R&S®Scope Rider RTH
Handheld Digital Oscilloscope
Getting Started

1326156102

ROHDE&SCHWARZ

This manual describes the following R&S®RTH models with firmware version 1.70 and higher:

- R&S®RTH1002 (1317.5000.K02)
- R&S®RTH1004 (1317.5000.K04)

This manual is available in various languages for download from the R&S RTH product page at www.rohde-schwarz.com/manual/rth.

Contents

1   Preface

1.1   Key Features

The R&S RTH is the perfect multi-purpose tool for the lab and in the field. Outstanding key features are:

- Full isolation of all channels and interfaces
- CAT IV 600 V / CAT III 1000 V safety rating
- Bandwidth 60 MHz to 500 MHz with 5 GS/s sampling rate
- Acquisition speed up to 50.000 waveforms per second
- 2 mV/div sensitivity
- Up to 200 V offset range
- 33 automatic measurement functions
- Full operation using touch or keypad
- Wireless LAN and Ethernet for web based remote control and quick data access (optional)

The R&S RTH combines:
- Lab performance oscilloscope
- Logic analyzer with 8 digital inputs (optional)
- Protocol analyzer with trigger and decode (optional)
- Data logger
- Digital multimeter (R&S RTH1002)

1.2   Main Specifications

This chapter lists the main characteristics of the R&S RTH. The complete specifications are listed in the Data Sheet, see Chapter 1.5, "Documentation Overview", on page 12.

Input channels

- R&S RTH1002: 2 oscilloscope channels, 1 multimeter
- R&S RTH1004: 4 oscilloscope channels

Maximum input voltage

- At BNC inputs: CAT IV 300 V
- With probe R&S RT-ZI10 or R&S RT-ZI11: CAT IV 600 V, CAT III 1000 V
- Meter input: CAT IV 600 V; CAT III 1000 V

Voltage ratings: V RMS (50 to 60 Hz) for AC sine wave and V DC for DC applications.

Vertical system

- Analog bandwidth (–3 dB) of oscilloscope channels:
  - R&S RTH1002 and R&S RTH1004: ≥ 60 MHz
  - R&S RTH1002 with -B221 option and R&S RTH1004 with -B241 option: ≥ 100 MHz
  - R&S RTH1002 with -B222 option and R&S RTH1004 with -B242 option: ≥ 200 MHz
  - R&S RTH1002 with -B223 option and R&S RTH1004 with -B243 option: ≥ 350 MHz
  - R&S RTH1002 with -B224 option and R&S RTH1004 with -B244 option: ≥ 500 MHz
- Rise time (calculated):
  R&S RTH1002 and R&S RTH1004 with bandwidth of 60 MHz, 100 MHz, 200 MHz, 350 MHz, 500 MHz: < 5.8 ns, < 3.5 ns, < 1.75 ns, < 1 ns, < 700 ps respectively
- DC gain accuracy:
  Offset and position set to zero after self-alignment
  - Input sensitivity > 5 mV/div: ±1.5 %
  - Input sensitivity > 2 mV/div to 5 mV/div : ±2 %
  - input sensitivity 2 mV/div: ±2,5 %
- Input impedance: 1 MΩ ± 1 % || 12 pF ± 2 pF (meas.)
- Input coupling: DC, AC
- Input sensitivity: 2 mV/div to 100 V/div

- Offset

  Offset range depends on input sensitivity:

  – Input sensitivity ≥ 40 V/div: 0

  – Input sensitivity ≥ 1 V/div to ≤ 20 V/div: ±200 V

  – Input sensitivity ≤ 500 mV/div: ±4 V

Horizontal system

- Timebase range: selectable between 1 ns/div and 500 s/div
- Timebase accuracy: ±10 ppm

Acquisition system

- Maximum realtime sampling rate
  1 / 2 / 4 channels active: 5 / 2.5 / 1.25 Gsample/s respectively
- Acquisition modes: sample, high resolution, peak detect, average, envelope
- Max. acquisition length
  1 / 2 / 4 channels active: 500 / 250 / 125 ksample/channel respectively

Trigger system

- Trigger modes: auto, normal, single
- Trigger types:
  – Standard: edge, glitch, width, TV/video (PAL, NTSC, SECAM, PAL-M)
  – Optional: TV/video (DTV and HDTV), pattern, state, slew rate, window, runt, data2clock, serial pattern, timeout, interval, protocol
- Trigger level ±4 div from center of screen

Analysis features

- 4 active automatic waveform measurements
- Cursor measurements
- Mask testing with up to 5 simultaneous masks
- Waveform mathematics
- Data logger
- True RMS Digital Multimeter (R&S RTH1002 only)
  – Resolution: 4 digits, 10,000 counts

- – Measurements: voltage: DC, AC, AC+DC, resistance, continuity test, diode test, capacitance, temperature (with PT 100 temperature probe), frequency, current (with current clamp or shunt)
- Protocol trigger and decode (optional)
- Logic analysis with 8 additional digital inputs (optional)

General data

- Display: 7.0" LC TFT color display with 800 × 480 pixel resolution (WVGA)
- Weight with battery: 2.4 kg (5.3 lb) (nom.)
- Dimensions W x H x D:
  201 mm x 293 mm x 74 mm (7.91 in x 11.54 in x 2.91 in)
- Interfaces: USB host, USB device, LAN
- Internal storage medium: removable 4 Gbyte microSD card

Power supply

- Power adapter
  - – Input: 100 V to 240 V AC, 50 Hz to 60 Hz, 1.5 A
  - – Output: +15 V DC, 4.0 A
- Lithium-ion rechargeable smart battery
  voltage 11.25 V; capacity 72.0 Wh

Environmental conditions

- Operating temperature
  - – Battery only: 0 °C to +50 °C
  - – Power adapter: 0 °C to +40 °C
- Storage temperature: –20 °C to +50 °C
- Climatic loading: +25° C/+55 °C at 95 % rel. humidity cyclic, in line with IEC 60068-2-30
- Altitude
  - – Operating:
    CAT IV 600 V, CAT III 1000 V: up to 2000 m above sea level
    CAT III 600 V, CAT II 1000 V: up to 3000 m above sea level
  - – Nonoperating: up to 4600 m above sea level
- Pollution degree 2

IP rating

● IP51 in line with IEC 60529

Safety compliance

● IEC / EN / DIN EN 61010-1
● IEC / EN / DIN EN 61010-2-030
● IEC / EN / DIN EN 61010-2-033 (R&S RTH1002)
● UL / CSA 61010-1
● UL / CSA 61010-2-030
● UL / CSA 61010-2-033 (R&S RTH1002)

EMC compliance

● RF emission
  – In line with CISPR 11 / EN 55011 group 1 class A (for a shielded test setup)
  – Complies with the emission requirements stipulated by EN 55011, EN 61326-1 and EN 61326-2-1 class A, making the instrument suitable for use in industrial environments
● Immunity: in line with IEC / EN 61326-1 table 2, immunity test requirements for industrial environments

1.3   Input Isolation

The instrument has independently floating isolated inputs. Each input channel has its own signal input and its own reference input. Each input channel is electrically isolated from the other input channels. Therefore, each reference of the used inputs must be connected to a reference voltage. Furthermore, input channels are electrically isolated from the communication ports and the power adapter input.
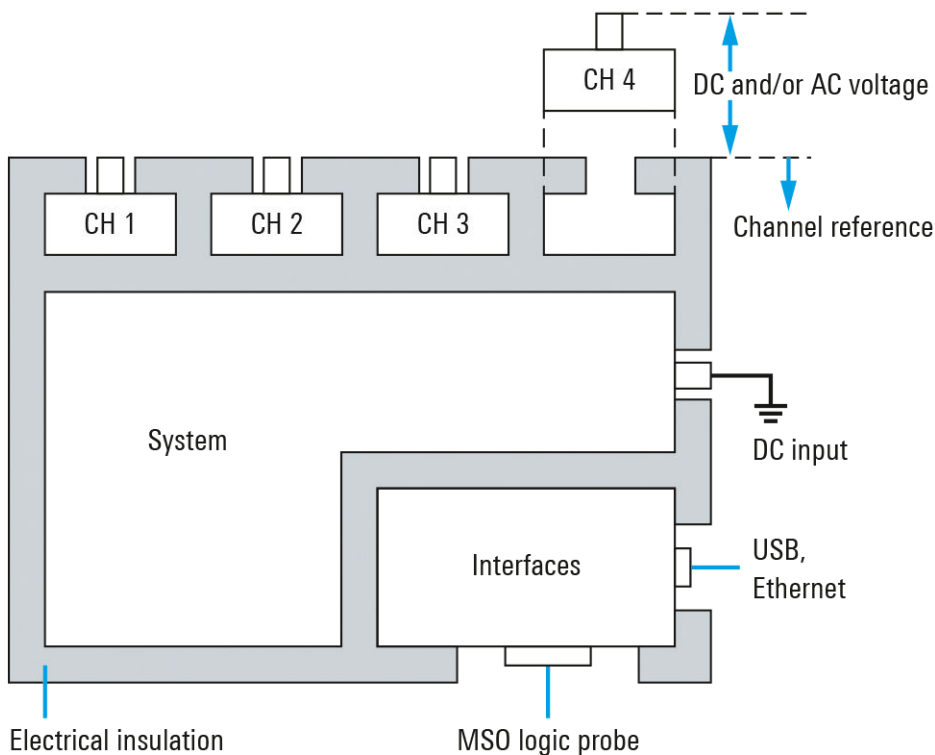
Figure 1-1: Isolation scheme of the R&S RTH

The input isolation has several advantages:

● You can measure independently floating signals simultaneously.
● The risk of causing a short circuit while measuring multiple signals is reduced substantially.
● When measuring signals with different grounds, the induced ground currents are kept to a minimum.

1.4   Measurement Categories

To ensure safe operation of measurement instruments, IEC 61010-2-030 defines particular safety requirements for testing and measuring circuits. The standard introduces measurement categories that rate instruments on their ability to resist short transient overvoltages that occur in addition to the working voltage of the instrument and can exceed the working voltage many times over.

Measurement categories are distinguished as follows:

● O - Instruments without rated measurement category

For measurements performed on circuits not directly connected to mains, for example, electronics, circuits powered by batteries, and specially protected secondary circuits. This measurement category is also known as CAT I.

- CAT II:
  For measurements performed on circuits directly connected to the low-voltage installation by a standard socket outlet, for example, household appliances and portable tools.

- CAT III:
  For measurements performed in the building installation, such as junction boxes, circuit breakers, distribution boards, and equipment with permanent connection to the fixed installation.

- CAT IV:
  For measurements performed at the source of the low-voltage installation, such as electricity meters and primary overcurrent protection devices.
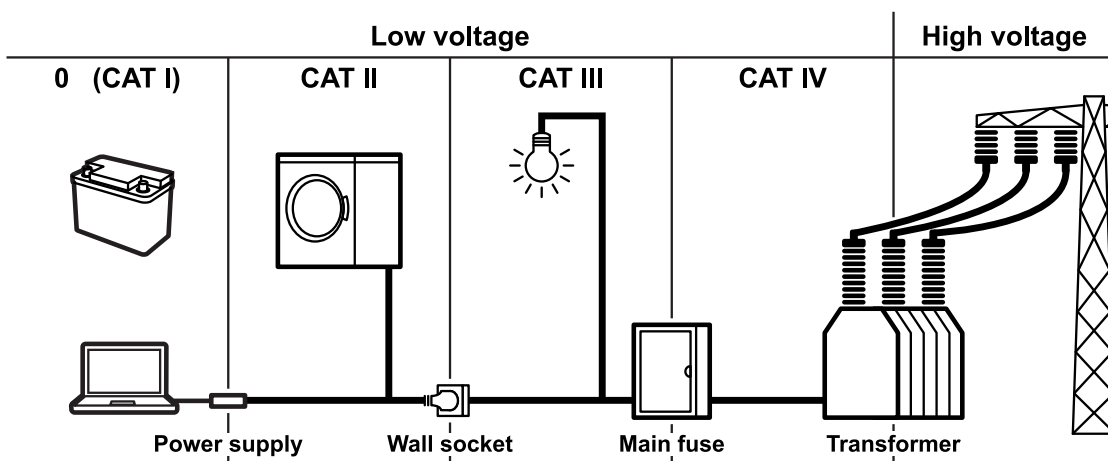

Figure 1-2: Examples of measurement categories

The higher the category, the higher the expected transient overvoltage. Overvoltages can overload a circuit and cause electrical and physical damage. Therefore, use the measurement instrument only in electrical environments for which the instrument is rated.

The measurement categories correspond to the overvoltage categories of the IEC60664 standards. Working voltages stated in context with measurement categories are always specified as effective voltages V (RMS) against earth ground.

1.5   Documentation Overview

The user documentation for the R&S RTH consists of the following parts:

- Instrument Help
  The instrument help is part of the instrument's firmware. It offers quick, context-sensitive access to the complete information directly on the instrument.

- Basic Safety Instructions
  This brochure provides safety instructions and operating conditions and further important information. The brochure is delivered with the instrument in printed form.

- Getting Started
  The Getting Started manual provides the information needed to set up and start working with the instrument, and describes basic operations. The English edition of this manual is delivered with the instrument in printed form. Editions in other languages and the newest version of the English manual are available on the product website.

- User Manual
  The user manual describes all instrument modes and functions in detail. It also provides an introduction to remote control and a complete description of the remote control commands with programming examples. The newest version of the manual is available in English on the R&S RTH product website at www.rohde-schwarz.com/manual/rth.

- Data Sheet
  The data sheet contains the complete instrument specification. It also lists the options and their order numbers, and optional accessories. The data sheet is available on the R&S RTH product website at www.rohde-schwarz.com/brochure-datasheet/rth.

- Calibration Certificate
  The document is available on https://gloris.rohde-schwarz.com/calcert.

- Open Source Acknowledgment
  The Open Source Acknowledgment document provides verbatim license text of open source software that is used in the instrument's firmware. It is available on the R&S RTH website at www.rohde-schwarz.com/firmware/rth, and it can be read directly on the instrument.

- Instrument security procedures manual
  Provides information on security issues when working with the R&S RTH in secure areas.

- Application cards and application notes
  These documents deal with special applications or background information on particular topics. See www.rohde-schwarz.com/application/rth

1.6 Regulatory Information

Part 15 of the FCC and RSS-210 of IC Rules

This device complies with Part 15 of the FCC Rules and with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

- this device may not cause harmful interference, and
- this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- l'appareil ne doit pas produire de brouillage, et
- l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Changes or modifications made to this equipment not expressly approved by Rohde & Schwarz may void the FCC authorization to operate this equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Administrative Regulations on Low Power Radio Waves Radiated Devices warning (Republic of China/Taiwan)

Article 12

- Without permission granted by the NCC, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to a approved low power radio-frequency devices.

Article 14

- The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; If found, the user shall cease operating immediately until no interference is achieved.

- The said legal communications means radio communications is operated in compliance with the Telecommunications Act.

- The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices.

LP0002 Warning Statement

- 經審驗合格之射頻電信終端設備，非經許可，公司、商號使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

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2   Preparing for Use

This section describes the basic steps to be taken when setting up the R&S RTH for the first time.

⚠ **WARNING**

Shock hazard caused by high voltages

The instrument must be used in an appropriate manner to prevent electric shock, fire, personal injury, or damage.

- Do not open the instrument casing.

- Do not use the instrument if the instrument casing, the display or any probe or accessory are damaged. If you detect or suspect any damage, have the instrument or accessory inspected by qualified service personnel.

- Use only specified probes and accessories that comply with the measurement category of your measurement task.
  If you use other than Rohde & Schwarz accessories, make sure that they are suitable to the instrument and the measurement task.

- Do not operate the instrument in wet, damp or explosive atmospheres. Make sure that all connectors are completely dry before connecting the inputs.

- Voltages higher than 30 V RMS or 42 V peak or 60 V DC are regarded as hazardous contact voltages. Make sure that only electrically skilled persons may use the R&S RTH for measurements on hazardous contact voltages because these working conditions require special education and experience to perceive risks and to avoid hazards which electricity can create.

- Observe the operating conditions specified in the data sheet. Note that the general safety instructions also contain information on operating conditions that will prevent damage to the instrument.

- Read and observe the "Basic Safety Instructions" delivered as a printed brochure with the instrument. In addition, read and observe the safety instructions in the following sections.

2.1   Unpacking the Instrument

When you receive your shipping package, unpack and inspect the package and its contents for damage.

1. Inspect the package for damage.
   If the packaging material shows any signs of stress, notify the carrier as well as your Rohde & Schwarz service center. Keep the package and cushioning material for inspection. Keep a damaged package and the cushioning material until the contents have been checked for completeness and the instrument has been tested.

2. Unpack the handheld scope and the accessories and check the contents for completeness, see "Package contents" on page 16.
   If anything is missing, contact your Rohde & Schwarz service center.

3. Inspect the handheld scope and the accessories.
   If there is any damage or defect, or if the R&S RTH does not operate properly, notify your Rohde & Schwarz service center.

> **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.

Package contents

The delivery package contains the following items:

- R&S RTH handheld scope
- 4 Gbyte microSD card, installed in the battery compartment
- Power adapter with cable and adapter set for various socket types
- Battery pack
- R&S RT-ZI10 probes (2x for R&S RTH1002; 4x for R&S RTH1004)
- DMM test leads (only for R&S RTH1002)
- Hand strap, attached on the handheld scope
- Printed "Getting Started" manual and "Basic Safety Instructions" brochure

Optional accessories and their order numbers are listed in the data sheet.
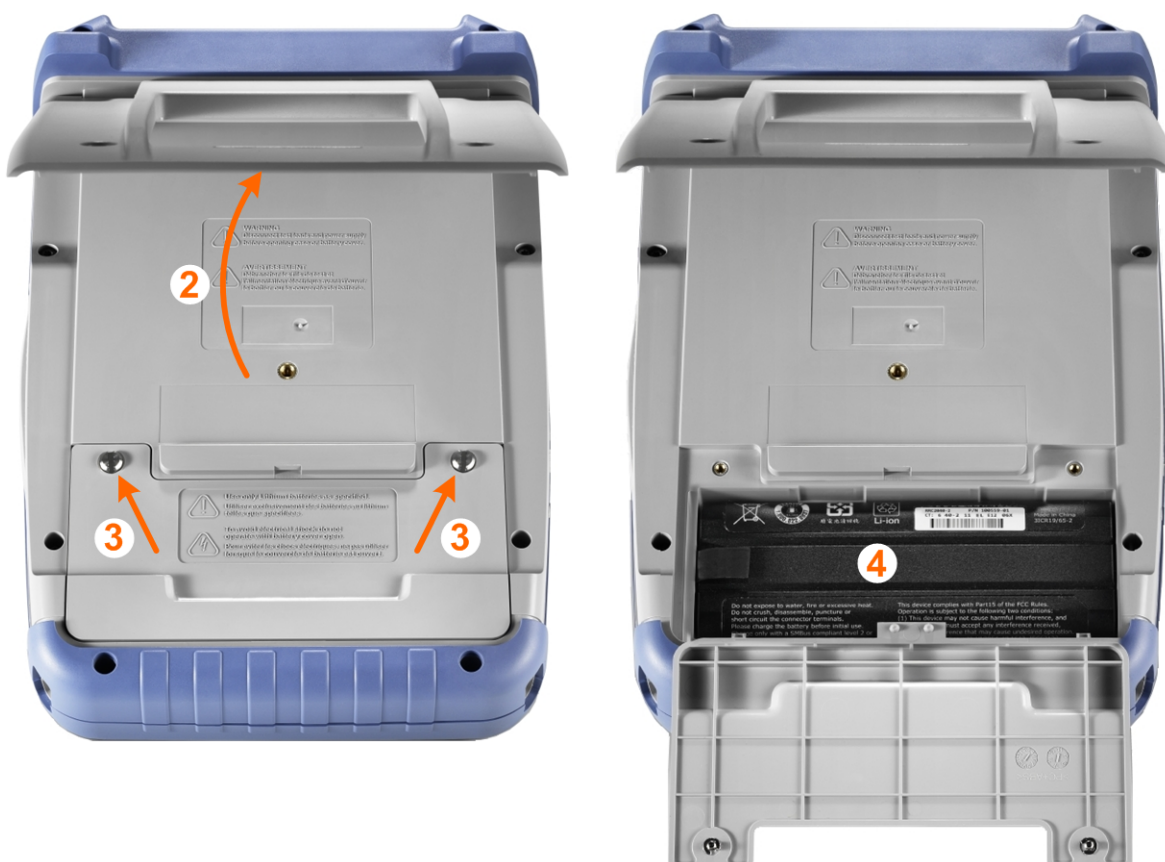
2.2 Inserting and Charging the Battery

Before you can use the handheld scope for the first time, insert the battery pack and charge it.

⚠ **WARNING**

Risk of electrical shock during battery replacement

- Disconnect power supply, probes, test leads and all other cables before opening the battery cover.
- Use only the specified Li-Ion battery pack, which is delivered with the instrument. You can order additional battery packs at Rohde & Schwarz, see Data Sheet for order number.
- Do not operate the instrument with the battery cover open.
- Use only the specified power adapter, which is delivered with the instrument.

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1. Turn off the instrument power. Remove power supply, probes, test leads and all other cables.

2. Fold out the tilt stand on the back of the instrument.

3. Screw open the battery cover.

4. Insert the battery pack.

5. Screw down the battery cover.

6. Connect the power adapter to the connector on the left side of the scope, and fully charge the battery. Charging may take a few hours.

If the instrument is on, the battery status is shown on the display.

Replace used batteries periodically by new batteries after 24 months of usage.

Observe the safety regulations in the "Batteries and rechargeable batteries/ cells" chapter in the "Basis Safety Instructions" brochure, which is delivered with the instrument.

2.3   Powering On/Off

► Press the ⏻ [Power] key to switch the instrument on or off.

   The key blinks and turns green after a few seconds.

Table 2-1: Colors of the Power key

Green	Power is on
Blue	Charging the battery, power is off
Orange (yellow)	Battery is fully charged, power adapter is connected, power is off

If you do not use the instrument for a longer time, the battery gets exhausted. When you connect the power supply and switch on the instrument with exhausted battery, it takes a few minutes until the instrument can start.

2.4   Using the Tilt Stand

The R&S RTH has a tilt stand for proper handling while the scope is placed on a table.

► Pull the tilt stand as shown below.

2.5   EMI Suppression

Electromagnetic Interference (EMI) may affect the measurement results.

To suppress generated Electromagnetic Interference:

- 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.

3   Instrument Tour

3.1   Front View
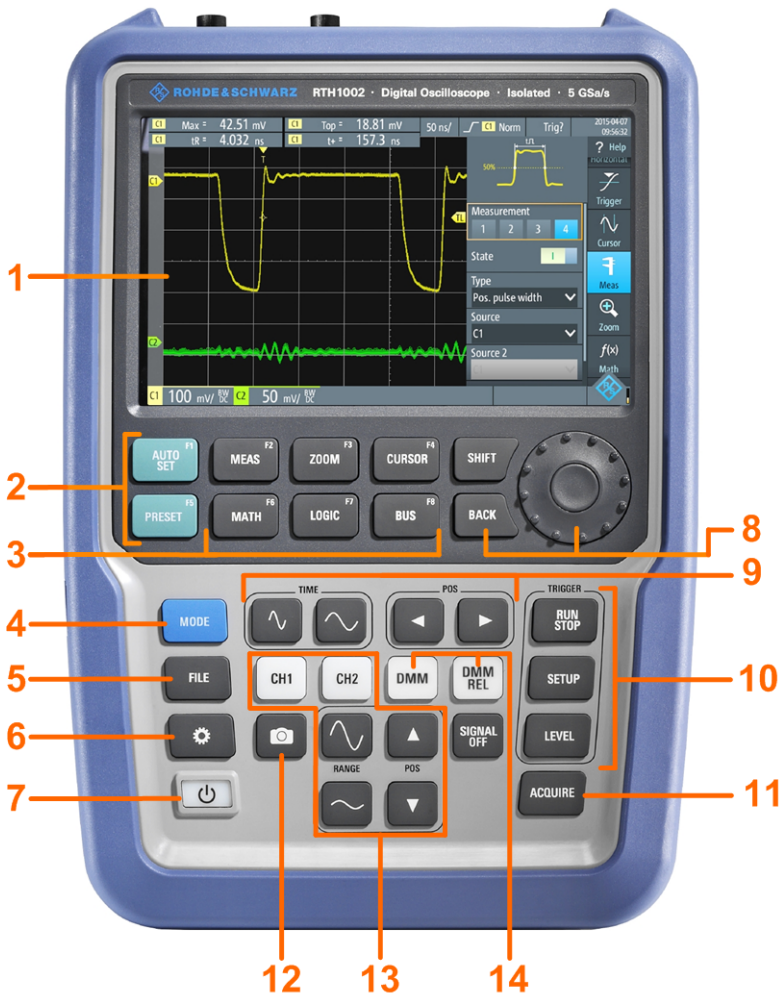
Figure 3-1: Front panel of the R&S RTH1002

1 = Touch display
2 = Waveform setup with [AUTOSET], reset to default with [PRESET]
3 = Analysis functions
4 = Mode selection
5 = Save/Recall
6 = Instrument settings
7 = Power on/off
8 = Navigation controls
9 = Horizontal settings

10 = Run/stop acquisition and trigger settings
11 = Acquisition settings
12 = Screenshot and documentation output
13 = Channels and vertical settings
14 = Multimeter measurements
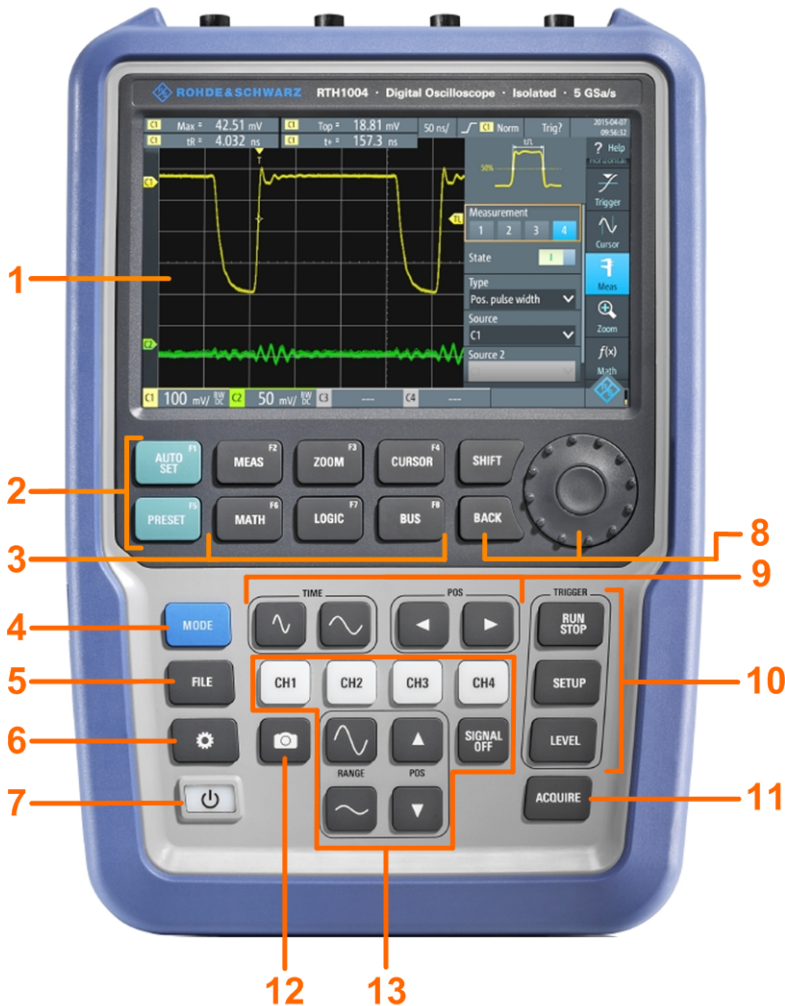
Figure 3-2: Front panel of the R&S RTH1004

1 = Touch display
2 = Waveform setup with [AUTOSET], reset to default with [PRESET]
3 = Analysis functions
4 = Mode selection
5 = Save/Recall
6 = Instrument settings
7 = Power on/off
8 = Navigation controls
9 = Horizontal settings
10 = Run/stop acquisition and trigger settings

11 = Acquisition settings
12 = Screenshot and documentation output
13 = Channels and vertical settings

For a description of the keys, see Chapter 4.3.3, "Using Front Panel Keys",
on page 37.

3.2   Top View

The R&S RTH1002 has two BNC input connectors CH1 and CH2, and two 4 mm
banana plug inputs for multimeter measurements. The channel inputs have dou-
ble channel-to-channel isolation that allows for independent floating measure-
ments at each input. The DMM input is fully isolated from scope inputs, interfa-
ces, and ground.

Figure 3-3: Top view of R&S RTH1002

The R&S RTH1004 has four BNC input connectors CH1, CH2, CH3, CH4. The
channel inputs have double channel-to-channel isolation that allows for independ-
ent floating measurements at each input.

Figure 3-4: Top view of R&S RTH1004

⚠ **WARNING**

Shock hazard caused by high voltages

To avoid electrical shock and personal injury, and to prevent damage to the instrument or any other products connected to it, observe the following:

- Do not apply input voltages above the rating of the instrument and the accessories.
- Use only probes, test leads, and adapters that comply with the measurement category (CAT) of your measurement task.
- Test leads and measurement accessories used for multimeter measurements on a live mains circuit must be rated for CAT III or CAT IV according to IEC 61010-031. The voltage of the measured circuit must not exceed the rated voltage value.

Maximum input voltage:

- At BNC inputs: CAT IV 300 V
- With probe R&S RT-ZI10 or R&S RT-ZI11: CAT IV 600 V, CAT III 1000 V
- Meter input: CAT IV 600 V; CAT III 1000 V

Voltage ratings: V RMS (50 to 60 Hz) for AC sine wave and V DC for DC applications.

⚠ **WARNING**

Risk of electrical shock or fire

Voltages higher than 30 V RMS or 42 V peak or 60 V DC are regarded as hazardous contact voltages. When working with hazardous contact voltages, use appropriate protective avoid electrical shock and injuries:

- Use only insulated probes, cables, test leads and adapters.
- Do not touch voltages higher than 30 V RMS or 42 V peak or 60 V DC.

3.3   Right View

1 = LAN
2 = USB type B for remote control
3 = Probe compensation
4 = USB type A for flash drive
5 = Logic probe connector

⚠ CAUTION

Risk of injury or instrument damage

Always close the lids of the communication ports and DC input when they are not in use.

LAN connector

RJ-45 connector to connect the instrument to a Local Area Network (LAN). It supports up to 100 Mbit/s.

USB type A connector

USB type A connector to connect a USB flash drive to store and reload instrument settings and measurement data.

USB type B connector (mini USB)

Mini USB connector to connect a computer for remote control of the instrument.

Probe compensation

Probe compensation terminal to support adjustment of passive probes to the oscilloscope channel.

Logic probe connector

Input for the logic probe R&S RT-ZL04. Logic analysis requires Mixed Signal Option R&S RTH-B1, which includes the logic probe R&S RT-ZL04.

⚠ **WARNING**

Risk of electrical shock - no CAT rating for MSO measurements

The logic probe R&S RT-ZL04 is not rated for any measurement category. To avoid electrical shock or personal injury, and to prevent material damage, make sure that the ground clips of the R&S RT-ZL04 are connected to protective earth on the DUT.

3.4   Left View

1 = DC input
2 = Kensington lock slot

DC input

Connector for the power adapter to charge the battery.

Kensington lock slot

The Kensington lock is used to secure the instrument against theft.

3.5   Rear View

1 = Tilt stand to fold out
2 = Thread hole M5
3 = Battery compartment

3.6   Display Overview

In the most important modes scope, mask and XY, the display shows the follow-
ing information.
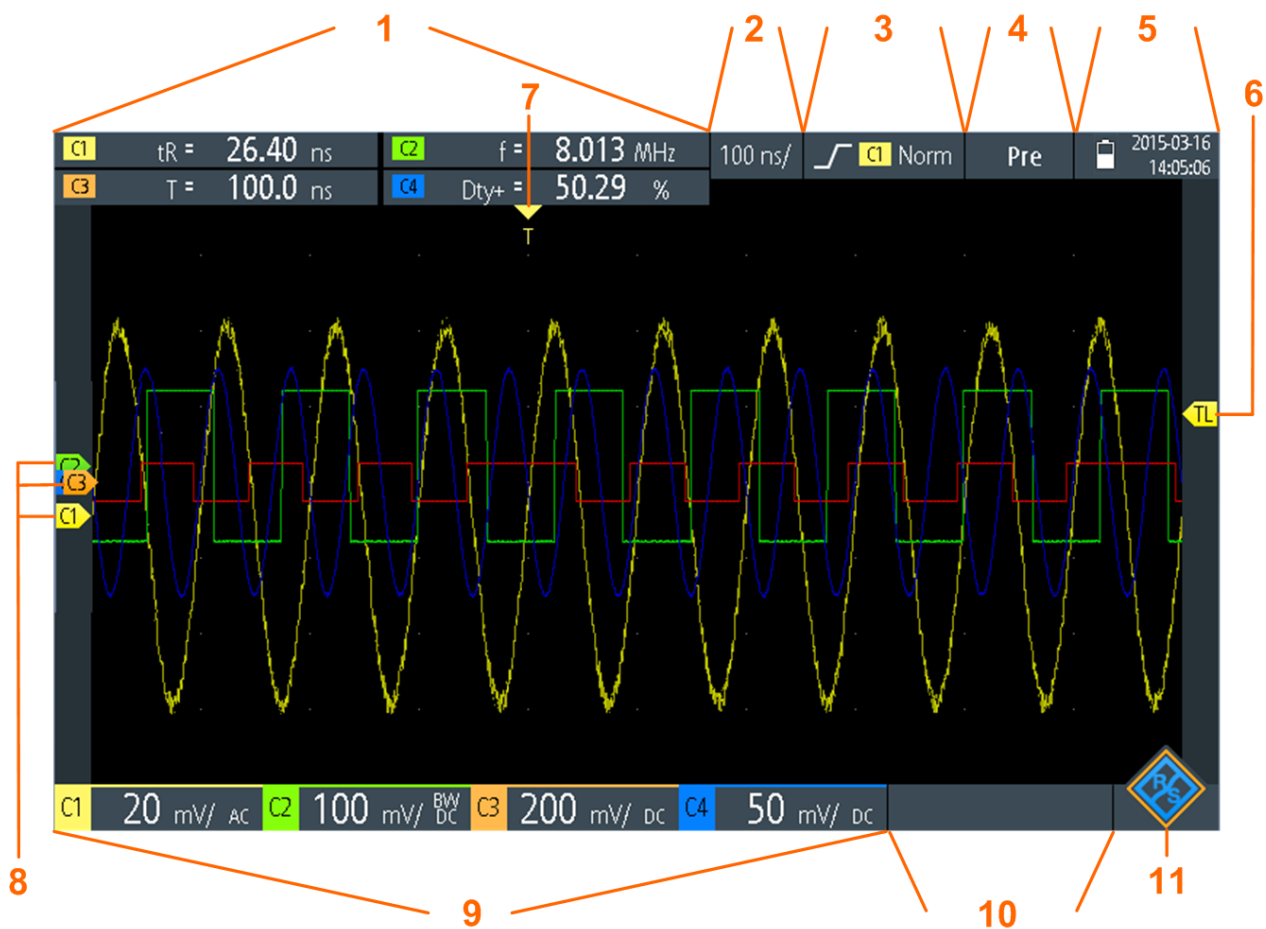
1   = Measurement results, depends on the mode and the selected measurement
2   = Time scale (horizontal scale, in s/division)
3   = Trigger type, trigger source, and trigger mode
4   = Capture status
5   = Battery status and AC connectivity for battery charging; date and time
6   = Trigger level marker, has the color of the trigger source
7   = Trigger position marker, has the color of the trigger source
8   = Channel markers indicate the ground levels. Channel C3 has the focus
9   = Vertical settings for each active channel: vertical scale (vertical sensitivity, in V/division),
      bandwidth limit (no indicator = full bandwidth, BW= limited frequency), coupling (AC or DC)
10 = Logic channels (MSO R&S RTH-B1)
11 = Menu button

You can adjust the vertical position of each waveform, the trigger level, and the trigger position by dragging the corresponding marker on the display. Alternatively, tap a marker to set the focus, and use the wheel to adjust position.

4   Operating the Instrument

4.1   Connecting Probes

⚠ WARNING

Shock hazard caused by high voltages

Make sure to set the attenuation factor on the instrument according to the probe being used. Otherwise, the measurement results do not reflect the actual voltage level, and you might misjudge the actual risk.

ⓘ Obtain best signal integrity

To get the most accurate waveform display and best measurement results, remove all redundant connectors: power adapter, USB flash drive, DMM test leads and unused channels.

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1. Connect the probe(s) to the channel input(s) at the top of the instrument.

2. Press and hold the [CH] key of the used input.

3. Select "Probe Setting".

4. Select the attenuation factor of the probe:
   - To set a common attenuation factor, select it on the list.
   - To set a user-defined attenuation factor:
     – Select "User".
     – Set the "Probe Factor".

   The probe's attenuation factor is indicated on the probe.
   Note: If you measure current using a shunt resistor as a current sensor, you have to multiply the V/A-value of the resistor by the attenuation of the probe. For example, if a 1 Ω resistor and a 10:1 probe is used, the V/A-value of the resistor is 1 V/A, the attenuation factor of the probe is 0.1, and the resulting current probe attenuation is 100 mV/A.

5. Switch off the test circuit.

6. Connect the probe to the DUT.

7. Switch on the test circuit.

4.2   Connecting Test Leads (R&S RTH1002)

The R&S RTH1002 has an integrated digital multimeter (DMM) and test leads for multimeter measurements.

Figure 4-1: Meter inputs to connect test leads

1. Connect the leads first to the DMM inputs at the top of the instrument, and then to the DUT.

2. To start meter measurements, press the [DMM] key.

4.3 Accessing the Functionality

The complete functionality is available in the menus and dialogs on the touch-screen. You can touch the functions directly on the display, or you can use the wheel to navigate and select. In addition, the most important functions are applied to the keys on the front panel to set up and perform measurement tasks quickly.

4.3.1 Using the Touchscreen

Using the touchscreen of the R&S RTH is as easy as using your mobile phone. To open the menu, tap the "Menu" button - that is the R&S logo in the right bottom corner of the display.
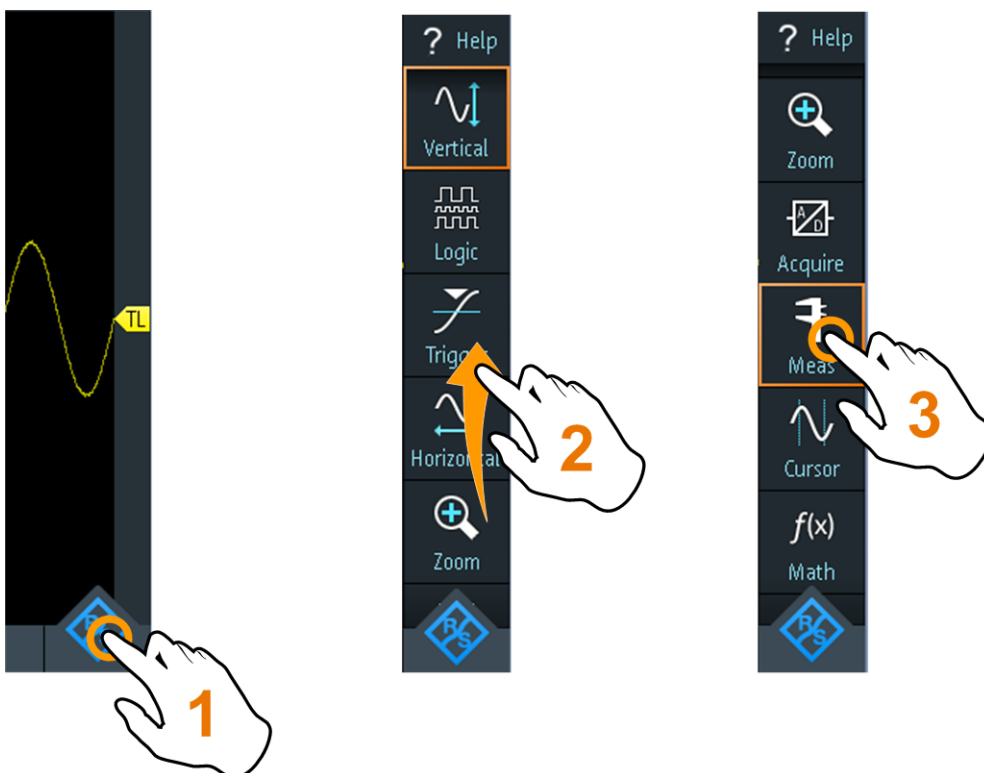
Figure 4-2: Open the menu and select a menu item

Figure 4-3: Switch on or off (left) and select a parameter value (right)
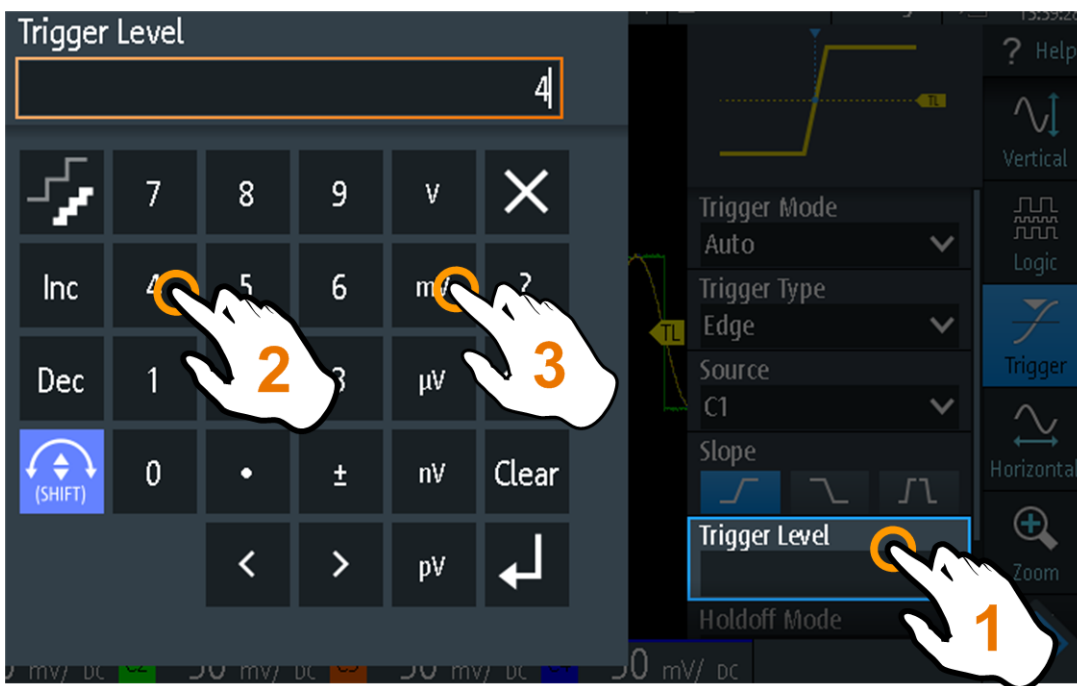
Figure 4-4: Enter numerical value and unit

4.3.2   Using the Navigation Wheel

In addition or alternatively to the touchscreen, you can use the wheel to control the R&S RTH.

When using the wheel, always observe the position of the focus - the orange frame or other highlighting that marks the active object on the screen.

- If the focus is on the menu button or somewhere in the menu or dialogs:
  – Turn the wheel to move the focus.
  – Press the wheel button to apply the selection.
- If the focus is on an element in the diagram, for example, on a waveform, cursor line, or trigger level:
  – Turn the wheel to change the position of the active element.
  – Press the wheel button to toggle the active element, for example, to toggle the cursor lines, or zoom size and zoom position.

The [BACK] key closes open dialogs and menus, and resets the focus to the "Menu" button.

Menu navigation

The following procedure describes how to access and navigate the menu. Navigating dialogs and selecting parameter values works in the same way. See also Figure 4-5.

1. Press [BACK] until the focus is on the "Menu" button.

2. Press the wheel button to open the menu.

3. Turn the wheel to move the focus to the required menu item.

4. Press the wheel button to open the dialog, submenu, or keypad for the selected menu item.
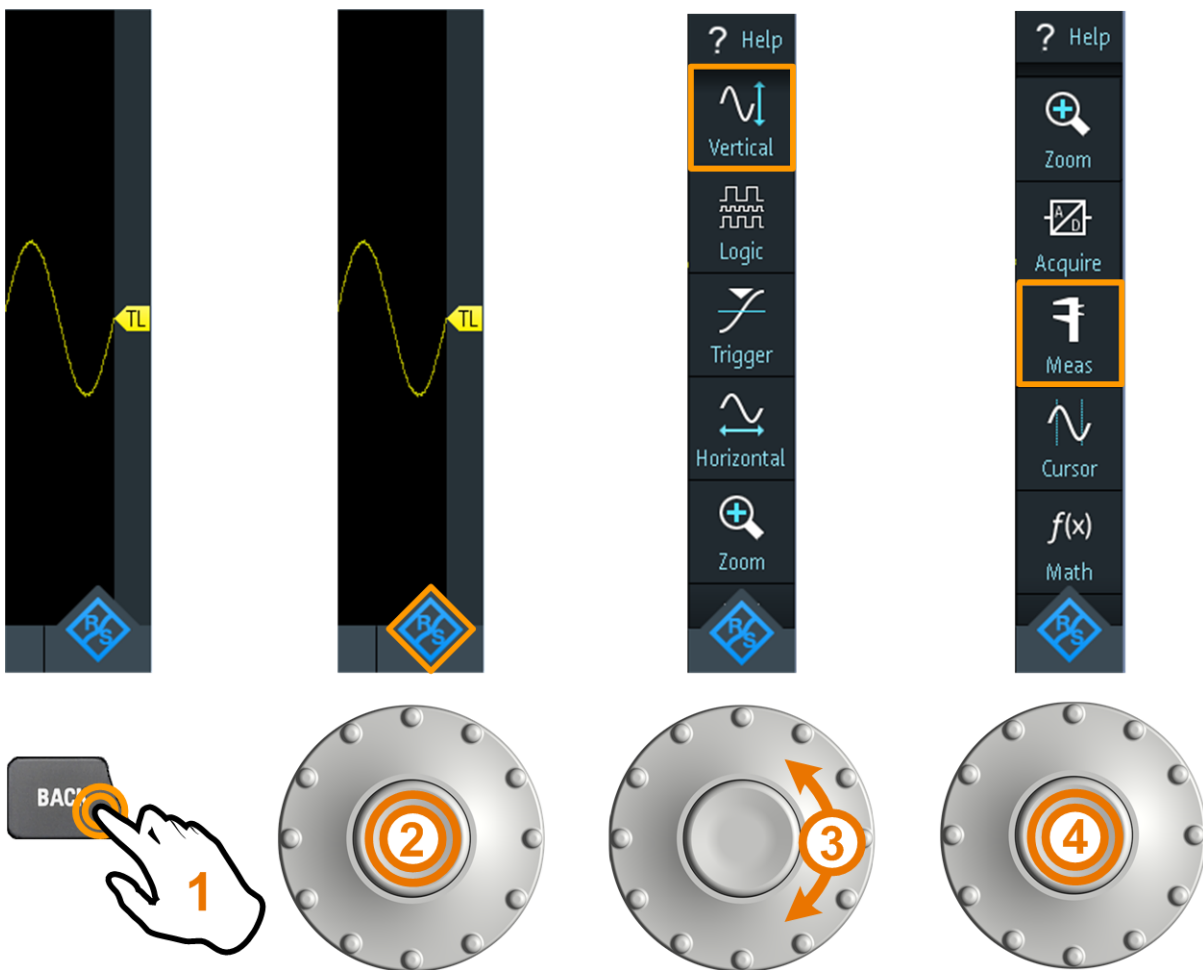
Figure 4-5: Open the menu and select a menu item

Set numerical value using the wheel

1. Set the focus to the required setting, and press the wheel button *once*.

2. Turn the wheel until the required value is shown.

3. Press [BACK].

Figure 4-6: Set numerical value using the wheel

Data entry using wheel and keypad

You can enter precise numerical values on the keypad. See also Figure 4-7.

1. Set the focus to the required setting, and press the wheel button *twice*.

2. Turn the wheel until the focus is on the required number.

3. Press the wheel button.

4. Turn the wheel until the focus is on the required unit.

5. Press the wheel button.
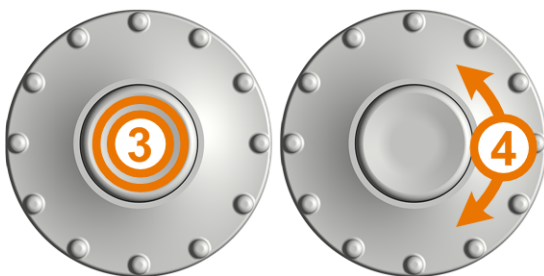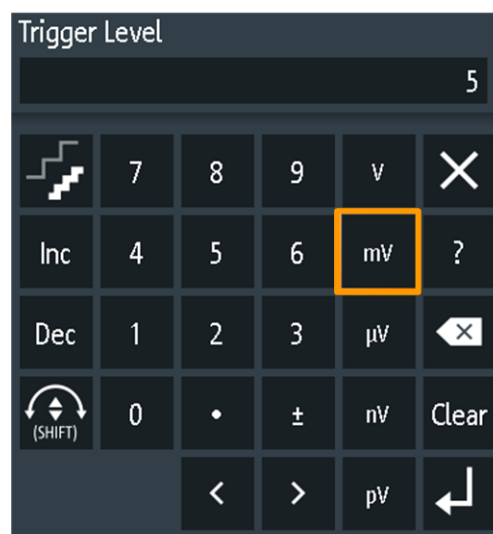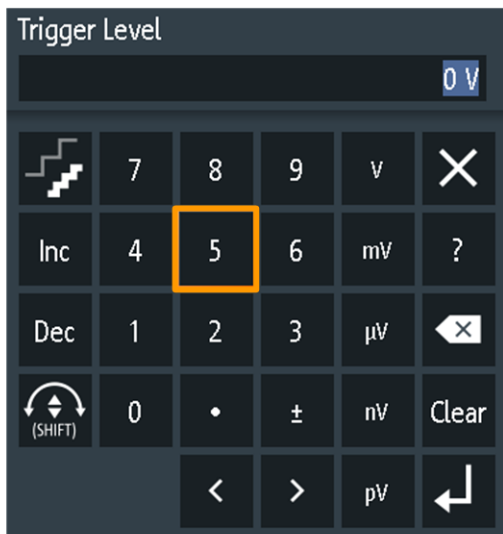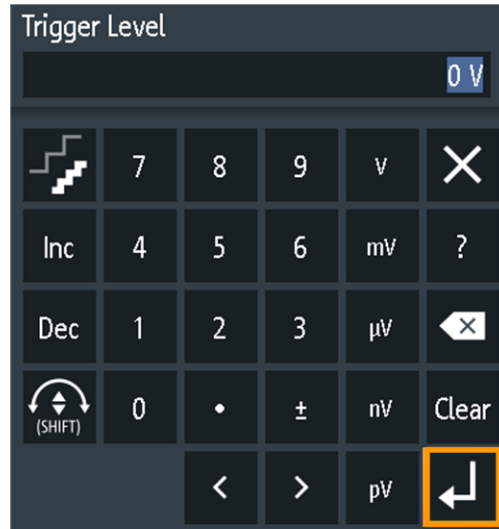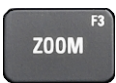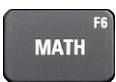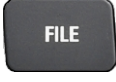
Figure 4-7: Enter numerical value and unit in the keypad
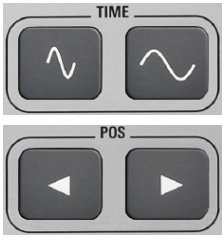
The [SHIFT] button toggles the wheel focus in the keypad. If the focus is on the entry field, turning the wheel changes the value. If the focus is in the lower part, the wheel selects numbers and unit.

4.3.3 Using Front Panel Keys

For an overview of the front panel keys, see Figure 3-2

Key	Press shortly	Press and hold
AUTO SET (F1)	[AUTOSET] analyses the active channels, adjusts the instrument settings, and displays stable waveforms.	
PRESET (F5)	[PRESET] sets the instrument to the default factory state.	
MEAS (F2)	[MEAS] starts or stops the last configured automatic measurements.	Opens or closes the "Meas" dialog to configure the measurements.
ZOOM (F3)	[ZOOM] enables or disables the zoom with the last configuration. If the zoom is on but not in focus, pressing the key focuses the zoom.	Opens or closes the "Zoom" dialog to configure the zoom scale and position.
CURSOR (F4)	[CURSOR] starts or stops the last configured cursor measurement. If the cursor is on but not in focus, pressing the key sets the focus to the first cursor line.	Opens or closes the "Cursor" dialog to configure the measurement.
MATH (F6)	[MATH] switches the math waveform on or off.	Opens or closes the "Math" dialog to configure the math waveform.
LOGIC (F7)	Requires logic analyzer option R&S RTH-B1 (MSO). The effect depends on the state of digital channels: If the all digital channels are off, the key switches them on and sets the focus. If the digital channels are on but not in focus, the key sets the focus. If the focus is on digital channels, the key switches them off.	Opens or closes the "Logic" dialog to configure digital channels.
BUS (F8)	Activates or deactivates the serial bus. Requires at least one serial triggering and decoding option. Available options are listed in the data sheet.	Opens or closes the "Bus" dialog to configure serial protocols.

Key	Press shortly	Press and hold
SHIFT	[SHIFT] opens a dialog to save and load instrument settings.	Press and hold for 2 seconds to disable or enable the touchscreen.
BACK	If a dialog or menu is open, [BACK] closes it. If the menu is closed, the key toggles the focus between focused element in the diagram and the Menu button.	
MODE / **FILE** / ⚙	Open or close the "Mode", "File" or "Setup" dialog, respectively.	
📷	Saves measurement documentation: Only screenshot if "one touch" is off. ZIP file with selected data if "one touch" is on.	Opens or closes the "Screenshot" dialog to configure the screenshot and the "one touch" output.
All R&S RTH: **CH1** **CH2** Only R&S RTH1004: **CH3** **CH4**	The effect depends on the channel state: If the channel is off, the key switches on the channel and sets the focus. The key lights up. If the channel is on but not in focus, the key sets the focus. The key lights up.	Open or close the "Vertical" dialog for the corresponding channel to configure the channel settings.
Only R&S RTH1002: **DMM** **DMM REL**	[DMM] starts or stops the meter measurements (same as [MODE] = "Meter"). [DMM REL] enables or disables relative meter measurements.	Opens or closes the "Meter" dialog to configure the measurements.
TIME / **POS**	[TIME] and [POS] adjust the horizontal time scale and position of the trigger point.	
RANGE / **POS**	[RANGE] and [POS] set the vertical scale (vertical sensitivity) and the vertical position of the focused waveform (analog or channel, math or reference waveform).	

Key	Press shortly	Press and hold
SIGNAL OFF	[SIGNAL OFF] switches off the focused waveform.	
RUN STOP	[RUN STOP] starts and stops the acquisition.	
SETUP	[SETUP] opens or closes the "Trigger" dialog to select the trigger type and adjust the trigger settings.	
LEVEL	[LEVEL] activates the trigger level to be set using the wheel. If the trigger type has two trigger levels, pressing the key toggles the upper and lower levels.	
ACQUIRE	[ACQUIRE] opens or closes the "Acquire" dialog to adjust the acquisition mode.	
⏻	[Power] key: switches the power on or off	

4.4   Displaying an Unknown Signal

The R&S RTH can display unknown, complex signals automatically. The [AUTOSET] function analyzes the enabled channel signals, and adjusts the horizontal, vertical, and trigger settings to display stable waveforms.

1. Press the [PRESET] key.

    PRESET F5

    [PRESET] sets the instrument to a default factory state. The previous user-defined configuration is removed and all channels except for channel 1 are disabled.

2. Press the [AUTOSET] key.

    AUTO SET F1
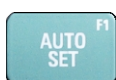
    The waveform is displayed.

4.5 Selecting the Mode

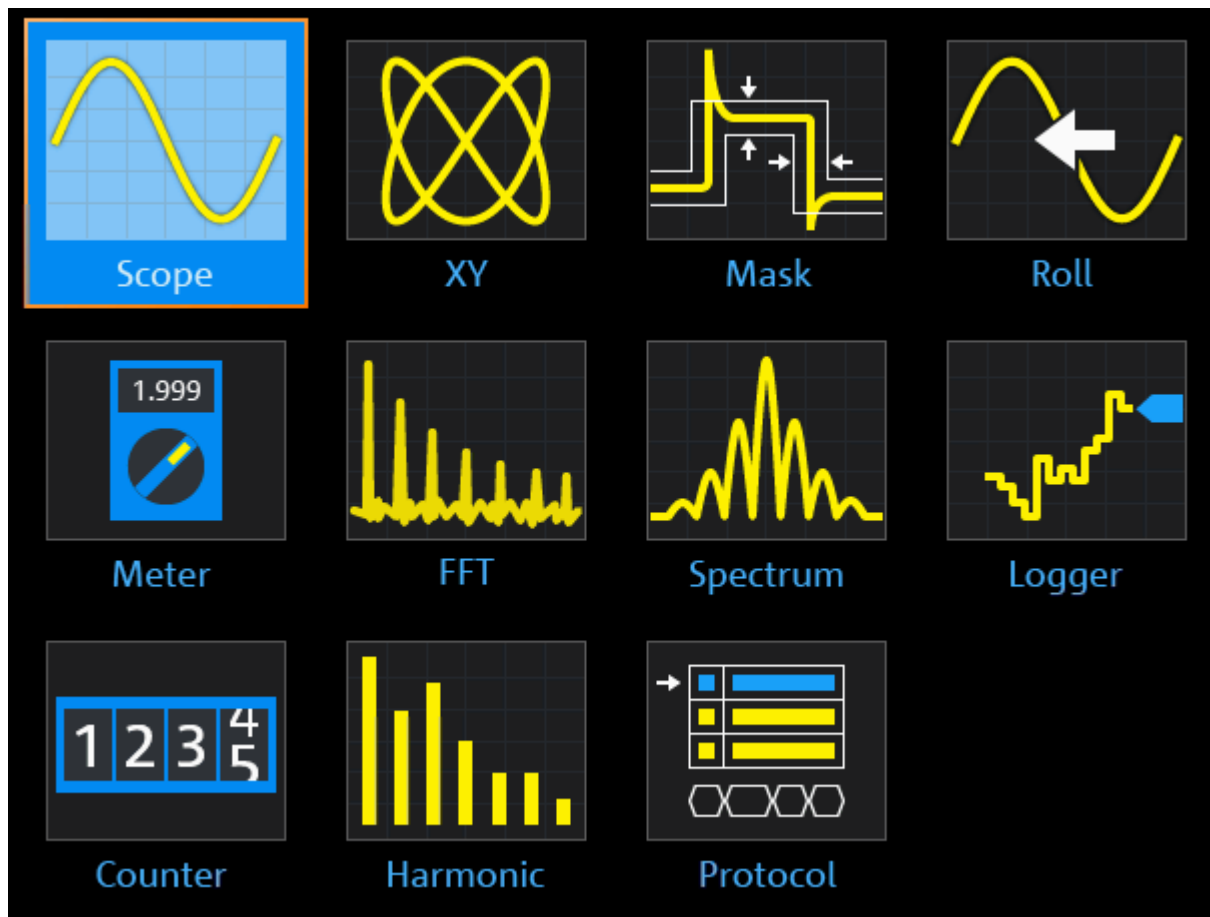A mode comprises all settings and functions that are needed to perform a measurement task. Selecting the mode is the first setup step.

1. Press the [MODE] key.

   MODE

2. Select the mode:
   - On the touchscreen: Tap the required mode icon.
   - Using controls: Turn the wheel until the required mode is marked, and press the wheel button to select the mode.
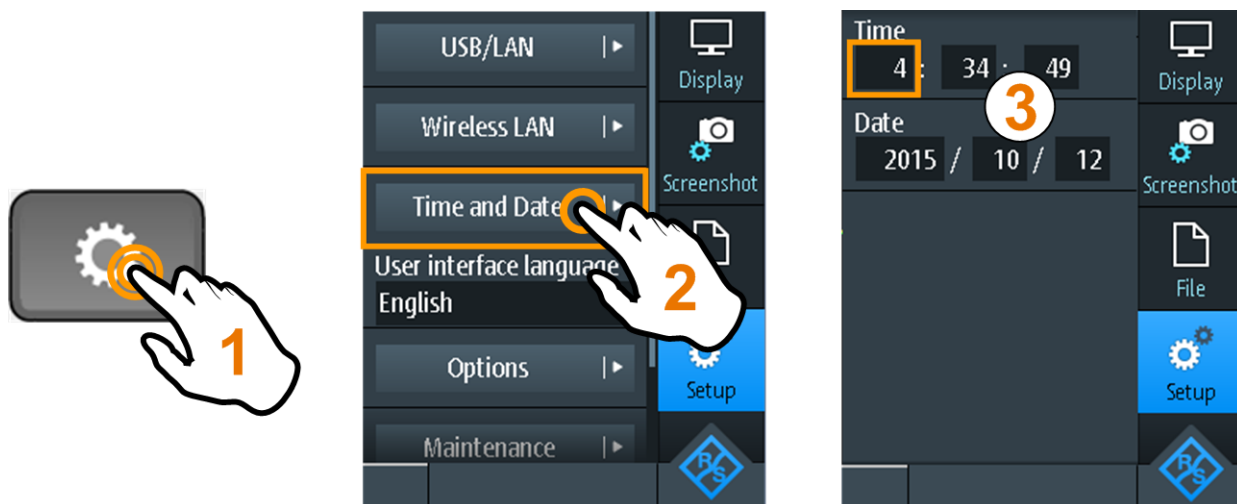
4.6   Setting the Date, Time and Language

The instrument has a date and time clock. You can adjust the clock to the local time, and you can select the display language. Supported languages are listed in the data sheet. The help is provided in English.

A reboot of the instrument is not necessary.

Set date and time

Set display language

4.7   Getting Information and Help

In most dialogs, graphics explain the meaning of the selected setting. For further information, you can open the help, which provides functional description of the settings with links to the corresponding remote commands, and background information.

Note: When the help window is open, you can use only the [SHIFT] and [BACK] keys. Other keys may not work as expected. Close the help window before you use the keys.

4.7.1   Displaying Help

To open the help window

► Tap the "Help" icon on the top of the menu.

  If a dialog is open, the dialog's help topic is shown beside the dialog.
  If a menu is open, the table of contents is shown.

To show information on a setting

If a dialog and the help window are open, you can easily call the information on each setting of the dialog.

► Tap the setting's *name*.

  The corresponding help topic is displayed.
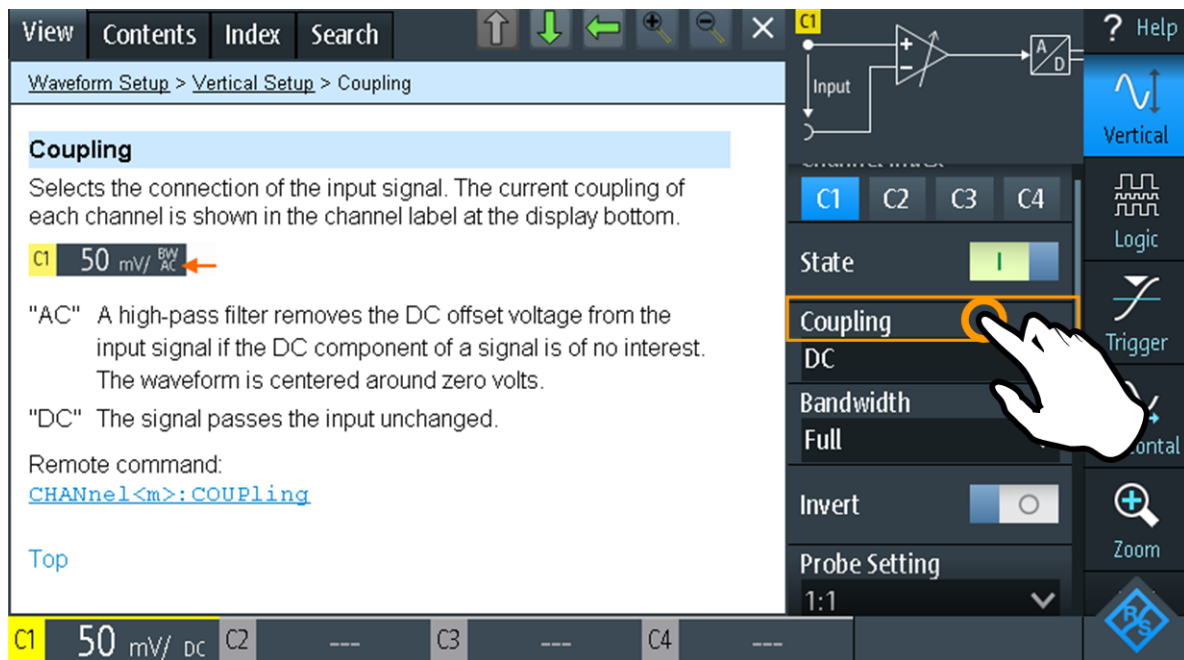
If you tap the *switch* or the *entry field*, you can adjust the setting without closing the help window.
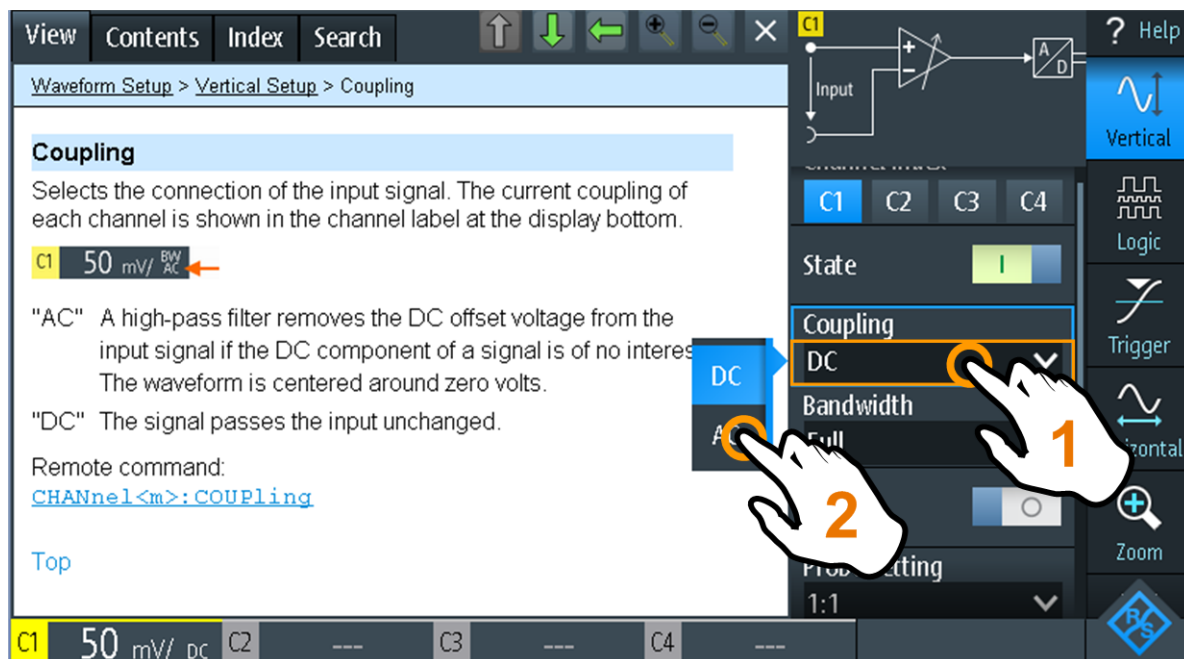
To close the help window

► Tap the "Close" icon in the upper right corner of the help window, or press [BACK].

4.7.2   Using the Help Window

The help window has several tabs:

| View | Contents | Index | Search |

- "View": shows the selected help topic.
- "Contents": contains a table of help contents.
- "Index": contains index entries to search for help topics.
- "Search": provides text search.

The help toolbar provides the following buttons:

- Up and down arrows: browse the topics in the order of the table of contents. Up = previous topic, down = next topic.
- Left and right arrows: browse the topics visited before: Left = back, right = forward.
- Magnifiers: increase or decrease the font.
- ×: closes the help window.

To search for a topic in the index

The index is sorted alphabetically. You can browse the list, or search for entries.

1. Tap the "Index" tab.

2. Tap the entry field on top of the list.

3. Enter some characters of the keyword you are interested in.
   You can use the Backspace key to delete single characters, and "Clear" to delete all characters in the "Keyword" field.

4. Tap the Enter key.

   Now only index entries are displayed that contain the keyword characters.

5. To delete the keyword:
   a) Tap the entry field again.
   b) Tap "Clear".
   c) Tap the Enter key.

To search the help for a text string

1. Tap the "Search" tab.

2. Tap the entry field on the top.

3. Enter the words you want to find.
   If you enter several words with blanks between, topics containing all words
   are found.
   To find a string of several words, enclose it in quotation marks. For example, a
   search for *"trigger mode"* finds all topics with exactly *"trigger mode"*. A search
   for *trigger mode* finds all topics that contain the words *trigger* and *mode*.

4. Tap the Enter key.
   A list of search results is displayed.

5. To refine the search, use "Match Whole Word" and "Match Case", and tap
   "Start Search".

5   Maintenance

The instrument does not need periodic maintenance. Only cleaning the instrument is essential.

The addresses of the Rohde & Schwarz support centers can be found at www.customersupport.rohde-schwarz.com.

A list of service centers is available on www.services.rohde-schwarz.com.

5.1   Cleaning

> ⚠ **WARNING**
>
> **Shock hazard**
>
> Before cleaning the instrument, remove all probes, leads, USB and LAN cables and power supply.

> **NOTICE**
>
> **Instrument damage caused by cleaning agents**
>
> Cleaning agents contain substances such as solvents (thinners, acetone, etc.), acids, bases, or other substances. Solvents can damage the front panel labeling, plastic parts, or screens, for example.
>
> Never use cleaning agents to clean the outside of the instrument. Use a soft, dry, lint-free dust cloth instead.

5.2   Information for Technical Support

If you encounter problems that you cannot solve yourself, contact your Rohde & Schwarz support center at www.customersupport.rohde-schwarz.com. The staff of our support center is optimally trained to assist you in solving the problems. The support center finds solutions more quickly and efficiently if you provide them with information on the instrument and an error description.

To create, collect and save the required information, you can create a service report. It contains the bug report, all relevant setup information, reporting and log files, and the instrument configuration (device footprint).

1. Press ⚙, or open the "Setup" menu.

2. Scroll down.

3. Tap "Maintenance".

4. Select "Service".

5. Tap "Service Report".

    The instrument creates the `.report` file and saves it to the USB flash device (if connected), or to the microSD card.

6. Attach the report file to an email in which you describe the problem. Send the email to the customer support address for your region as listed in the internet.

5.3   Data Storage and Security

The instrument is delivered with the 4 Gbyte microSD card inserted and ready to use. We recommend that you do not remove the microSD card.

All instrument configuration data and user data are stored on the microSD card. In addition, fallback firmware is stored on the microSD card to boot the instrument if an update failed.

If you use the instrument in a secured environment, you can remove the microSD card before the instrument leaves this area. The microSD card slot is under the right lid under the battery pack.

You can also change the microSD card if you need more memory. The instrument supports microSD cards up to 32 Gbyte.

5.4   Storing and Packing

The storage temperature range of the instrument is given in the data sheet. If the instrument is to be stored for a longer period of time, it must be protected against dust.

Repack the instrument as it was originally packed when transporting or shipping. The two protective foam plastic parts prevent the control elements and connectors from being damaged. The antistatic packing foil avoids any undesired electrostatic charging to occur.

If you do not use the original packaging, use a sturdy cardboard box of suitable size and provide for sufficient padding to prevent the instrument from slipping inside the package. Wrap antistatic packing foil around the instrument to protect it from electrostatic charging.