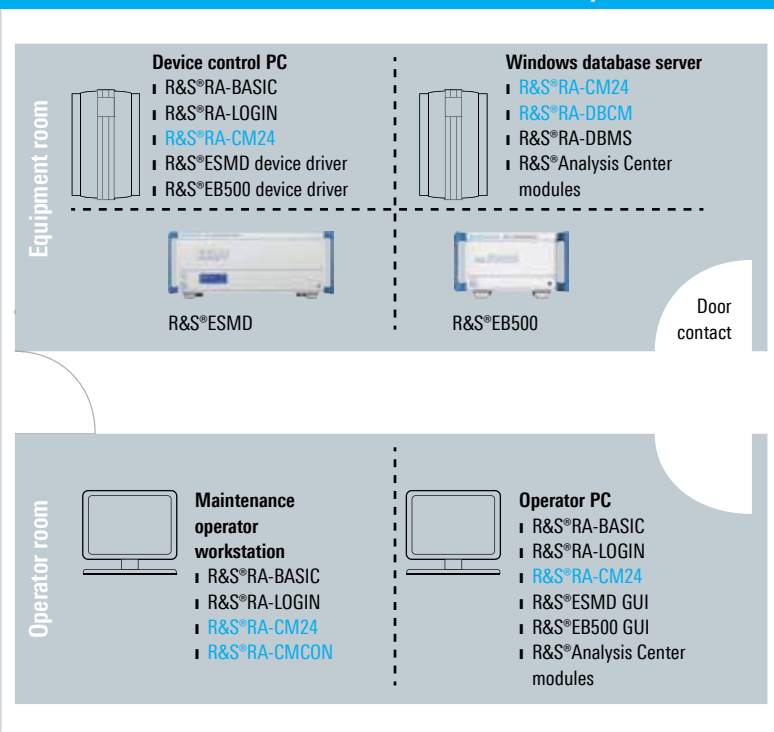
The system contains the following components:

- ▮ Two monitoring receivers (R&S®ESMD and R&S®EB500)
- ▮ Device control PC
- ▮ R&S®Analysis Center database server
- ▮ Operator PC for the two receivers and the R&S®Analysis Center operating software
- ▮ Maintenance operator workstation

The two operator PCs are not in the same room as the other system components. The same is true of the R&S®RAMON receiver software modules. The device drivers run on the device control PC in the equipment room, the graphical user interfaces on the operator PC in the operator room. The door to the windowless, air-conditioned equipment room is equipped with a contact which is connected to an interface card in the device control PC.

The operator PC and the device control PC include the operating system as well as a number of R&S®RAMON software modules that are required for monitoring. The R&S®RA-DBMS relational database system can be implemented, for example, as an Oracle or PostgreSQL database.

### Spatial distribution of hardware components and R&S®RA-CM software modules in a COMINT system



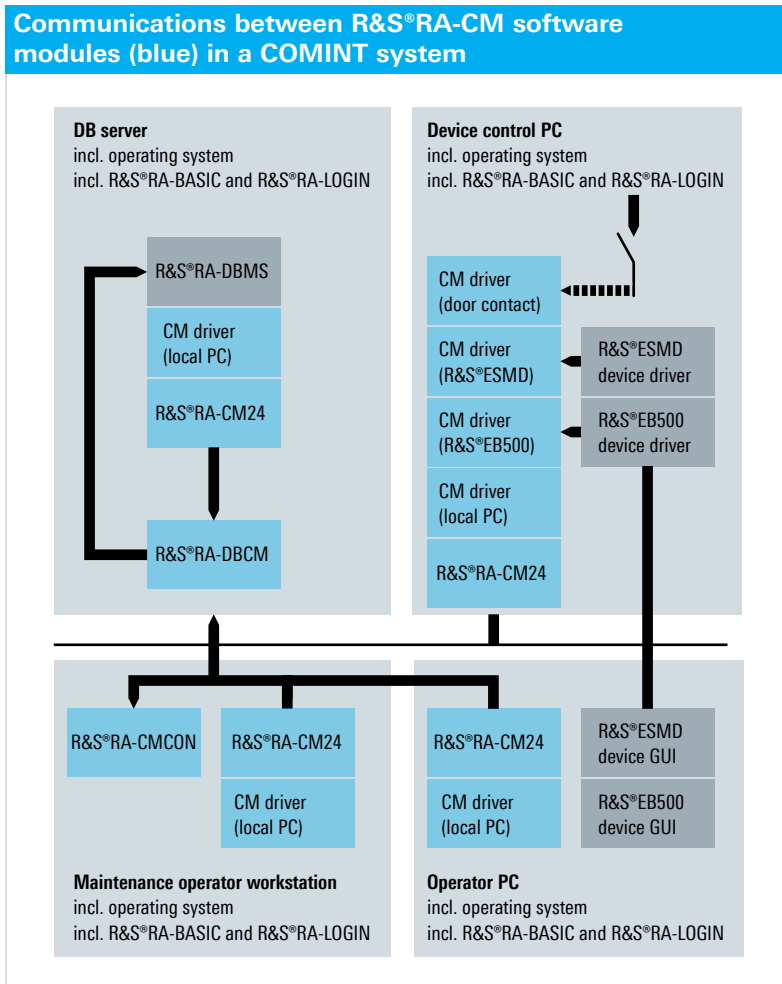
## Communications between R&S®RA-CM software modules

In the following, the tasks and distribution of the R&S®RA-CM software modules used in the example system are described.

The R&S®RA-CM24 driver software is installed on each of the four PCs/servers. The local PC CM driver monitors the data volume stored on the various PC drives as well as RAM and processor utilization. The device control PC includes further CM drivers, which communicate with the R&S®RA-DBCM database via the agent of the R&S®RA-CM24 driver software installed on that PC. These CM drivers monitor the device drivers of the two receivers, the receivers themselves and the door contact connected to the PC.

R&S®RA-DBCM is installed on the database server. Each of the four R&S®RA-CM24 agents forwards its status information and measured data to the R&S®RA-DBCM database, where the data and information are stored in tables.

The maintenance operator workstation contains the R&S®RA-CMCON graphical user interface and is used in this example for remote monitoring only. From this workstation, the system administrator in charge accesses the R&S®RA-DBCM database.



# Specifications

## The R&S®RA-CM continuous monitoring software currently supports the following devices/components:

Digital direction finders	R&S®DDF0xA/E, R&S®DDF39x, R&S®DDF0xM, R&S®DDF04E, R&S®DDF255, R&S®DDF19x, R&S®DDF205, R&S®DDF550
R&S®AMMOS GX400	R&S®GX400VC, R&S®GX400VD, R&S®EM010, R&S®EM050, R&S®GX401BP, R&S®GX405BP, R&S®GX401EM, R&S®GX420/R&S®GX425
Monitoring receivers	R&S®ESMD, R&S®PR100, R&S®EM100, R&S®EB5x0, R&S®EM510, R&S®EM550, R&S®EMx50, R&S®ESMD, R&S®ESMB, R&S®ESMC, R&S®ESM100x, R&S®EK89x, CFE receivers on request
Antenna matrices	AAD 20/4/A, ADS x, AVS x, AVA_600, AHSM 4/7, MAS 2x, MAR 23x, ZS12x, CFE antennas on request
FPDP matrixes	LL 3505, LX 1500e
Navigation modules	GPS, Compass, CFE components on request
Generic SNMP	e.g. for PCs, switches, routers
Satellite monitoring systems	R&S®GSA300 (general SatMon), R&S®GSA600/620/630 (Thuraya monitoring), R&S®GSA700/720/730 (ACeS/ISAT monitoring), R&S®GSA900 (INMARSAT monitoring)

Your local Rohde&Schwarz representative will be glad to provide you with an updated list of all CM drivers available for the R&S®RA-CM continuous monitoring software.

# Ordering information

For R&S®RAMON systems		
Designation	Type	Order No.
R&S®RAMON Continuous Monitoring Database and Server Software. Contains tables for storing measured data of system hardware components and environmental sensors. Requires R&S®RA-DBMS system database.	R&S®RA-DBCM	3020.8512.02
Replication of CM Databases (R&S®RA-DBCM). For hierarchical CM system structures. Replication of measured data for higher hierarchical levels; replication of configurations (e.g. thresholds) for both higher and lower hierarchical levels.	R&S®RA-DBCMX	3020.8529.02
R&S®RAMON Continuous Monitoring Client including drivers for communication with all COMINT system components. To be installed on all PCs connected to the CM system.	R&S®RA-CM24	3020.8535.02
R&S®RAMON Continuous Monitoring Console with graphical user interface. Required once per system. Configuration of all system parameters and output of alarms and status information.	R&S®RA-CMCON	3020.8541.02
Extension of R&S®RA-CMCON with an interface to R&S®RAMON ReportEdit, extension for configuration of additional COMINT system components. Requires R&S®RA-CMCON.	R&S®RA-CMCONX	3020.8558.02

For Rohde & Schwarz satellite monitoring systems		
Designation	Type	Order No.
R&S®RAMON Continuous Monitoring Database and Server Software. Contains tables for storing measured data of system hardware components and environmental sensors. Requires R&S®RA-DBMS.	R&S®RA-DBCM	3025.3019.02
Replication of CM Databases (R&S®RA-DBCM). For hierarchical CM system structures. Replication of measured data for higher hierarchical levels, replication of configurations (e.g. thresholds) for both higher and lower hierarchical levels.	R&S®RA-DBCMX	3025.3025.02
R&S®RAMON Continuous Monitoring Client including drivers for communication with all COMINT system components. To be installed on all PCs connected to the CM system.	R&S®RA-CM24	3025.3031.02
R&S®RAMON Continuous Monitoring Console with graphical user interface. Required once per system. Configuration of all system parameters and output of alarms and status information.	R&S®RA-CMCON	3025.3048.02
Extension of R&S®RA-CMCON with an interface to R&S®RAMON ReportEdit, extension for configuration of additional COMINT system components. Requires R&S®RA-CMCON.	R&S®RA-CMCONX	3025.3054.02

The above software requires R&S®RA-BASIC and R&S®RA-LOGIN to be installed on the PC. The R&S®RA-DBCM server software must be installed on a PC running the R&S®RA-DBMS system database.

Your local Rohde & Schwarz representative will help you determine the optimum solution for your requirements. To find your nearest Rohde & Schwarz representative, visit [www.sales.rohde-schwarz.com](http://www.sales.rohde-schwarz.com)

## Service you can rely on

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

## About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

## Environmental commitment

- | Energy-efficient products
- | Continuous improvement in environmental sustainability
- | ISO 14001-certified environmental management system

Certified Quality System  
**ISO 9001**

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