

R&S[®]NRX Power Meter Getting Started



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

- R&S®NRX (1424.7005.02)
- R&S®NRX-B1 (1424.7805.02)
- R&S®NRX-B4 (1424.8901.02)
- R&S®NRX-B8 (1424.8301.02)
- R&S®NRX-B9 (1424.8601.02)
- R&S®NRX-K2 (1424.9208.02)
- R&S®NRX-K4 (1424.9308.02)

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1424.7070.02 | Version 07 | R&S®NRX

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

Contents

1 Safety and Regulatory Information.....	5
1.1 Korea Certification Class B.....	5
2 Documentation Overview.....	6
2.1 Getting Started Manual.....	6
2.2 User Manual.....	6
2.3 Tutorials.....	6
2.4 Instrument Security Procedures.....	6
2.5 Basic Safety Instructions.....	7
2.6 Data Sheets and Brochures.....	7
2.7 Release Notes and Open Source Acknowledgment (OSA).....	7
3 Key Features.....	8
4 Preparing for Use.....	9
4.1 Unpacking and Checking.....	9
4.1.1 Accessory List.....	9
4.2 Operating Conditions.....	10
4.3 Considerations for Test Setup.....	10
4.4 Placing on a Bench Top.....	11
4.5 Mounting in a Rack.....	12
4.6 Connecting to the AC Power Supply.....	12
4.7 Switching On or Off.....	13
4.8 Connecting Power Sensors.....	14
4.8.1 Sensor Connectors A to D.....	14
4.8.2 Optional Sensor Interface for R&S NRT (R&S NRX-B9).....	15
4.8.3 LAN Interface.....	16

4.8.4 USB 2.0 Host Interfaces.....	16
4.9 Connecting USB and External Devices.....	16
5 Instrument Tour.....	18
5.1 Front Panel Tour.....	18
5.1.1 Sensor Connector A and B.....	18
5.1.2 Module Bay.....	19
5.1.3 Touchscreen.....	20
5.1.4 Keys.....	20
5.1.5 USB Host Interface.....	22
5.1.6 On/Standby Key.....	22
5.2 Rear Panel Tour.....	23
5.2.1 Trig In / Out 2 and Out 1 / Trig Out Connectors.....	23
5.2.2 Ethernet Interface.....	24
5.2.3 USB Device Interface.....	24
5.2.4 USB Host Interface.....	24
5.2.5 AC Supply and Power Switch.....	24
5.2.6 IEC 625/IEEE 488 Interface.....	25
5.2.7 Sensor Connectors C and D.....	25
6 Contacting Customer Support.....	26
Index.....	27

1 Safety and Regulatory Information

The product documentation helps you use the R&S NRX safely and efficiently. Follow the instructions provided here and in the printed "Basic Safety Instructions". Keep the product documentation nearby and offer it to other users.

Intended use

The R&S NRX is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the R&S NRX 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 about the potential dangers and gives instructions how to prevent personal injuries or damage caused by dangerous situations. Safety information is provided as follows:

- The printed "Basic Safety Instructions" provide safety information in many languages and are delivered with the R&S NRX.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

1.1 Korea Certification Class B



이 기기는 가정용(B급) 전자파 적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

2 Documentation Overview

This section provides an overview of the R&S NRX user documentation. Unless specified otherwise, you find the documents on the R&S NRX product page at:

www.rohde-schwarz.com/manual/NRX

2.1 Getting Started Manual

Introduces the R&S NRX and describes how to set up and start working with the product. A printed version is delivered with the instrument.

2.2 User Manual

Contains the description of all instrument modes and functions. It also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual .

The user manual is provided on the R&S NRX for download under:

[System] > "Instrument Info" > "Help & Copyrights"

2.3 Tutorials

Tutorials offer guided examples and demonstrations on operating the R&S NRX. They are provided on the product page of the internet.

2.4 Instrument Security Procedures

Deals with security issues when working with the R&S NRX in secure areas. It is available for download on the Internet.

2.5 Basic Safety Instructions

Contains safety instructions, operating conditions and further important information. The printed document is delivered with the instrument.

2.6 Data Sheets and Brochures

The data sheet contains the technical specifications of the R&S NRX. It also lists the firmware applications and their order numbers, and optional accessories.

The brochure provides an overview of the instrument and deals with the specific characteristics.

See www.rohde-schwarz.com/brochure-datasheet/NRX

2.7 Release Notes and Open Source Acknowledgment (OSA)

The release notes list new features, improvements and known issues of the current firmware version.

The open source acknowledgment and the license texts of open source software packages used in the R&S NRX software are provided under:

[System] > "Instrument Info" > "Help & Copyrights"

See www.rohde-schwarz.com/firmware/NRX

3 Key Features

The R&S NRX supports:

- Easy RF power measurements
- Multi-channel measurements
- RF pulse analysis
- System integration

The R&S NRX is a versatile, user-friendly base unit.

- Straightforward numerical and graphical display of measured values, plus intuitive operation with touchscreen-based graphical user interface
- Supports up to four R&S NRP and R&S NRQ6 power sensors.
- Supports all sensor-dependent measurement functions
- Hardware interfaces for remote control and triggering
- Code emulation of the R&S NRP2
- Optional high-precision CW and pulse mode reference source module
- Optional power reflection measurements with R&S NRT directional power sensors

See also the R&S NRX fact sheet at www.rohde-schwarz.com.

4 Preparing for Use

• Unpacking and Checking.....	9
• Operating Conditions.....	10
• Considerations for Test Setup.....	10
• Placing on a Bench Top.....	11
• Mounting in a Rack.....	12
• Connecting to the AC Power Supply.....	12
• Switching On or Off.....	13
• Connecting Power Sensors.....	14
• Connecting USB and External Devices.....	16

4.1 Unpacking and Checking

Check the equipment for completeness using the delivery note and the accessory lists for the various items. Check the R&S NRX for any damage. If there is damage, immediately contact the carrier who delivered the R&S NRX. Make sure not to discard the box and packing material.



Packing material

Retain the original packing material. If the instrument needs to be transported or shipped later, you can use the material to protect the control elements and connectors.

4.1.1 Accessory List

The R&S NRX comes with the following accessories:

- Printed getting started manual
- Multilingual safety brochure
- Additive data sheet ref. China ROHS
- Country-specific power cable

4.2 Operating Conditions

Specific operating conditions are required to ensure accurate measurements and to avoid damage to the R&S NRX and connected devices. Before switching on the R&S NRX, observe the information on appropriate operating conditions provided in the basic safety instructions and the data sheet of the R&S NRX.

In particular, ensure the following:

- The R&S NRX is dry and shows no sign of condensation.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are connected correctly and are not overloaded.

4.3 Considerations for Test Setup

Preventing electrostatic discharge (ESD)

Electrostatic discharge is most likely to occur when you connect or disconnect a DUT or test fixture to the instrument's test ports.

- ▶ **NOTICE!** Risk of electrostatic discharge (ESD). Electrostatic discharge (ESD) can damage the electronic components of the R&S NRX and the device under test (DUT).

Ground yourself to avoid electrostatic discharge (ESD) damage:

- Use a wrist strap and cord to connect yourself to the ground.
- Use a conductive floor mat and heel strap combination.

EMI impact on measurement results

Electromagnetic interference (EMI) may affect the measurement results.

To suppress generated electromagnetic interference (EMI):

- Use suitable shielded cables of high quality. For example, use double-shielded RF and LAN cables.
- Always terminate open cable ends.
- Note the EMC classification in the data sheet.

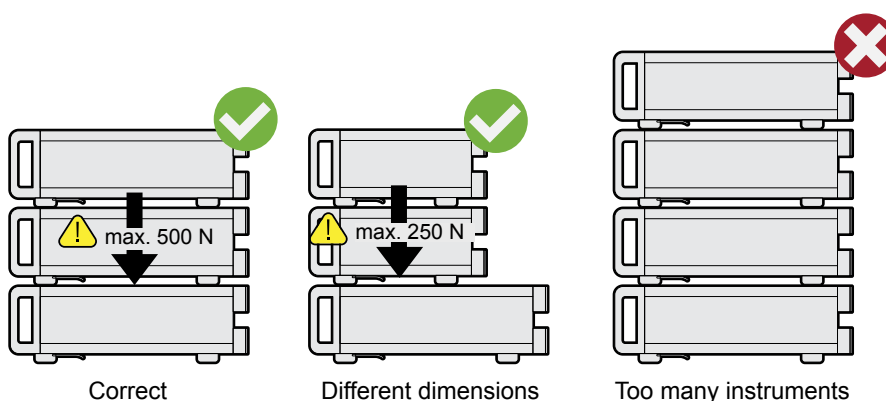
- Do not use USB connecting cables exceeding 5 m.

4.4 Placing on a Bench Top

Place the R&S NRX on a stable and level surface. The R&S NRX can be used in horizontal position, standing on its feet, or with the support feet on the bottom extended. Do not place anything on top of the R&S NRX, if the R&S NRX is not in a level position.

To place the R&S NRX on a bench top

1. Place the R&S NRX on a stable, flat and level surface. Ensure that the surface can support the weight of the R&S NRX. For information on the weight, see the data sheet.
2. **CAUTION!** Foldable feet can collapse. Always fold the feet completely in or out to ensure stability. The feet can collapse if they are not folded out completely or if the product is moved without lifting it. The foldable feet are designed to carry the weight of the product, but not an extra load.
With folded-out feet, do not place anything on top or underneath the instrument.
3. **WARNING!** A stack of products can fall over and cause injury. Never stack more than three products on top of each other. Instead, mount them in a rack.
Stack as follows:
 - It is best if all instruments have the same dimensions (width and length).
 - The overall load on the lowest instrument must not exceed 500 N.
 - With smaller instruments on top of the lowest instrument, the overall load on the lowest instrument must not exceed 250 N.



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

Prevent overheating as follows:

- Keep a minimum distance of 10 cm between the fan openings of the R&S NRX and any object in the vicinity.
- Do not place the R&S NRX next to heat-generating equipment such as radiators or other instruments.

4.5 Mounting in a Rack

1. Order one of the rack adapter kits designed for the R&S NRX. For the order number, see data sheet.
2. Follow the installation instructions provided with the adapter kit.
3. **NOTICE!** Insufficient airflow can cause overheating and damage the product. Design and implement an efficient ventilation concept for the rack.

4.6 Connecting to the AC Power Supply

The R&S NRX can be used with different AC power voltages and adapts itself automatically to them. Adjusting the R&S NRX to a particular AC supply voltage is therefore not required. Refer to the data sheet for the requirements of voltage and frequency.

The power switch can be set to two positions:

- [0]: The instrument is disconnected from the mains.
 - [I]: The instrument is power-supplied. It is either ready for operation (STANDBY) or in operating mode.
1. Plug the AC power cable into the AC power connector on the rear panel of the R&S NRX. Only use the power cable delivered with the R&S NRX.
 2. Plug the AC power cable into a power outlet with ground contact. The R&S NRX complies with safety class EN61010-1.

The required ratings are listed next to the AC connector and in the data sheet.

Further information:

- [Chapter 5.2.5, "AC Supply and Power Switch"](#), on page 24

4.7 Switching On or Off

The possible instrument states are described in [Chapter 5.1.6, "On/Standby Key"](#), on page 22.

To switch on the R&S NRX

1. To turn on the power, press the AC power switch at the rear to position [I] (On).
After power-up, the R&S NRX is in standby or ready state, depending on the position of the on/standby key.
2. If the R&S NRX is in standby state, press the on/standby key.
The R&S NRX initiates its startup procedure. It boots the operating system and starts the instrument firmware.
If the previous session ended regularly, the R&S NRX uses the settings from the last session.
3. If you want to return to a defined initial state, perform a preset.

To switch off the R&S NRX

1. Press the on/standby key.
The R&S NRX saves its current settings for reuse in the next session and changes into the standby state.
2. To power down the R&S NRX completely, set the AC power switch to position [0] (Off).

Further information:

- [Chapter 5.1.6, "On/Standby Key"](#), on page 22

4.8 Connecting Power Sensors

The R&S NRX supports a wide range of R&S power sensors. See the data sheet for detailed information.

Depending on the power sensor, you have different choices for connecting power sensors.

4.8.1 Sensor Connectors A to D

See [Chapter 5.1.1, "Sensor Connector A and B"](#), on page 18 and [Chapter 5.2.7, "Sensor Connectors C and D"](#), on page 25.

Suitable for:

- USB and LAN power sensors
- R&S NRQ6
- R&S NRP-Zxx power sensors

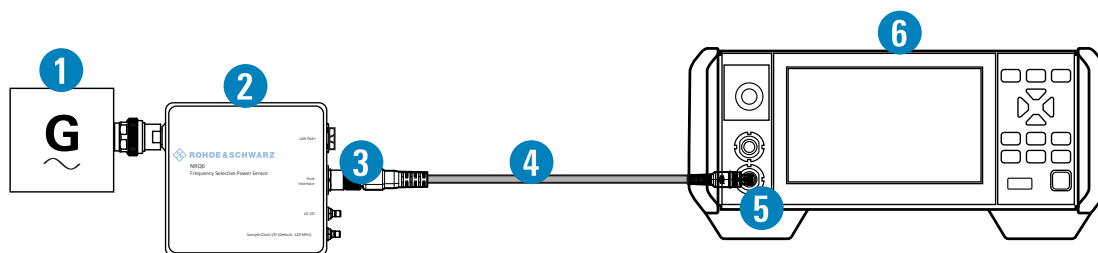


Figure 4-1: Setup with an R&S power sensor (example)

- 1 = Signal source
- 2 = R&S power sensor
- 3 = Host Interface connector
- 4 = R&S NRP-ZK8
- 5 = Sensor connector of the R&S NRX
- 6 = R&S NRX

Use an R&S NRP-ZK8 cable to connect an R&S power sensor to the R&S NRX. If you use an R&S NRP-ZK6 cable, the reference clock and trigger are not supported.

1. 8-pin female connector of R&S NRP-ZK8:
 - a) Insert the screw-lock cable connector into the host interface of the R&S power sensor.
 - b) Tighten the union nut manually.

2. 8-pin male connector of R&S NRP-ZK8:
 - a) Insert this connector into one of the sensor ports of the R&S NRX.
3. Connect the RF connector of the R&S power sensor to the signal source. For details, see the user manual of the R&S power sensor.

Note: Incorrectly connecting/disconnecting an R&S power sensor can damage the power sensor or lead to erroneous results.

4.8.2 Optional Sensor Interface for R&S NRT (R&S NRX-B9)

See [Chapter 5.1.2, "Module Bay"](#), on page 19.

Suitable for R&S NRT directional power sensors.

Communication between R&S NRT-Zxx power sensor and R&S NRX is only possible with a baud rate setting of 38400 Bd. This setting is the factory default that must be restored if the setting was changed. If the R&S NRT-Zxx power sensor is not recognized by the R&S NRX, check that the baud rate setting of the R&S NRT-Zxx power sensor is 38400 Bd. See the manual of the R&S NRT-Zxx power sensor for details.

1. Connect the R&S NRT-Zxx power sensor between source and load.
 - a) Connector (1) to the source.
 - b) Connector (2) to the load.
2. Connect the cable of the R&S NRT-Zxx power sensor (3) to the sensor interface for R&S NRT (R&S NRX-B9).



4.8.3 LAN Interface

See [Chapter 5.2.2, "Ethernet Interface"](#), on page 24.

Suitable for LAN power sensors.

4.8.4 USB 2.0 Host Interfaces

See [Chapter 5.1.5, "USB Host Interface"](#), on page 22 and [Chapter 5.2.4, "USB Host Interface"](#), on page 24.

Suitable for USB power sensors. You can increase the number of connected power sensors by using USB hubs.

4.9 Connecting USB and External Devices

Apart from connecting power sensors, you can use the USB interfaces to connect USB devices. You can increase the number of connected devices by using USB hubs.

Connecting USB and External Devices

Due to the large number of available USB devices, there is almost no limit to the possible expansions. In the following, useful USB devices are listed exemplarily:

- Memory stick for easy transfer of data to/from a computer (e.g. firmware updates).
- Mouse if you prefer this way of operation over a touchscreen.

5 Instrument Tour

- [Front Panel Tour](#)..... 18
- [Rear Panel Tour](#)..... 23

5.1 Front Panel Tour

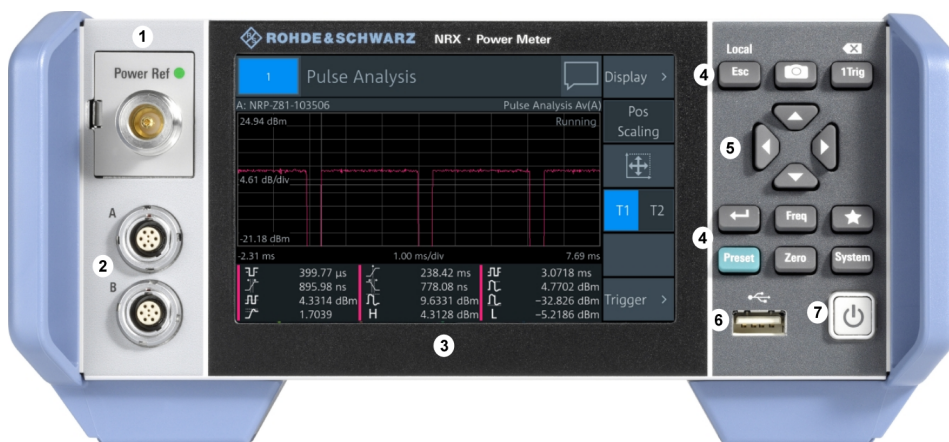


Figure 5-1: Front panel of the R&S NRX

- 1 = Module bay for optional connectors, see [Chapter 5.1.2, "Module Bay"](#), on page 19.
 2 = Sensor connectors A and B, see [Chapter 5.1.1, "Sensor Connector A and B"](#), on page 18.
 3 = Touchscreen, see [Chapter 5.1.3, "Touchscreen"](#), on page 20.
 4 = Keys, see [Chapter 5.1.4, "Keys"](#), on page 20.
 5 = Cursor keys, see ["Cursor keys"](#) on page 22.
 6 = USB host interface, see [Chapter 5.1.5, "USB Host Interface"](#), on page 22.
 7 = On/standby key, see [Chapter 5.1.6, "On/Standby Key"](#), on page 22.

5.1.1 Sensor Connector A and B

See (2) in [Figure 5-1](#).

Sensor connectors A and B are used to connect the R&S NRP power sensors and the R&S NRQ6. For details on the supported power sensors, see the data sheet.

The complete functional range, including external trigger and reference clock for the synchronization of connected sensors, is provided by these connectors.

Further information:

- [Chapter 4.8, "Connecting Power Sensors"](#), on page 14

5.1.2 Module Bay

See (1) in [Figure 5-1](#).

Two options fit in this bay. If you have both options, you can exchange them, see ["To exchange the option"](#) on page 19.

If no option is installed, the module bay is closed by a cover.

Sensor check source (R&S NRX-B1)

Used as a power reference for testing the connected power sensors and the cabling. The LED of the sensor check source (R&S NRX-B1) shows the state, see [Table 5-1](#).

You can remove the option and send it to Rohde & Schwarz for calibration. Contact the Rohde & Schwarz customer service.

Table 5-1: Possible states

Illumination	State	Signal output setting
Off	No signal is generated.	"Off"
Steady green	Continuous wave is output.	"CW"
Blinking green	Pulse signal is output.	"Pulse"
Blinking red	Settings conflict exists. For example if "Pulse" is set and the power level is set to 20 dBm.	"CW" or "Pulse"

Sensor interface for R&S NRT (R&S NRX-B9)

Provides an optional power sensor connector to connect an R&S NRT-Zxx power sensor. For supported power sensors, see the data sheet.

To exchange the option

1. Press the latch to the right, using your thumb nail or a small pen.



2. Pull the option from its casing.
3. Insert the other option.
4. Press until you hear a click when the latch locks.

Further information:

- [Chapter 4.8, "Connecting Power Sensors"](#), on page 14

5.1.3 Touchscreen

See (3) in [Figure 5-1](#).

The R&S NRX displays results in panes. Depending on the measurement mode, values are displayed digitally or graphically.



False triggers can occur

If an object (e.g. a human finger) that is charged with static electricity is brought near the touch panel, false triggers can occur.

This behavior is caused by the principle of operation of a PCAP (projected capacitive) touch panel.

5.1.4 Keys

See (4) in [Figure 5-1](#).

[Esc] / Local

If you press shortly:

- Changes to the next-higher hierarchy level.
- Escapes from the entry mode in text boxes and lists.
- Closes dialogs without losing any entries that have been made.
- Switches from remote control mode (all controls disabled) to manual operation.

If you press and hold:

- Goes to the start dialog that shows an overview of the active measurements.

Screenshot

Creates a screenshot of the current display.

[1Trig] / Delete

- Controls the measurements depending on the trigger mode:
 - For all trigger modes except "Single", starts and stops the measurement.
 - For the "Single" trigger mode, enables and triggers the measurement.Changes of the trigger state apply to all measurements.
- Resets the auxiliary values that provide additional information about the measured values.
- Deletes numbers or text in a field so that you can enter a new value.

Enter

- Confirms entries in text fields, dialogs and selections in lists.
- Shows a frame around the control in focus. You can change the focus using the [Cursor keys](#).

[Freq]

Sets the carrier frequency of the applied signal. This value is used for frequency-response correction of the measurement result.

Favorites

Reserved for future use.

[Preset]

Opens the "Save / Recall / Preset" dialog.

If you press [Preset] again, the preset function starts.

If you press the [Preset] key during booting, the R&S NRX starts with the factory default state.

[Zero]

Pressing [Zero] opens the "Zeroing Sensors" dialog.

If you press [Zero] again, "Zero All Sensors" starts.

Also displays status information:

- Zeroing status
- Sensor status

System [System]

Opens the "System Overview" dialog.

Cursor keys

See (5) in [Figure 5-1](#).

The cursor keys are context-sensitive. The control in focus is indicated by a focus frame. Use the cursor keys as follows:

- Selecting an element in the navigation pane.
- Selecting the active pane.
- Selecting an element from a list.
- Moving the cursor in text boxes.
- Changing the value of an entry in a text box.

5.1.5 USB Host Interface

See (6) in [Figure 5-1](#).

USB 2.0 (universal serial bus) interface of the type A (host USB). Used to connect:

- USB power sensors
- External devices like a keyboard, mouse, or memory stick

Further information:

- [Chapter 4.8.4, "USB 2.0 Host Interfaces"](#), on page 16
- [Chapter 4.9, "Connecting USB and External Devices"](#), on page 16

5.1.6 On/Standby Key

See (7) in [Figure 5-1](#).

The on/standby key toggles the R&S NRX between standby and ready state.

The following states are possible:

- Off (key is not illuminated)
The AC power switch on the back of the R&S NRX is switched off. The R&S NRX is disconnected from the AC power supply.
- Ready (green)
The R&S NRX is ready for operation.
- Standby (red)

The power supply has the operating voltage supplied to it. Thus, the R&S NRX is still power-supplied.

For operating details, see [Chapter 4.7, "Switching On or Off"](#), on page 13.

5.2 Rear Panel Tour

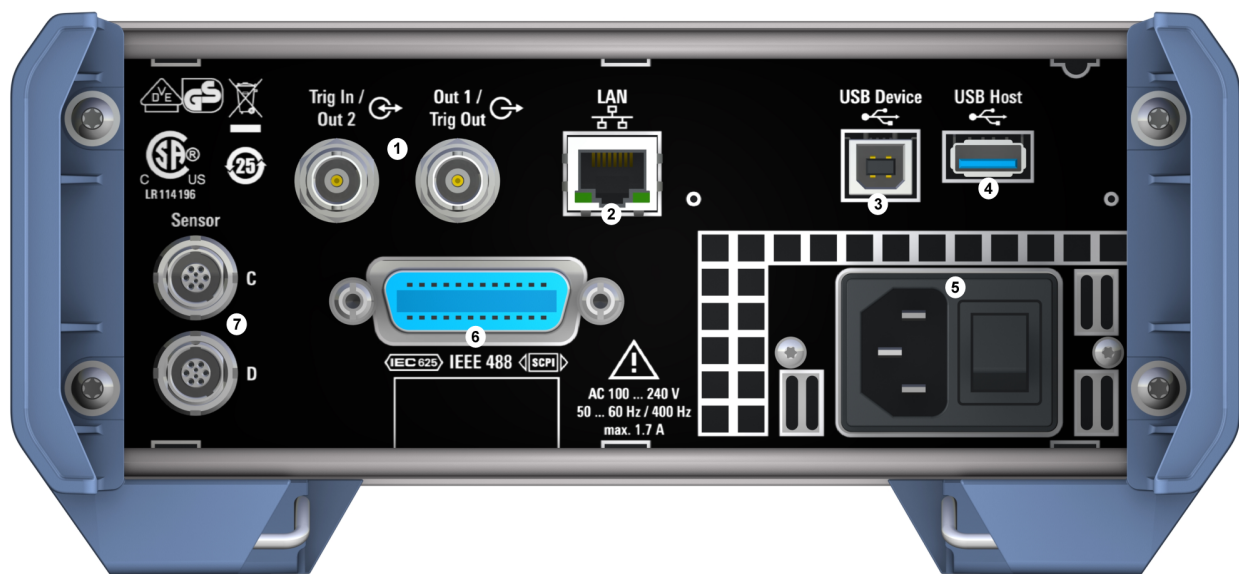


Figure 5-2: Rear panel of the R&S NRX

- 1 = Trig In / Out 2 and Out 1 / Trig Out connectors, see [Chapter 5.2.1, "Trig In / Out 2 and Out 1 / Trig Out Connectors"](#), on page 23.
- 2 = Ethernet interface, see [Chapter 5.2.2, "Ethernet Interface"](#), on page 24.
- 3 = USB device interface, see [Chapter 5.2.3, "USB Device Interface"](#), on page 24.
- 4 = USB host interface, see [Chapter 5.2.4, "USB Host Interface"](#), on page 24.
- 5 = AC supply and power switch, see [Chapter 5.2.5, "AC Supply and Power Switch"](#), on page 24.
- 6 = IEC 625/IEEE 488 interface, optional, see [Chapter 5.2.6, "IEC 625/IEEE 488 Interface"](#), on page 25.
- 7 = Sensor connectors C and D (optional), used to connect R&S power sensors, see [Chapter 5.2.7, "Sensor Connectors C and D"](#), on page 25.

5.2.1 Trig In / Out 2 and Out 1 / Trig Out Connectors

See (1) in [Figure 5-2](#).

The Out 1 / Trig Out BNC connectors supply an analog signal with a voltage between 0 V and 2.5 V. It can be used to output a voltage that is proportional to the measured value (e.g. for level regulation) or a digital signal for limit monitoring.

The Trig In / Out 2 BNC connectors can be used either as an external trigger input with a switchable impedance (10 k Ω or 50 Ω) or as a second analog output.

By default, both connectors are disabled.

5.2.2 Ethernet Interface

See (2) in [Figure 5-2](#).

The Ethernet connector is an RJ45 socket for remote controlling the R&S NRX via a network.

5.2.3 USB Device Interface

See (3) in [Figure 5-2](#).

USB 2.0 (universal serial bus) interface of the type B (receptacle). Used to connect the R&S NRX to a computer for USB remote control.

5.2.4 USB Host Interface

See (4) in [Figure 5-2](#).

See [Chapter 5.1.5, "USB Host Interface"](#), on page 22.

5.2.5 AC Supply and Power Switch

See (5) in [Figure 5-2](#).

When the R&S NRX is connected to the AC supply, it automatically sets itself to the correct range for the applied voltage. The range is printed on the type label. There is no need to set the voltage manually.

For more details, see [Chapter 4.6, "Connecting to the AC Power Supply"](#), on page 12.

5.2.6 IEC 625/IEEE 488 Interface

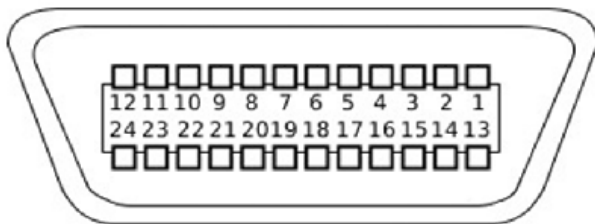
See (6) in [Figure 5-2](#).

Requires GPIB/IEEE488 interface (R&S NRX-B8).

IEC bus (IEEE 488) interface for remote control of the R&S NRX. Used to connect a controller to remote control the R&S NRX. Use a shielded cable for the connection.

Characteristics of the IEC bus (IEEE 488) interface:

- 8-bit parallel data transfer
- Bidirectional data transfer
- Three-wire handshake
- High data transfer rate
- Maximum length of connecting cables 15 m (single connection 2 m)



5.2.7 Sensor Connectors C and D

See (7) [Figure 5-2](#).

Requires 3rd and 4th R&S NRP sensor connector (R&S NRX-B4).

For more details, see [Chapter 5.1.1, "Sensor Connector A and B"](#), on page 18.

6 Contacting Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:



Figure 6-1: QR code to the Rohde & Schwarz support page

Index

Symbols

1 Trig key 21

A

AC power supply 24

 Connecting to 12

Accessory list 9

B

Bench top operation 11

Brochures 7

C

Checking 9

Connecting

 External devices 16

 Power supply 12

 Sensor 14

Connector

 AC power supply 24

 Out 1 / Trig Out 23

 Sensor 18, 25

 Trig In / Out 2 23

Cursor keys 22

Customer support 26

D

Data sheets 7

Delete key 21

Documentation overview 6

E

Electromagnetic interference (EMI) 10

Electrostatic discharge (ESD) 10

Enter key 21

Esc key 20

Ethernet interface 24

External devices 16

F

Favorites key 21

Freq key 21

Front panel keys 20

G

Getting started 6

H

Hardware option 19

Help 6

I

IEC 625/IEEE 488 interface 25

Instrument security procedures 6

Interface

 Ethernet 24

 IEC 625/IEEE 488 25

 Module bay 19

 USB device 24

 USB host 24

K

Key 20

 1 Trig 21

 Delete 21

 Enter 21

 Esc 20

 Favorites 21

 Freq 21

 Local 20

 On/standby 22

 Preset 21

 Screenshot 21

 System 22

 Zero 21

L

Local key 20

M

Module bay 19

O

On/standby key 22

Open source acknowledgment (OSA) 7

Operating conditions 10

Out 1 / Trig Out connector 23

P

Placing 11

Power supply

 Connecting to 12

Preparing for use 9

Preset key	21
R	
Release notes	7
S	
Safety information	10
Safety instructions	7
Screenshot key	21
Security procedures	6
Sensor	
Connecting	14
Connector	18, 25
Switching on	13
System key	22
T	
Touchscreen	20
Trig In / Out 2 connector	23
Tutorials	6
U	
Unpacking	9
USB	
Device interface	24
Host interface	22, 24
User manual	6
Z	
Zero key	21