

R&S®QAR50

Automotive Radome Tester

Getting Started



1179498602
Version 03

ROHDE & SCHWARZ
Make ideas real



This document describes the following R&S®QAR50 models and options:

- R&S®QAR50 (1343.0099K02/03)

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1179.4986.02 | Version 03 | R&S®QAR50

Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol, e.g. R&S®QAR50 is indicated as R&S QAR50.

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1 Safety and regulatory information

The product documentation helps you use the product safely and efficiently. Follow the instructions provided here and in the following chapters.

Intended use

The product is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the product only for its designated purpose. Observe the operating conditions and performance limits stated in the data sheet.

Where do I find safety information?

Safety information is part of the product documentation. It warns you of potential dangers and gives instructions on how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

- In [Chapter 1.1, "Safety instructions"](#), on page 5. The same information is provided in many languages as printed "Safety Instructions". The printed "Safety Instructions" are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

1.1 Safety instructions

Products from the Rohde & Schwarz group of companies are manufactured according to the highest technical standards. To use the products safely, follow the instructions provided here and in the product documentation. Keep the product documentation nearby and offer it to other users.

Use the product only for its intended use and within its performance limits. Intended use and limits are described in the product documentation such as the data sheet, manuals and the printed "Safety Instructions". If you are unsure about the appropriate use, contact Rohde & Schwarz customer service.

Using the product requires specialists or specially trained personnel. These users also need sound knowledge of at least one of the languages in which the user interfaces and the product documentation are available.

Never open the casing of the product. Only service personnel authorized by Rohde & Schwarz are allowed to repair the product. If any part of the product is damaged or broken, stop using the product. Contact Rohde & Schwarz customer service at <http://www.customersupport.rohde-schwarz.com>.

Lifting, carrying and installing the product

The product is heavy and must be installed and set up by trained staff. Always use appropriate lifting equipment when you lift or carry the product, like a forklift when the R&S QAR50 is still packed in its original box or a crane when it is unpacked.

Lifting and carrying heavy items can cause structural or muscular injuries. Heavy items can also cause other physical injuries like crushed body parts when they fall or tip over.

Because of its weight, at least two strong people are required to move or install the R&S QAR50. During the installation, make sure that the installation site is only accessible to people working on the installation.

During transport, installation or repair, wear appropriate protective clothing that complies with your local rules and regulations. If you are unsure of which equipment to use, ask your safety inspector.

We recommend to wear:

- Safety shoes with toe cap and ESD protection.
- Protective gloves

Always place the product on a stable, flat and level surface with the bottom of the product facing down. If the product is designed for different positions, secure the product so that it cannot fall over.

Choosing the operating site

Only use the product indoors. The product casing is not waterproof. Water that enters can electrically connect the casing with live parts, which can lead to electric shock, serious personal injury or death if you touch the casing. If Rohde & Schwarz provides accessories designed for your product, e.g. a carrying bag, you can use the product outdoors.

Unless otherwise specified, you can operate the product up to an altitude of 2000 m above sea level. The product is suitable for pollution degree 2 environments where nonconductive contamination can occur. For more information on environmental conditions such as ambient temperature and humidity, see the data sheet.

Connecting to power

The product is an overvoltage category II product. Connect the product to a fixed installation used to supply energy-consuming equipment such as household appliances and similar loads. Keep in mind that electrically powered products have risks, such as electric shock, fire, personal injury or even death.

Take the following measures for your safety:

- Before switching on the product, ensure that the voltage and frequency indicated on the product match the available power source. If the power adapter does not adjust automatically, set the correct value and check the rating of the fuse.
- Only use the power cable delivered with the product. It complies with country-specific safety requirements. Only insert the plug into an outlet with protective conductor terminal.
- Only use intact cables and route them carefully so that they cannot be damaged. Check the power cables regularly to ensure that they are undamaged. Also ensure that nobody can trip over loose cables.
- If the product needs an external power supply, use the power supply that is delivered with the product or that is recommended in the product documentation or a power supply that conforms to the country-specific regulations.

- Only connect the product to a power source with a fuse protection of maximum 20 A.
- Ensure that you can disconnect the product from the power source at any time. Pull the power plug to disconnect the product. The power plug must be easily accessible. If the product is integrated into a system that does not meet these requirements, provide an easily accessible circuit breaker at the system level.

Cleaning the product

Use a dry, lint-free cloth to clean the product. When cleaning, keep in mind that the casing is not waterproof. Do not use liquid cleaning agents.

Meaning of safety labels

Safety labels on the product warn against potential hazards.

	Potential hazard Read the product documentation to avoid personal injury or product damage.
	Heavy product Be careful when lifting, moving or carrying the product. Carrying the product requires a sufficient number of persons or transport equipment.
	Electrical hazard Indicates live parts. Risk of electric shock, fire, personal injury or even death.
	Hot surface Do not touch. Risk of skin burns. Risk of fire.
	Protective conductor terminal Connect this terminal to a grounded external conductor or to protective ground. This connection protects you against electric shock if an electric problem occurs.

1.2 Labels on the product

Labels on the casing inform about:

- Personal safety, see ["Meaning of safety labels"](#) on page 7
- Product and environment safety, see [Table 1-1](#)
- Device information is provided on a sticker attached to the connector board.
For details, see [Chapter 5.2.6, "Device ID"](#), on page 31.

Table 1-1: Labels regarding product and environment safety

	Labeling in line with EN 50419 for disposal of electrical and electronic equipment after the product has come to the end of its service life. For more information, see the user manual.
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1.3 Warning messages in the documentation

A warning message points out a risk or danger that you need to be aware of. The signal word indicates the severity of the safety hazard and how likely it will occur if you do not follow the safety precautions.

WARNING

Potentially hazardous situation. Could result in death or serious injury if not avoided.

CAUTION

Potentially hazardous situation. Could result in minor or moderate injury if not avoided.

NOTICE

Potential risks of damage. Could result in damage to the supported product or to other property.

1.4 Regulatory information

The R&S QAR50 complies with the following regulations.

1.4.1 Regulations for the USA

FCC compliance

This equipment has been tested and found to comply with the limits for Industrial, Scientific and Medical Equipment (ISM), pursuant to part 18 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in an industrial installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference other devices, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Consult Rohde & Schwarz customer service for help.

1.4.2 Regulations for Canada

ICES-001 compliance

This class A ISM device complies with Canadian ICES-001.

Cet appareil ISM de la classe A est conforme à la norme NMB-001 du Canada.

1.5 Korea certification class A



이 기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기
바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

2 Documentation overview

The user documentation for the R&S QAR50 consists of several documents.

Getting started

Introduces the R&S QAR50 and describes how to set up and start working with the product. A printed version is included in the delivery.

User manual

Contains a description of the R&S QAR50 system, including the features available in the R&S QAR50 application.

A digital version of the user manual in html format is available in the measurement application.

Safety instructions

Contains safety instructions, operating conditions and further important information. The printed safety instructions are part of the delivery.

Data sheet and brochure

The data sheet contains the technical specifications of the R&S QAR50, its options and accessories.

The brochure provides an overview of the R&S QAR50 and its characteristics.

Open-source acknowledgment (OSA)

The open-source acknowledgment documents provide verbatim license texts of the used open source software.

The OSAs is available in the measurement application ("Info" > "Open Source Acknowledgement") and on the SSD in the folder `C:\OpenSourceAgreement`.

3 Welcome

The R&S QAR50 is the ideal tool for accurately testing the quality of radomes and bumpers in the automotive radar frequency range at the end-of-line (EOL). It features sufficient space to easily accommodate bulky bumpers combined with spatially resolved measurements to evaluate the homogeneity of design emblems. Its innovative hardware concept enables impressively fast measurement times whereas the modular software concept allows adaptation to your particular requirements.

Measurements:

- Precise reflection measurements from both sides for two frequency bands.
- Frequency-resolved reflection and transmission loss measurement.
- Transmission phase measurement.
- High-resolution reflection image.

4 Preparing for use

Here, you can find basic information about setting up the product for the first time.

4.1 Choosing the operating site

Specific operating conditions ensure proper operation and avoid damage to the product and connected devices. For information on environmental conditions such as ambient temperature and humidity, see the data sheet.

See also ["Choosing the operating site"](#) on page 6.

► **NOTICE!** Overheating can damage the product.

Prevent overheating as follows:

- Keep a minimum distance of 10 cm between the fan openings of the product and any object in the vicinity to provide sufficient airflow and ventilation. Several fan openings are located on either side of the R&S QAR50.
- Do not place the product next to heat-generating equipment such as radiators or other products.

Electromagnetic compatibility classes

The electromagnetic compatibility (EMC) class indicates where you can operate the product. The EMC class of the product is given in the data sheet.

- Class B equipment is suitable for use in:
 - Residential environments
 - Environments that are directly connected to a low-voltage supply network that supplies residential buildings
- Class A equipment is intended for use in industrial environments. It can cause radio disturbances in residential environments due to possible conducted and radiated disturbances. It is therefore not suitable for class B environments. If class A equipment causes radio disturbances, take appropriate measures to eliminate them.

4.2 Unpacking and checking

The R&S QAR50 is a large and heavy device. Unpacking, moving and installing the R&S QAR50 requires special arrangements. Follow the instructions provided here when you unpack the R&S QAR50.

Also see ["Lifting, carrying and installing the product"](#) on page 5.

If you do not have appropriate lifting equipment, contact your Rohde & Schwarz representative.

Unpacking the R&S QAR50

1. **WARNING!** Risk of physical injury caused by heavy items. See "[Lifting, carrying and installing the product](#)" on page 5.
Move the delivery box to a place near the installation site.
2. Remove the top lid of the wooden box the R&S QAR50 is delivered in.
Disassembling the box requires a screwdriver, because the box parts are screwed to one another.
3. Remove the bars that hold secure the R&S QAR50 inside the box.
4. Remove the four side parts of the box.
5. Using the delivery notes, check the equipment for completeness.
6. Check the equipment for damage.
If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.
7. **WARNING!** Risk of physical injury caused by heavy items. See "[Lifting, carrying and installing the product](#)" on page 5.
Carefully lift the R&S QAR50 out of the box.

Lifting the R&S QAR50 out of the transport box

Use a crane or similar lifting device to lift the R&S QAR50 out of its transport box.

1. Unpack the R&S QAR50 as described in [Chapter 4.2, "Unpacking and checking"](#), on page 12.
Included in the delivery are four eye bolts. The eye bolts serve as lifting points. Use these bolts to attach appropriate lifting equipment. We recommend using a crane to lift and move the R&S QAR50.
2. Screw the four eye bolts into the mounting holes on top of the R&S QAR50.
Make sure that the bolts sit tight in the mounting holes. They sit tight if you cannot screw them any further into the mounting holes.
3. **WARNING!** Risk of physical injury caused by heavy items. See "[Lifting, carrying and installing the product](#)" on page 5.
The product is heavy. Moving the R&S QAR50 safely is only possible with appropriate lifting equipment (like a crane) and a suitable lifting harness (like a four leg rope). Commission personnel that is qualified to safely attach the R&S QAR50 to the lifting equipment, to operate the lifting equipment and take the necessary safety measures.
Attach the the lifting device.

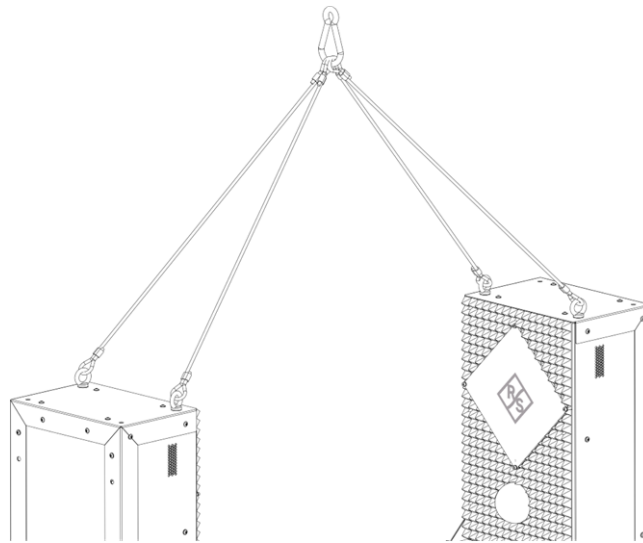


Figure 4-1: Attachment of lifting equipment, for example a rope harness

- Use lifting equipment and harness that can carry the weight of the R&S QAR50 (see datasheet).
- Connect the eye bolts securely to the harness, for example with shackles.
- Distribute the weight equally over all four eye bolts.
- Mount the harness legs at a maximum angle of 45° per eye bolt.



Figure 4-2: Eye bolt load limit

4. Move the R&S QAR50 carefully to its operating site and put it firmly onto the ground.
5. Remove the lifting equipment.
6. Remove the eye bolts from the mounting holes.
7. Proceed with the installation as described in [Chapter 4.3, "Installing the R&S QAR50"](#), on page 15.
8. Retain the original packing material. Use it when transporting or shipping the R&S QAR50 later.

4.3 Installing the R&S QAR50

The R&S QAR50 is a large and heavy device. Unpacking, moving and installing the R&S QAR50 requires special arrangements. Follow the instructions provided here when you install the R&S QAR50.

See also:

- ["Intended use"](#) on page 5
- ["Lifting, carrying and installing the product"](#) on page 5

Parts of delivery required for installation

- 1 x R&S QAR5050
- 2 x supporting feet, incl. screws (M8X45) and washers
- 16 x mounting hole caps (M8X16 screws)
- 1 x power cable
- 2 x Allen wrench (1x size 5 and 1 x size 6)

Other required tools for installation

- Open-ended wrench size 19
- Spirit level

Setting up the R&S QAR50

You can set up the R&S QAR50 in two different ways: lying on its long side ("lying position") or standing upright on one of its short sides ("upright position"). By default, the R&S QAR50 is designed to stand on a pair of feet that are part of the delivery.

For the upright position, make sure that the side with the connector board is at the bottom.

The R&S QAR50 must be placed on a level surface. This is important not only for safety reasons, but also to get valid measurement results. If the body of the R&S QAR50 is not at a right angle to the floor, measurement results can be invalid.

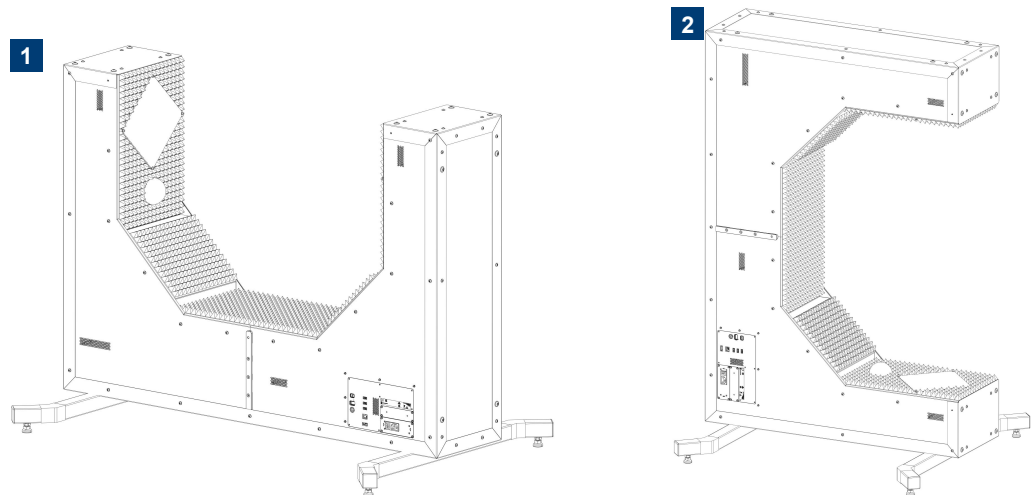


Figure 4-3: Possible operation positions for the R&S QAR50

- 1 = Lying position
2 = Standing position



Instead of using the supporting feet, you can also integrate the R&S QAR50 in a production line system. For these special setups, contact your Rohde & Schwarz representative.

Attaching the supporting feet

The R&S QAR50 is delivered with a pair of feet that you can attach to the R&S QAR50. All required parts (feet, screws and washers) are part of the delivery.

The supporting feet are bent at their ends to make the R&S QAR50 more stable. Make sure to align the feet correctly with the bent parts facing away from the ends of the main body.



Figure 4-4: Correct alignment of the supporting feet

After you have unpacked the R&S QAR50, it usually rests in lying position on the floor. The way to attach the feet depends on the way you set up the R&S QAR50 (lying position or upright position).

1. **WARNING!** Risk of physical injury caused by heavy items.. See ["Lifting, carrying and installing the product"](#) on page 5.
Attaching the feet requires you to tilt the R&S QAR50 by 90° at least once.

To tilt the R&S QAR50, you can attach a suitable aid like a handle to the mounting holes not needed for the feet. While tilting the R&S QAR50, be careful not to damage the R&S QAR50 or the supporting feet. One person must secure the R&S QAR50 while another person tilts the R&S QAR50.

For the lying position, proceed as follows to attach the supporting feet.

- a) Tilt the R&S QAR50 by 90° to an upright position (make sure that the side with the connector board is on the bottom).

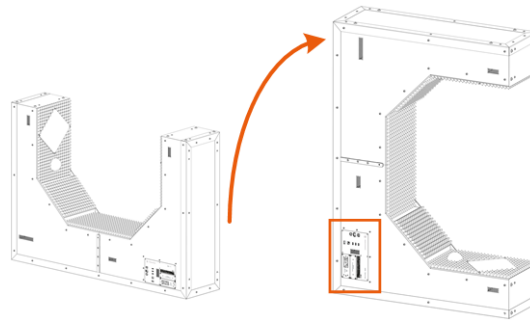


Figure 4-5: Tilting the R&S QAR50 into an upright position

- b) Screw the two feet to the mounting holes indicated in [Figure 4-6](#) with an Allen wrench. The screws and wrench are part of the delivery (M8X45). Put the washers between screw heads and feet.

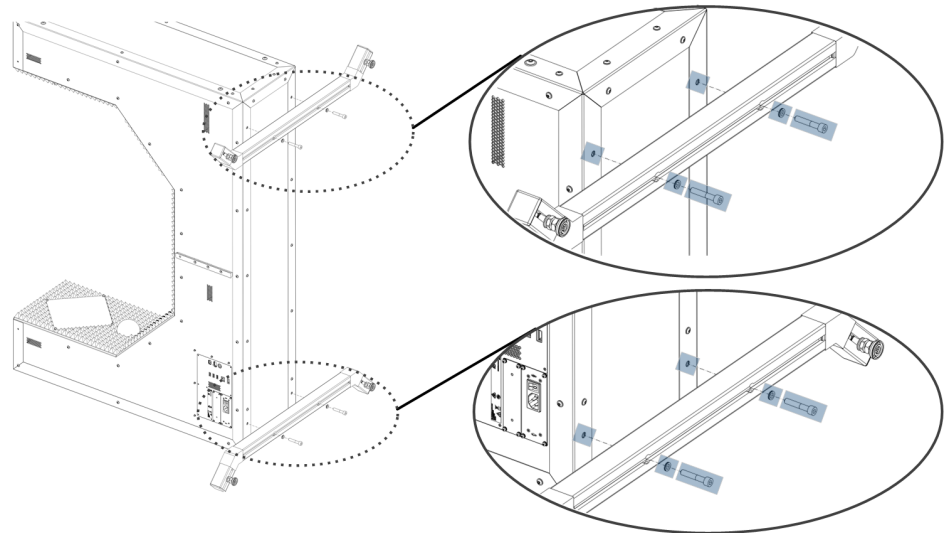


Figure 4-6: Attaching the supporting feet for lying position

- c) Screw in the caps of the mounting holes (M8X16 screws). The caps are part of the delivery.

- d) Tilt the R&S QAR50 back to the lying position.

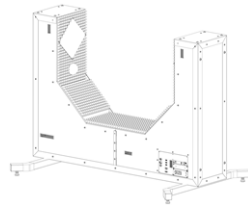


Figure 4-7: Final lying position

2. For the upright position, proceed as follows to attach the supporting feet.
- In the upright position, make sure to install the feet on the side of the R&S QAR50 that contains the connector board.
- a) Screw the two feet to the mounting holes indicated in [Figure 4-8](#) with an Allen wrench. The screws and wrench are part of the delivery (M8X45). Put the washers between screw heads and feet.

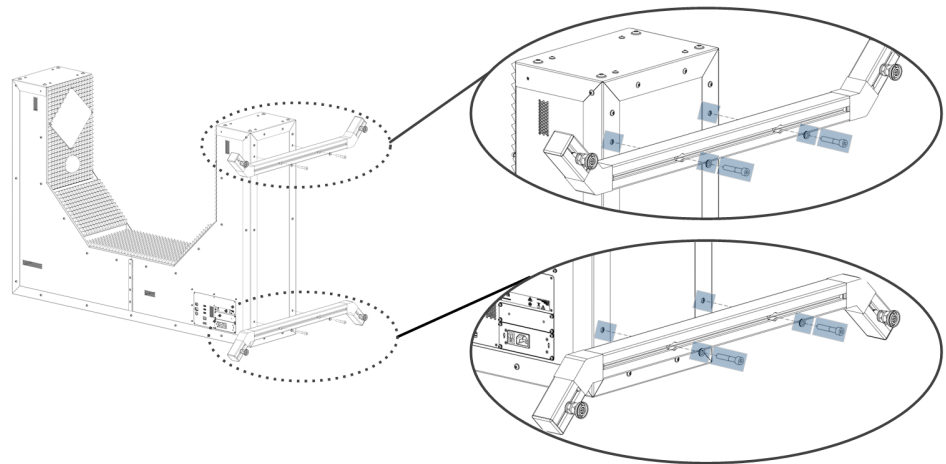


Figure 4-8: Attaching the supporting feet for upright position

- b) Screw in the caps of the mounting holes (M8X16 screws). The caps are part of the delivery.
- c) Tilt the R&S QAR50 by 90° to an upright position (make sure that the side with the connector board is on the bottom).

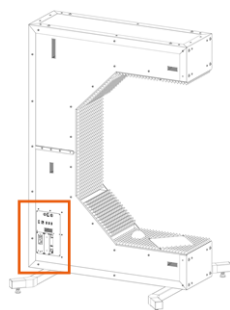


Figure 4-9: Final upright position

3. For both positions, make sure that the R&S QAR50 is in a stable position.
 - a) Check with a spirit level if the R&S QAR50 itself is level.
 - b) If necessary, remove any irregularities by adjusting the height of the feet with the open-ended wrench until the R&S QAR50 is level.

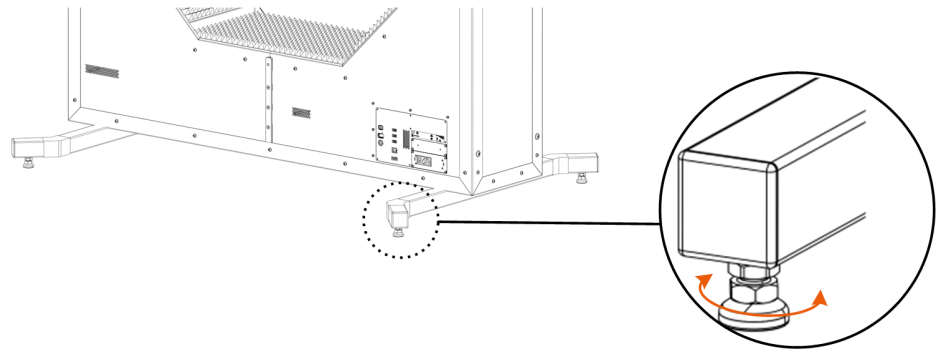


Figure 4-10: Adjusting feet height

- A clockwise movement lowers the corresponding foot.
 - A counterclockwise movement raises the corresponding foot.
- c) Tighten the feet with the check nuts using the open-end wrench.

Moving the R&S QAR50

Use a crane or similar device to move the R&S QAR50 from one location to another.

The process is similar to lifting the R&S QAR50 out of the transport box ("[Lifting the R&S QAR50 out of the transport box](#)" on page 13).

During the whole process, the feet can remain attached to the R&S QAR50.

1. **WARNING!** Risk of physical injury caused by heavy items. See "[Lifting, carrying and installing the product](#)" on page 5.
The product is heavy. Moving the R&S QAR50 safely is only possible with appropriate lifting equipment (like a crane) and a suitable lifting harness (like a four leg rope). Commission personnel that is qualified to safely attach the R&S QAR50 to the lifting equipment and to operate the lifting equipment.
Unscrew the caps of the mounting holes you need (M8X16 screws).
Depending on the setup (lying or upright position), use the mounting holes indicated in [Figure 4-11](#) to lift the R&S QAR50. Do not use different mounting holes and always use four mounting holes to distribute the weight equally.
 - For the lying position: Use the mounting holes on top of the R&S QAR50. Use either the four outer mounting holes (variant 1 in [Figure 4-11](#)) **or** the inner mounting holes (variant 2 in [Figure 4-11](#)).
 - For the upright position: Use the mounting holes on the opposite side of the connector board. The side with the connector board must always be on the bottom.

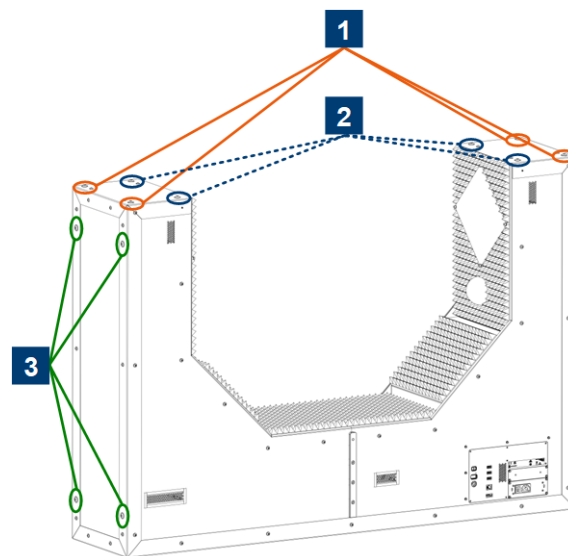


Figure 4-11: Attachment points for lifting equipment

- 1 = Attachment points for lying position (variant 1)
- 2 = Attachment points for lying position (variant 2)
- 3 = Attachment points for upright position

2. Screw the eye bolts that were part of the delivery securely into the mounting holes. They sit tight if you cannot screw them any further into the mounting holes.
3. Attach lifting equipment as described in ["Lifting the R&S QAR50 out of the transport box"](#) on page 13.
4. Carefully move the R&S QAR50 to its new location.
5. Remove the lifting equipment from the R&S QAR50.
6. Remove the eye bolts from the mounting holes.
7. Screw the caps of the mounting holes back in (M8X16 screws).

4.4 Considerations for test setup

Integration of the R&S QAR50 at the workplace

The R&S QAR50 has several edges that are required by its functionality. To avoid physical injuries like head lacerations, take care of an appropriate ergonomic integration of the device at the workplace, especially if frequent human interaction with the device is expected.

Cable selection and electromagnetic interference (EMI)

Electromagnetic interference (EMI) can affect the measurement results.

To suppress electromagnetic radiation during operation:

- Use high-quality shielded cables, for example, double-shielded RF and LAN cables.
- Always terminate open cable ends.
- Ensure that connected external devices comply with EMC regulations.

4.5 Connecting the R&S QAR50

The following overview shows the possible connections for the R&S QAR50.

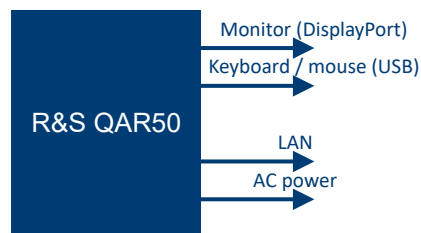


Figure 4-12: Connections for the R&S QAR50

1. Connect a monitor to the DisplayPort port on the R&S QAR50.
As a power source, you can use a household AC outlet to supply the monitor with power (for monitors with a light-current extension cable).
Note: We recommend using a monitor with a resolution of at least 1920 x 1080. Lower resolutions can lead to an incorrect display of the measurement data.
2. Connect a keyboard and a mouse to two of the USB ports.
3. Optional: Establish a connection to your LAN via the LAN interface.
Note: Always connect all devices before connecting the R&S QAR50 to the mains supply.

Network connections

Before connecting the product to a local area network (LAN), consider the following:

- Install the latest software to reduce security risks.
- For internet or remote access, use secured connections if applicable.
- Ensure that the network settings comply with the security policies of your company. Contact your local system administrator or IT department before connecting your product to your company LAN.
- When connected to the LAN, the product can potentially be accessed from the internet, which can be a security risk. For example, attackers might misuse or damage the product.

Connecting to power

The R&S QAR50 contains an AC power supply on the connector board.

For safety information, see ["Connecting to power"](#) on page 6.

1. Plug the AC power cable into the AC power connector on the connector board.
Only use the AC power cable delivered with the product.
2. Plug the AC power cable into a power outlet with ground contact.
The required ratings are listed next to the AC power connector and in the data sheet.

4.6 Switching on or off

Table 4-1: Overview of power states

Status	LED	Position of power switch
Off	Off	[0]
Standby	 orange	[I]
Ready	 green	[I]

Turning on the R&S QAR50

The product is off but connected to power.

1. Set the switch on the power supply to position [I]. See [Chapter 5.2.1, "AC power supply"](#), on page 29.
The LED of the [Power] key is orange. See [Chapter 5.2.2, "Power button"](#), on page 30.
2. Press the [Power] key.
The LED turns green. The R&S QAR50 boots.

Shutting down the product

The product is in the ready state.

- Press the [Power] key.
The operating system shuts down. The LED changes to orange.

Disconnecting from power

The product is in the standby state.

1. **NOTICE!** Risk of data loss. If you disconnect the product from power when it is in the ready state, you can lose settings and data. Shut it down first.
Set the switch on the power supply to position [0].
The LED of the Power key is switched off.
2. Disconnect the product from the power source.

4.7 Operating system

The R&S QAR50 contains a Microsoft Windows 10 operating system which has been configured according to the R&S QAR50's features and needs. Changes in the system setup are only required when you install peripherals like a keyboard or if the network configuration does not comply with the default settings.

The drivers and software installed on the R&S QAR50 are adapted to the R&S QAR50. Only install software updates released by Rohde & Schwarz.

Service packs and updates

Microsoft regularly creates security updates and other patches to protect Windows-based operating systems. They are released through the Microsoft Update website and associated update server. Update instruments using Windows regularly, especially instruments that connect to a network.

Firewall settings

A firewall protects an instrument by preventing unauthorized users from gaining access to it through a network. Rohde & Schwarz highly recommends using the firewall on your instrument. Rohde & Schwarz instruments are shipped with the Windows firewall enabled. All ports and connections for remote control are enabled.

Note that changing firewall settings requires administrator rights.

Virus protection

Take appropriate steps to protect your instruments from infection. Use strong firewall settings and scan any removable storage device used with a Rohde & Schwarz instrument regularly. It is also recommended that you install anti-virus software on the instrument. Rohde & Schwarz does NOT recommend running anti-virus software in the background ("on-access" mode) on Windows-based instruments, due to potentially degrading instrument performance. However, Rohde & Schwarz does recommend running it during non-critical hours.

For details and recommendations, see the following Rohde & Schwarz white paper:

- [1EF96: Malware Protection Windows 10](#)

User accounts

The Windows 10 operating system installed on the R&S QAR50 has two predefined user accounts:

- Standard user account with standard windows rights.
The user name for this account is `Operator`.
The password is `operator<serialnumber>`, with `<serialnumber>` being a placeholder of the serial number of the R&S QAR50.
Example: `operator123456`
- Administrator account with rights to install software or create user accounts.
The user name for this account is `Admin`

The password is `emodar8Administrator<serialnumber>`, with `<serialnumber>` being a placeholder of the serial number of the R&S QAR50.

Example: `emodar8Administrator123456`



Changing the passwords

For security reasons, we recommend that you to change the passwords after the first login.

5 Instrument tour

The R&S QAR50 is a millimeter wave imaging system operating in the frequency band of automotive radar sensors. With its support of spatially resolved reflection and transmission loss measurements, the R&S QAR50 provides an intuitive and powerful way to evaluate how radomes and bumpers influence the radar performance.

The R&S QAR50 contains the measuring electronics like transmitting and receiving antennas and a PC with dedicated software to operate and control the measurements.

The meanings of the labels on the product are described in "[Meaning of safety labels](#)" on page 7.

Additional equipment required to run measurements

- (Touchscreen) monitor
- Keyboard
- Mouse

Instrument variants

The R&S QAR50 is available in two variants.

- Variant 02: The antennas on the antenna clusters have a vertical polarization.
- Variant 03: The antennas on the antenna clusters have a horizontal polarization.

5.1 System overview

The visible part of the R&S QAR50 system consists of several elements that you can either interact with or that are required for measurement applications.

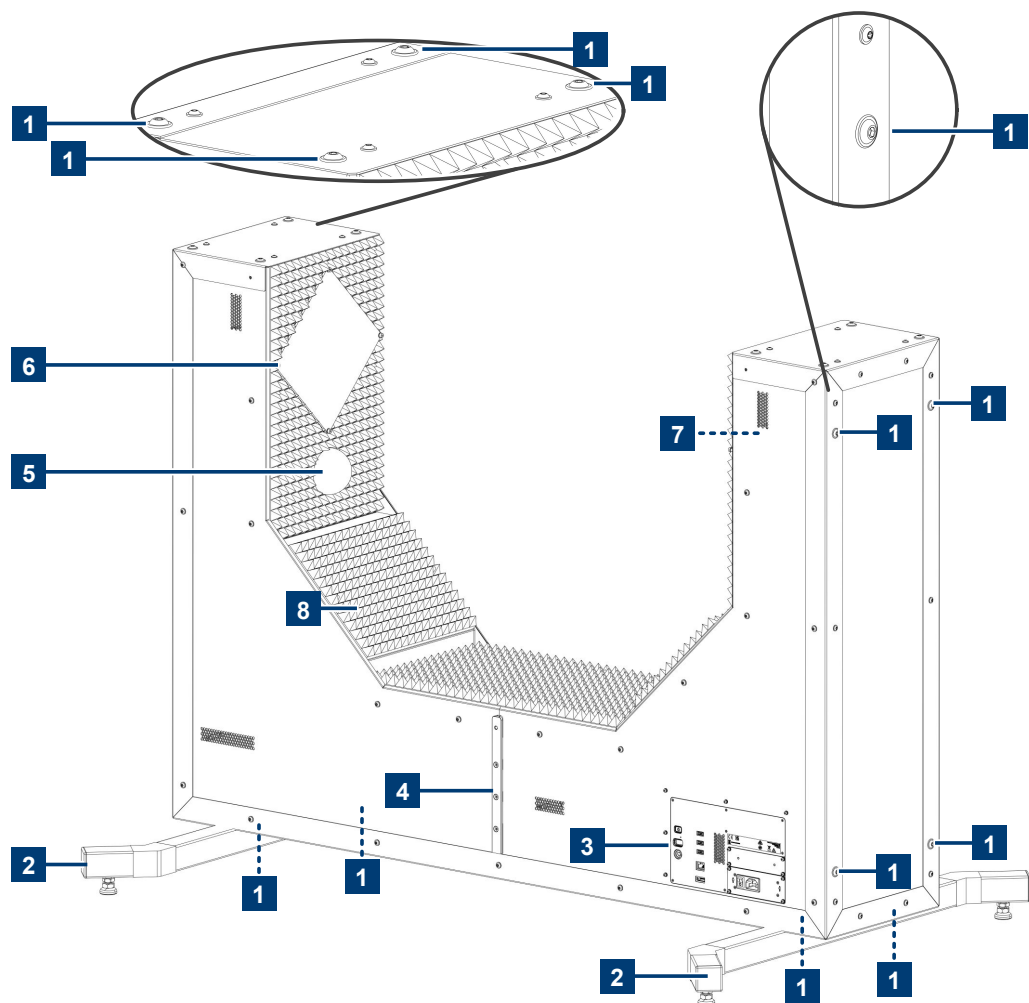


Figure 5-1: System overview

- 1 = Mounting holes
- 2 = Supporting feet
- 3 = Connector board
- 4 = Verification kit mounting rail
- 5 = Calibration sphere
- 6 = Antenna cluster 1
- 7 = Antenna cluster 2
- 8 = Absorbers

5.1.1 Connector board

Number of connector boards: 1

Function: The connector board provides various interfaces for external applications.

For more information about available connectors, see [Chapter 5.2, "Connectors and labels"](#), on page 28.

5.1.2 Antenna cluster

Number of clusters: 2

Function: The antenna clusters are located in the side body of the R&S QAR50. The antenna clusters contain the transmit and receive antennas. These antennas transmit and receive the signals to and from the DUT and digitize the resulting incident wave quantities, which are in turn the source for the microwave imaging.

Depending on the system variant, the antennas have a vertical polarization or a horizontal polarization.

- The variant with a vertical antenna polarization is required for measurements on radar covers with a vertical polarization.
- The variant with a horizontal antenna polarization is required for measurements on radar covers with a horizontal polarization.

The R&S QAR50 contains two clusters:

- Cluster "2" is located on the side of the connector board.
- Cluster "1" is located on the other side.

For better orientation, the cluster numbers are printed on the corresponding cluster.

5.1.3 Absorbers

Number of absorber sheets: 5

Function: The absorber sheets on the inside of the R&S QAR50 eliminate electromagnetic interferences that would otherwise distort the reflection and transmission measurements.

5.1.4 Mounting rail for the verification kit

Number of mounting rails: 2 (one on each side of the main body)

Function: The mounting rails for the verification kit are located in the center of each side of the R&S QAR50 body. Use these rails to install the verification kit if you have to verify the system.

For a comprehensive description of the verification procedure, refer to the user manual.

5.1.5 Calibration sphere

Number of calibration spheres: 2

Function: The calibration spheres are located in the side body of the R&S QAR50. The calibration spheres are passive features required for instrument calibration. System calibration becomes necessary after a module has been replaced or if the verification returns a poor image quality.

For more information about system calibration, contact your service representative or refer to the service manual.

5.1.6 Supporting feet

Number of supporting feet: 2

Function: The supporting feet provide a means to support the R&S QAR50.

Depending on how you install the R&S QAR50, the supporting feet are either located on the bottom of the main body of the R&S QAR50 or on the side body that contains cluster "2".

For more information about installing the supporting feet, see ["Attaching the supporting feet"](#) on page 16.

5.1.7 Mounting holes

Number of mounting holes: 20

Location of mounting holes:

- 8 x mounting holes on the top of each of the side bodies.
Function: These mounting holes provide a means to mount lifting equipment to the R&S QAR50.
- 4 x mounting holes on the outer side of each of the side bodies.
Function: These mounting holes provide a means to mount the supporting feet or lifting equipment to the R&S QAR50.
- 4 x mounting holes on the bottom of the main body.
Function: These mounting holes a means to mount the supporting feet to the R&S QAR50.

Caps (M8X16 screws) cover the mounting holes if the mounting holes are unused.

For more information about mounting supporting feet and lifting equipment, see ["Attaching the supporting feet"](#) on page 16 and ["Lifting the R&S QAR50 out of the transport box"](#) on page 13.

5.2 Connectors and labels

The R&S QAR50 has several connectors for various purposes. All connectors are located on the side of the R&S QAR50.

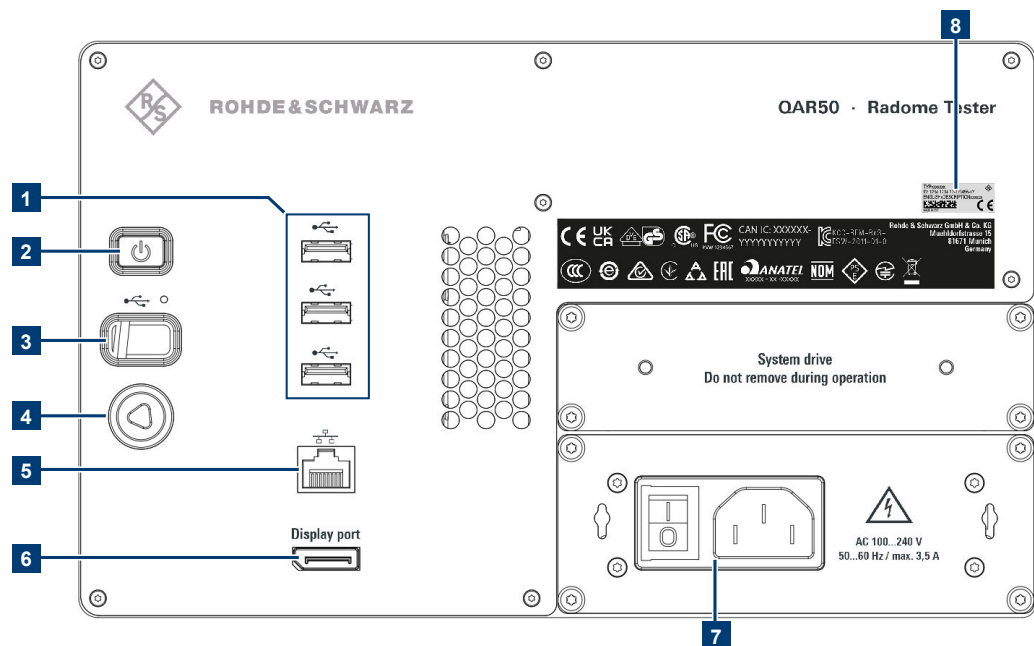


Figure 5-2: Connector overview

- 1 = USB ports
- 2 = Power button
- 3 = USB ports (behind protective cover)
- 4 = Lock for protected USB port
- 5 = LAN interface
- 6 = DisplayPort
- 7 = AC power supply
- 8 = Sticker with device ID

5.2.1 AC power supply

Connector type: IEC 60320-1 C14

Function: AC input for a connection to the AC mains supply. You can connect the R&S QAR50 to networks with different voltage levels (see datasheet for the supported voltage range). The power supply automatically adapts itself to the voltage level of the power source.

The power cord necessary to connect the panel to the power supply is part of the delivery (with country-specific plug).

For more information about using the AC power supply safely, see ["Connecting to power"](#) on page 6.

For more information about supplying the radio with power, see [Chapter 4.5, "Connecting the R&S QAR50"](#), on page 21.

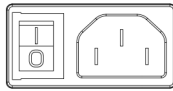


Figure 5-3: AC power supply

5.2.2 Power button

Function: A short press turns the R&S QAR50 on and off when it is connected to an AC power source

The power button contains an LED that indicates the state of the R&S QAR50. For more information about the power states, see [Chapter 4.6, "Switching on or off"](#), on page 22.



Figure 5-4: Power button

5.2.3 LAN interface

Connector type: RJ45

Function: LAN interface to connect the R&S QAR50 to a local network and for remote control via SCPI or OPC.



Figure 5-5: LAN interface

5.2.4 USB ports

Connector type: USB 3.0 type A

Number of ports: 4

Function: USB ports for various uses.

- Connection of a keyboard to operate the R&S QAR50.
- Connection of a mouse to operate the R&S QAR50.
- Connection of a memory stick, for example to update the software or export measurement results.

Note that the fourth USB port is located behind a protective cap that you can open with a triangular wrench.



Figure 5-6: USB port

5.2.5 DisplayPort connector

Connector type: DisplayPort

Function: DisplayPort for connection of a touchscreen or monitor that you can use to control the R&S QAR50 and view the measurement results.



Figure 5-7: DisplayPort connector

5.2.6 Device ID

The unique device identifier is provided as a barcode sticker on the connector board on the side of the R&S QAR50.

It consists of the device order number, the serial number and a checksum.

Example 1343.0099K02-123456-aa.