

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



1326.1561.02 – 0301

This manual describes the following R&S®RTH models:

- 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/product/rth.html > "Downloads > Manuals".

The software contained in this product makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" document, which is available for download from the R&S RTH product page at <http://www.rohde-schwarz.com/product/rth.html> > "Downloads" > "Firmware".

Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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Trade names are trademarks of the owners.

The following abbreviations are used throughout this manual: R&S®RTH is abbreviated as R&S RTH.

Basic Safety Instructions

Always read through and comply with the following safety instructions!

All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standards of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment they require are designed, built and tested in accordance with the safety standards that apply in each case. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed, built and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards. To maintain this condition and to ensure safe operation, you must observe all instructions and warnings provided in this manual. If you have any questions regarding these safety instructions, the Rohde & Schwarz group of companies will be happy to answer them.

Furthermore, it is your responsibility to use the product in an appropriate manner. This product is designed for use solely in industrial and laboratory environments or, if expressly permitted, also in the field and must not be used in any way that may cause personal injury or property damage. You are responsible if the product is used for any purpose other than its designated purpose or in disregard of the manufacturer's instructions. The manufacturer shall assume no responsibility for such use of the product.









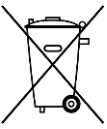
The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and, in some cases, a basic knowledge of English. It is therefore essential that only skilled and specialized staff or thoroughly trained personnel with the required skills be allowed to use the product. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation. Keep the basic safety instructions and the product documentation in a safe place and pass them on to the subsequent users.

Basic Safety Instructions




Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before and when using the product. It is also absolutely essential to observe the additional safety instructions on personal safety, for example, that appear in relevant parts of the product documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by the Rohde & Schwarz group of companies, including instruments, systems and all accessories. For product-specific information, see the data sheet and the product documentation.

Safety labels on products

The following safety labels are used on products to warn against risks and dangers.

Symbol	Meaning	Symbol	Meaning
	Notice, general danger location Observe product documentation	○	ON/OFF Power
	Caution when handling heavy equipment	⏻	Standby indication
	Danger of electric shock	≡	Direct current (DC)
	Caution ! Hot surface	~	Alternating current (AC)
	Protective conductor terminal To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth	⎓	Direct/alternating current (DC/AC)
	Earth (Ground)		Class II Equipment to identify equipment meeting the safety requirements specified for Class II equipment (device protected by double or reinforced insulation)
	Frame or chassis Ground terminal		EU labeling for batteries and accumulators. For additional information, see section "Waste disposal/Environmental protection", item 1.

Basic Safety Instructions

Symbol	Meaning	Symbol	Meaning
	Be careful when handling electrostatic sensitive devices		EU labeling for separate collection of electrical and electronic devices For additional information, see section "Waste disposal/Environmental protection", item 2.
	Warning! Laser radiation For additional information, see section "Operation", item 7.		

Signal words and their meaning

The following signal words are used in the product documentation in order to warn the reader about risks and dangers.



Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Indicates information considered important, but not hazard-related, e.g. messages relating to property damage.
In the product documentation, the word ATTENTION is used synonymously.

These signal words are in accordance with the standard definition for civil applications in the European Economic Area. Definitions that deviate from the standard definition may also exist in other economic areas or military applications. It is therefore essential to make sure that the signal words described here are always used only in connection with the related product documentation and the related product. The use of signal words in connection with unrelated products or documentation can result in misinterpretation and in personal injury or material damage.

Basic Safety Instructions

Operating states and operating positions

The product may be operated only under the operating conditions and in the positions specified by the manufacturer, without the product's ventilation being obstructed. If the manufacturer's specifications are not observed, this can result in electric shock, fire and/or serious personal injury or death. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
predefined operating position is always with the housing floor facing down, IP protection 2X, use only indoors, max. operating altitude 2000 m above sea level, max. transport altitude 4500 m above sea level. A tolerance of $\pm 10\%$ shall apply to the nominal voltage and $\pm 5\%$ to the nominal frequency, overvoltage category 2, pollution degree 2.
2. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves). An installation that is not carried out as described in the product documentation could result in personal injury or even death.
3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or even death.

Electrical safety

If the information on electrical safety is not observed either at all or to the extent necessary, electric shock, fire and/or serious personal injury or death may occur.

1. Prior to switching on the product, always ensure that the nominal voltage setting on the product matches the nominal voltage of the mains-supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with a protective conductor contact and protective conductor.

Basic Safety Instructions

3. Intentionally breaking the protective conductor either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
4. If there is no power switch for disconnecting the product from the mains, or if the power switch is not suitable for this purpose, use the plug of the connecting cable to disconnect the product from the mains. In such cases, always ensure that the power plug is easily reachable and accessible at all times. For example, if the power plug is the disconnecting device, the length of the connecting cable must not exceed 3 m. Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, the disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cables on a regular basis to ensure that they are in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.
6. The product may be operated only from TN/TT supply networks fuse-protected with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket provided for this purpose. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages $V_{rms} > 30\text{ V}$, suitable measures (e.g. appropriate measuring equipment, fuse protection, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC 60950-1 / EN 60950-1 or IEC 61010-1 / EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.

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12. If a product is to be permanently installed, the connection between the protective conductor terminal on site and the product's protective conductor must be made first before any other connection is made. The product may be installed and connected only by a licensed electrician.
13. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fuse-protected in such a way that anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.
14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1). Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.
2. Before you move or transport the product, read and observe the section titled "Transport".

Basic Safety Instructions

3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal/Environmental protection", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. Laser products are given warning labels that are standardized according to their laser class. Lasers can cause biological harm due to the properties of their radiation and due to their extremely concentrated electromagnetic power. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).
8. EMC classes (in line with EN 55011/CISPR 11, and analogously with EN 55022/CISPR 22, EN 55032/CISPR 32)

– **Class A equipment:**

Equipment suitable for use in all environments except residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings

Note: Class A equipment is intended for use in an industrial environment. This equipment may cause radio disturbances in residential environments, due to possible conducted as well as radiated disturbances. In this case, the operator may be required to take appropriate measures to eliminate these disturbances.

Basic Safety Instructions

– **Class B equipment:**

Equipment suitable for use in residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings

Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.
2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, protective conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

Batteries and rechargeable batteries/cells

If the information regarding batteries and rechargeable batteries/cells is not observed either at all or to the extent necessary, product users may be exposed to the risk of explosions, fire and/or serious personal injury, and, in some cases, death. Batteries and rechargeable batteries with alkaline electrolytes (e.g. lithium cells) must be handled in accordance with the EN 62133 standard.

1. Cells must not be taken apart or crushed.
2. Cells or batteries must not be exposed to heat or fire. Storage in direct sunlight must be avoided. Keep cells and batteries clean and dry. Clean soiled connectors using a dry, clean cloth.
3. Cells or batteries must not be short-circuited. Cells or batteries must not be stored in a box or in a drawer where they can short-circuit each other, or where they can be short-circuited by other conductive materials. Cells and batteries must not be removed from their original packaging until they are ready to be used.
4. Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.
5. If a cell develops a leak, the fluid must not be allowed to come into contact with the skin or eyes. If contact occurs, wash the affected area with plenty of water and seek medical aid.

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6. Improperly replacing or charging cells or batteries that contain alkaline electrolytes (e.g. lithium cells) can cause explosions. Replace cells or batteries only with the matching Rohde & Schwarz type (see parts list) in order to ensure the safety of the product.
7. Cells and batteries must be recycled and kept separate from residual waste. Rechargeable batteries and normal batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.

Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.
2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.
3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

Waste disposal/Environmental protection

1. Specially marked equipment has a battery or accumulator that must not be disposed of with unsorted municipal waste, but must be collected separately. It may only be disposed of at a suitable collection point or via a Rohde & Schwarz customer service center.
2. Waste electrical and electronic equipment must not be disposed of with unsorted municipal waste, but must be collected separately. Rohde & Schwarz GmbH & Co. KG has developed a disposal concept and takes full responsibility for take-back obligations and disposal obligations for manufacturers within the EU. Contact your Rohde & Schwarz customer service center for environmentally responsible disposal of the product.

Instrucciones de seguridad elementales

3. If products or their components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
4. If handling the product releases hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation. The improper disposal of hazardous substances or fuels can cause health problems and lead to environmental damage.

For additional information about environmental protection, visit the Rohde & Schwarz website.

Instrucciones de seguridad elementales

¡Es imprescindible leer y cumplir las siguientes instrucciones e informaciones de seguridad!

El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los estándares de seguridad y de ofrecer a nuestros clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestro sistema de garantía de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el certificado de conformidad de la UE y ha salido de nuestra planta en estado impecable según los estándares técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las indicaciones, informaciones de seguridad y notas de alerta. El grupo de empresas Rohde & Schwarz está siempre a su disposición en caso de que tengan preguntas referentes a estas informaciones de seguridad.

Instrucciones de seguridad elementales

Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda sufrir daño. El uso del producto fuera de sus fines definidos o sin tener en cuenta las instrucciones del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del mal uso del producto.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado conforme a las indicaciones de la correspondiente documentación del producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto hace necesarios conocimientos técnicos y ciertos conocimientos del idioma inglés. Por eso se debe tener en cuenta que el producto solo pueda ser operado por personal especializado o personas instruidas en profundidad con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de Rohde & Schwarz, encontraría la información debida en la documentación del producto en el capítulo correspondiente. Guarde bien las informaciones de seguridad elementales, así como la documentación del producto, y entréguelas a usuarios posteriores.

Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto. Deberán tenerse en cuenta todas las demás informaciones de seguridad, como p. ej. las referentes a la protección de personas, que encontrarán en el capítulo correspondiente de la documentación del producto y que también son de obligado cumplimiento. En las presentes informaciones de seguridad se recogen todos los objetos que distribuye el grupo de empresas Rohde & Schwarz bajo la denominación de "producto", entre ellos también aparatos, instalaciones así como toda clase de accesorios. Los datos específicos del producto figuran en la hoja de datos y en la documentación del producto.

Instrucciones de seguridad elementales

Señalización de seguridad de los productos

Las siguientes señales de seguridad se utilizan en los productos para advertir sobre riesgos y peligros.

Símbolo	Significado	Símbolo	Significado
	Aviso: punto de peligro general Observar la documentación del producto	○	Tensión de alimentación de PUESTA EN MARCHA / PARADA
	Atención en el manejo de dispositivos de peso elevado	⏻	Indicación de estado de espera (standby)
	Peligro de choque eléctrico	— —	Corriente continua (DC)
	Advertencia: superficie caliente	~	Corriente alterna (AC)
	Conexión a conductor de protección	⎓	Corriente continua / Corriente alterna (DC/AC)
	Conexión a tierra		El aparato está protegido en su totalidad por un aislamiento doble (reforzado)
	Conexión a masa		Distintivo de la UE para baterías y acumuladores Más información en la sección "Eliminación/protección del medio ambiente", punto 1.
	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)	 	Distintivo de la UE para la eliminación por separado de dispositivos eléctricos y electrónicos Más información en la sección "Eliminación/protección del medio ambiente", punto 2.
	Advertencia: rayo láser Más información en la sección "Funcionamiento", punto 7.		

Instrucciones de seguridad elementales

Palabras de señal y su significado

En la documentación del producto se utilizan las siguientes palabras de señal con el fin de advertir contra riesgos y peligros.



Indica una situación de peligro que, si no se evita, causa lesiones graves o incluso la muerte.



Indica una situación de peligro que, si no se evita, puede causar lesiones graves o incluso la muerte.



Indica una situación de peligro que, si no se evita, puede causar lesiones leves o moderadas.



Indica información que se considera importante, pero no en relación con situaciones de peligro; p. ej., avisos sobre posibles daños materiales.

En la documentación del producto se emplea de forma sinónima el término CUIDADO.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el área económica europea. Pueden existir definiciones diferentes a esta definición en otras áreas económicas o en aplicaciones militares. Por eso se deberá tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación del producto y solamente en combinación con el producto correspondiente. La utilización de las palabras de señal en combinación con productos o documentaciones que no les correspondan puede llevar a interpretaciones equivocadas y tener por consecuencia daños en personas u objetos.

Instrucciones de seguridad elementales

Estados operativos y posiciones de funcionamiento

El producto solamente debe ser utilizado según lo indicado por el fabricante respecto a los estados operativos y posiciones de funcionamiento sin que se obstruya la ventilación. Si no se siguen las indicaciones del fabricante, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte. En todos los trabajos deberán ser tenidas en cuenta las normas nacionales y locales de seguridad del trabajo y de prevención de accidentes.

1. Si no se convino de otra manera, es para los productos Rohde & Schwarz válido lo que sigue:
como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, uso solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4500 m sobre el nivel del mar. Se aplicará una tolerancia de $\pm 10\%$ sobre el voltaje nominal y de $\pm 5\%$ sobre la frecuencia nominal. Categoría de sobrecarga eléctrica 2, índice de suciedad 2.
2. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptos para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (p. ej. paredes y estantes). Si se realiza la instalación de modo distinto al indicado en la documentación del producto, se pueden causar lesiones o, en determinadas circunstancias, incluso la muerte.
3. No ponga el producto sobre aparatos que generen calor (p. ej. radiadores o calefactores). La temperatura ambiente no debe superar la temperatura máxima especificada en la documentación del producto o en la hoja de datos. En caso de sobrecalentamiento del producto, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

Seguridad eléctrica

Si no se siguen (o se siguen de modo insuficiente) las indicaciones del fabricante en cuanto a seguridad eléctrica, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.

Instrucciones de seguridad elementales

2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, o bien si el interruptor existente no resulta apropiado para la desconexión de la red, el enchufe del cable de conexión se deberá considerar como un dispositivo de desconexión.
El dispositivo de desconexión se debe poder alcanzar fácilmente y debe estar siempre bien accesible. Si, p. ej., el enchufe de conexión a la red es el dispositivo de desconexión, la longitud del cable de conexión no debe superar 3 m).
Los interruptores selectores o electrónicos no son aptos para el corte de la red eléctrica. Si se integran productos sin interruptor en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.
5. No utilice nunca el producto si está dañado el cable de conexión a red.
Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.
6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión $U_{eff} > 30 \text{ V}$ se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).

Instrucciones de seguridad elementales

10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.
12. Si un producto se instala en un lugar fijo, se deberá primero conectar el conductor de protección fijo con el conductor de protección del producto antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
13. En el caso de dispositivos fijos que no estén provistos de fusibles, interruptor automático ni otros mecanismos de seguridad similares, el circuito de alimentación debe estar protegido de modo que todas las personas que puedan acceder al producto, así como el producto mismo, estén a salvo de posibles daños.
14. Todo producto debe estar protegido contra sobretensión (debida p. ej. a una caída del rayo) mediante los correspondientes sistemas de protección. Si no, el personal que lo utilice quedará expuesto al peligro de choque eléctrico.
15. No debe introducirse en los orificios de la caja del aparato ningún objeto que no esté destinado a ello. Esto puede producir cortocircuitos en el producto y/o puede causar choques eléctricos, fuego o lesiones.
16. Salvo indicación contraria, los productos no están impermeabilizados (ver también el capítulo "Estados operativos y posiciones de funcionamiento", punto 1). Por eso es necesario tomar las medidas necesarias para evitar la entrada de líquidos. En caso contrario, existe peligro de choque eléctrico para el usuario o de daños en el producto, que también pueden redundar en peligro para las personas.
17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.
18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

Instrucciones de seguridad elementales

Funcionamiento

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.
2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".
3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados —los llamados alérgenos (p. ej. el níquel)—. Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.
4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación/protección del medio ambiente", punto 1.
5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.

Instrucciones de seguridad elementales

7. Los productos con láser están provistos de indicaciones de advertencia normalizadas en función de la clase de láser del que se trate. Los rayos láser pueden provocar daños de tipo biológico a causa de las propiedades de su radiación y debido a su concentración extrema de potencia electromagnética. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).
8. Clases de compatibilidad electromagnética (conforme a EN 55011 / CISPR 11; y en analogía con EN 55022 / CISPR 22, EN 55032 / CISPR 32)
 - **Aparato de clase A:**

Aparato adecuado para su uso en todos los entornos excepto en los residenciales y en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.

Nota: Los aparatos de clase A están destinados al uso en entornos industriales. Estos aparatos pueden causar perturbaciones radioeléctricas en entornos residenciales debido a posibles perturbaciones guiadas o radiadas. En este caso, se le podrá solicitar al operador que tome las medidas adecuadas para eliminar estas perturbaciones.
 - **Aparato de clase B:**

Aparato adecuado para su uso en entornos residenciales, así como en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.

Reparación y mantenimiento

1. El producto solamente debe ser abierto por personal especializado con autorización para ello. Antes de manipular el producto o abrirlo, es obligatorio desconectarlo de la tensión de alimentación, para evitar toda posibilidad de choque eléctrico.
2. El ajuste, el cambio de partes, el mantenimiento y la reparación deberán ser efectuadas solamente por electricistas autorizados por Rohde & Schwarz. Si se reponen partes con importancia para los aspectos de seguridad (p. ej. el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada cambio de partes relevantes para la seguridad deberá realizarse un control de seguridad (control a primera vista, control del conductor de protección, medición de resistencia de aislamiento, medición de la corriente de fuga, control de funcionamiento). Con esto queda garantizada la seguridad del producto.

Instrucciones de seguridad elementales

Baterías y acumuladores o celdas

Si no se siguen (o se siguen de modo insuficiente) las indicaciones en cuanto a las baterías y acumuladores o celdas, pueden producirse explosiones, incendios y/o lesiones graves con posible consecuencia de muerte. El manejo de baterías y acumuladores con electrolitos alcalinos (p. ej. celdas de litio) debe seguir el estándar EN 62133.

1. No deben desmontarse, abrirse ni triturarse las celdas.
2. Las celdas o baterías no deben someterse a calor ni fuego. Debe evitarse el almacenamiento a la luz directa del sol. Las celdas y baterías deben mantenerse limpias y secas. Limpiar las conexiones sucias con un paño seco y limpio.
3. Las celdas o baterías no deben cortocircuitarse. Es peligroso almacenar las celdas o baterías en estuches o cajones en cuyo interior puedan cortocircuitarse por contacto recíproco o por contacto con otros materiales conductores. No deben extraerse las celdas o baterías de sus embalajes originales hasta el momento en que vayan a utilizarse.
4. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.
5. En caso de falta de estanqueidad de una celda, el líquido vertido no debe entrar en contacto con la piel ni los ojos. Si se produce contacto, lavar con agua abundante la zona afectada y avisar a un médico.
6. En caso de cambio o recarga inadecuados, las celdas o baterías que contienen electrolitos alcalinos (p. ej. las celdas de litio) pueden explotar. Para garantizar la seguridad del producto, las celdas o baterías solo deben ser sustituidas por el tipo Rohde & Schwarz correspondiente (ver lista de recambios).
7. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

Transporte

1. El producto puede tener un peso elevado. Por eso es necesario desplazarlo o transportarlo con precaución y, si es necesario, usando un sistema de elevación adecuado (p. ej. una carretilla elevadora), a fin de evitar lesiones en la espalda u otros daños personales.

Instrucciones de seguridad elementales

2. Las asas instaladas en los productos sirven solamente de ayuda para el transporte del producto por personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como p. ej. grúas, carretillas elevadoras de horquilla, carros etc. Es responsabilidad suya fijar los productos de manera segura a los medios de transporte o elevación. Para evitar daños personales o daños en el producto, siga las instrucciones de seguridad del fabricante del medio de transporte o elevación utilizado.
3. Si se utiliza el producto dentro de un vehículo, recae de manera exclusiva en el conductor la responsabilidad de conducir el vehículo de manera segura y adecuada. El fabricante no asumirá ninguna responsabilidad por accidentes o colisiones. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Asegure el producto dentro del vehículo debidamente para evitar, en caso de un accidente, lesiones u otra clase de daños.

Eliminación/protección del medio ambiente

1. Los dispositivos marcados contienen una batería o un acumulador que no se debe desechar con los residuos domésticos sin clasificar, sino que debe ser recogido por separado. La eliminación se debe efectuar exclusivamente a través de un punto de recogida apropiado o del servicio de atención al cliente de Rohde & Schwarz.
2. Los dispositivos eléctricos usados no se deben desechar con los residuos domésticos sin clasificar, sino que deben ser recogidos por separado. Rohde & Schwarz GmbH & Co.KG ha elaborado un concepto de eliminación de residuos y asume plenamente los deberes de recogida y eliminación para los fabricantes dentro de la UE. Para desechar el producto de manera respetuosa con el medio ambiente, diríjase a su servicio de atención al cliente de Rohde & Schwarz.
3. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.

Instrucciones de seguridad elementales

4. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

Se puede encontrar más información sobre la protección del medio ambiente en la página web de Rohde & Schwarz.

Safety instructions for rechargeable lithium ion batteries

⚠ WARNING

Risk of serious personal injury or even death.

You must fully observe the following instructions in order to avoid serious personal injury – or even death – due to an explosion and/or fire.

1. Do not dismantle, open or crush the batteries or drop them from a great height. If mechanical damage occurs, there is a risk that chemicals may be released. Gases that are released can cause breathing difficulties. Immediately ventilate the area and in serious cases consult a doctor.
Irritation can occur if the chemicals that are released come in contact with the skin or eyes. If this happens, immediately and thoroughly rinse the skin or eyes with water and consult a doctor.
2. Do not expose cells or batteries to heat or fire. Do not store them in direct sunlight. If overheating occurs, there is the risk of an explosion or a fire, which can lead to serious personal injuries.
3. Keep the batteries clean and dry. If the terminals become soiled, clean them with a dry, clean cloth.
4. Charge the batteries prior to using them.
Only use the appropriate Rohde & Schwarz charger to charge the batteries. See the device manual or data sheet for the exact designation of the charger.
If the batteries are improperly charged, there is a risk of explosion, which can cause serious personal injury.
5. The charging temperature must be between 0 °C and 45 °C (see manual for information on possible restrictions).
6. Discharging may take place only at temperatures between 0 °C and 50 °C (see manual for information on possible restrictions).
7. Only charge batteries until they are fully charged. Frequent overcharging can reduce the battery lifetime.
8. Remove the battery from the device when the battery is not being used. Following a longer period of storage, it may be necessary to charge and discharge the battery several times in order to obtain the full capacity.
9. Only use the battery with designated Rohde & Schwarz devices. See the device manual for details.
10. Do not dispose of the batteries with unsorted municipal waste. The batteries must be collected separately. After the end of their life, dispose of the batteries at a suitable collection point or via a Rohde & Schwarz customer service center.



EU labeling for batteries and secondary cells

11. Keep this safety information for future reference.

Instrucciones de seguridad para baterías recargables de ión litio

⚠ ADVERTENCIA

Posibilidad de lesiones graves que en determinadas circunstancias puede causar la muerte.

Tenga en cuenta los siguientes avisos en caso de explosión y/o incendio para impedir lesiones graves en personas que, en determinadas circunstancias, podrían incluso causar la muerte.

1. No desarme las baterías, no las abra, no las triture ni las deje caer desde una gran altura.
En caso de daños mecánicos existe el riesgo de salida de sustancias químicas. En caso de salida de gases pueden producirse dificultades respiratorias. Ventile inmediatamente la habitación y acuda a un médico en casos graves.
Si sustancias químicas provenientes de la batería entran en contacto con la piel o los ojos pueden producirse irritaciones. Enjuague en estos casos la piel y los ojos inmediatamente con abundante agua y acuda a un médico.
2. No exponga las celdas o baterías al calor ni al fuego. No las almacene bajo la luz solar directa. En caso de sobrecalentamiento existe peligro de explosión o de incendio, lo que puede provocar lesiones graves en personas.
3. Mantenga las baterías limpias y secas. Si los conectores están sucios, límpielos con un paño seco y limpio.
4. Cargue las baterías antes de su uso.
Solamente está permitido cargar la batería con el correspondiente cargador de Rohde & Schwarz. Consulte en el manual o en las especificaciones técnicas del equipo la denominación exacta del cargador.
Si las baterías se cargan de forma incorrecta existe peligro de explosión, lo que podría causar lesiones graves en personas.
5. La temperatura de carga debe encontrarse entre 0 °C y 45 °C (consulte el manual para posibles restricciones).
6. La descarga solamente puede efectuarse entre 0 °C y 50°C (consulte el manual para posibles restricciones).
7. Cargue las baterías solamente el tiempo necesario hasta que se hayan cargado por completo. La sobrecarga frecuente reduce la vida útil de la batería.
8. Extraiga la batería del equipo si no se va a utilizar. Después de un periodo de almacenamiento prolongado puede ser necesario cargar y descargar varias veces la batería para recuperar su capacidad completa.
9. Utilice la batería exclusivamente con los equipos Rohde & Schwarz correspondientes. Consulte para ello el manual del equipo.
10. No elimine las baterías junto con los residuos urbanos sin clasificar, sino por separado. Para eliminar la batería una vez finalizada su vida útil, diríjase a un punto de recogida de residuos adecuado o a una oficina de representación de Rohde & Schwarz.



Etiquetado de la UE para baterías y acumuladores

11. Conserve estas instrucciones de seguridad para fines de información y consulta posterior.

Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish.

We will take care that you will get the right information.

Europe, Africa, Middle East

Phone +49 89 4129 12345
customersupport@rohde-schwarz.com

North America

Phone 1-888-TEST-RSA (1-888-837-8772)
customer.support@rsa.rohde-schwarz.com

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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 are 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: $\pm 2,5$ %
- Input impedance: $1\text{ M}\Omega \pm 1\%$ || $12\text{ pF} \pm 2\text{ pF}$ (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

Main Specifications

- 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.

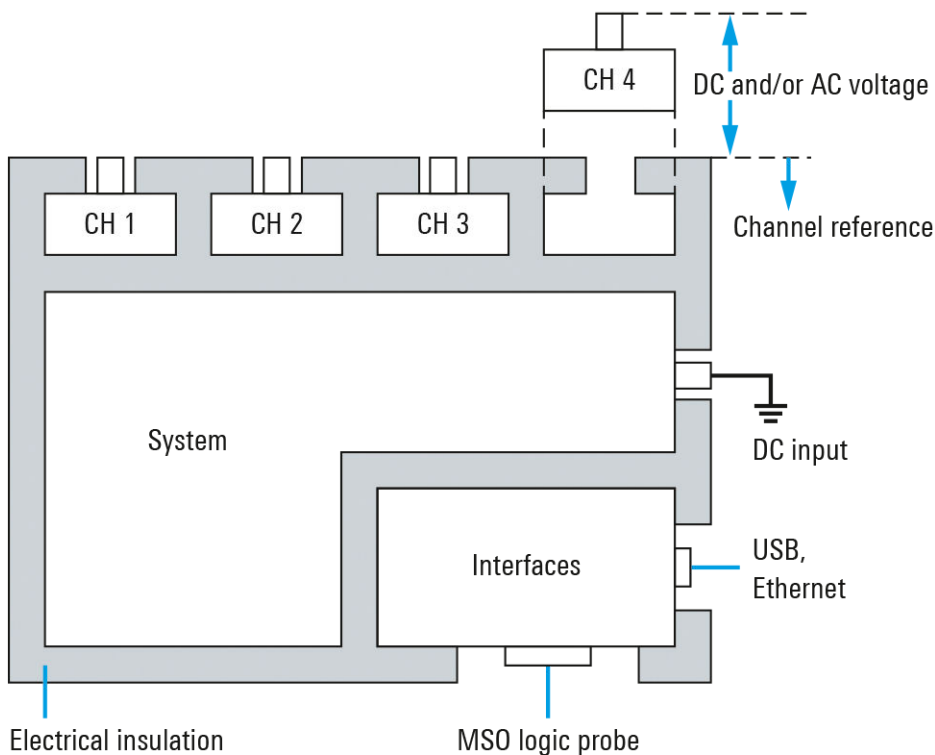


Figure 1-1: Isolation scheme of the R&S RTH

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

Measurement Categories

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.

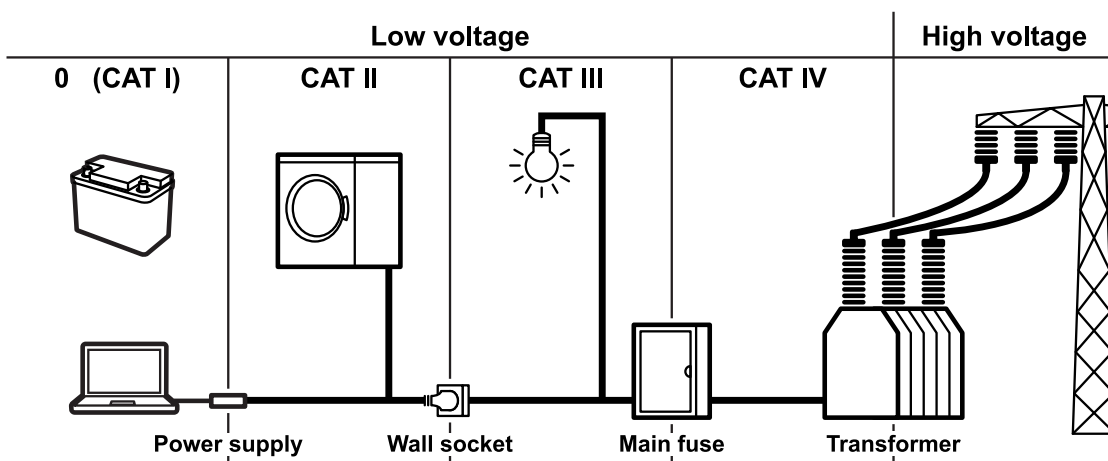


Figure 1-2: Examples of measurement categories

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 as well as 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, as well as newest version of the English one, 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/product/rth.html > "Downloads > Manuals".
- **Data Sheet**
The data sheet contains the complete instrument specification. It also lists the options and their order numbers as well as optional accessories. The data sheet is available on the R&S RTH product website at www.rohde-schwarz.com/product/rth.html > "Downloads" > "Brochures and Data Sheets".
- **Calibration Certificate**
The document is available on <https://gloris.rohde-schwarz.com/calcert>.
- **CE Declaration of Conformity**
The document is available on www.rohde-schwarz.com/en/products/test-measurement/oscilloscopes/pg_overview_63663.html.
- **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/product/rth.html > "Downloads" > "Firmware", and it can be read directly on the instrument.

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.

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 "[Environmental conditions](#)" on page 8. 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 15.
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 at a later date, 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.

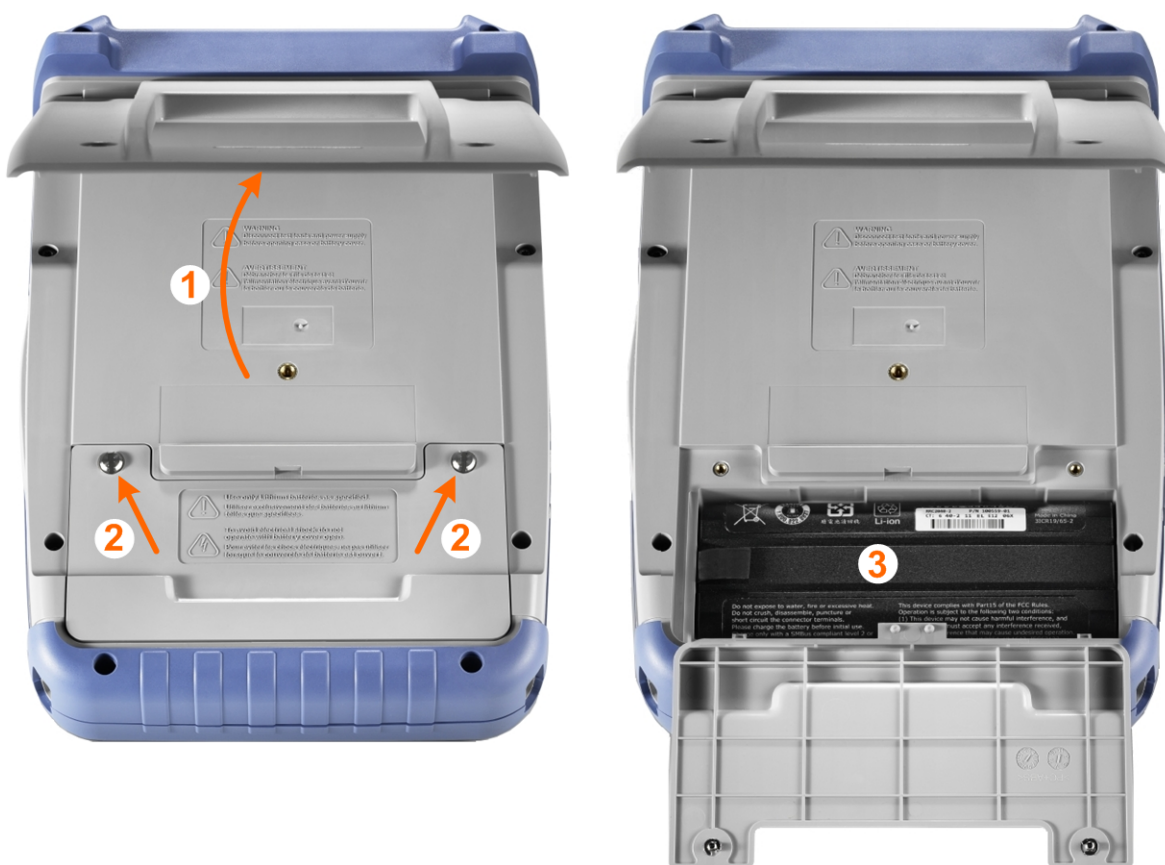
2.2 Inserting and Charging the Battery

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.



Inserting and Charging the Battery

1. Fold out the tilt stand on the back of the instrument.
2. Screw open the battery cover.
3. Insert the battery pack.
4. Screw down the battery cover.
5. 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 POWER key lights up in green color if power is on.

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

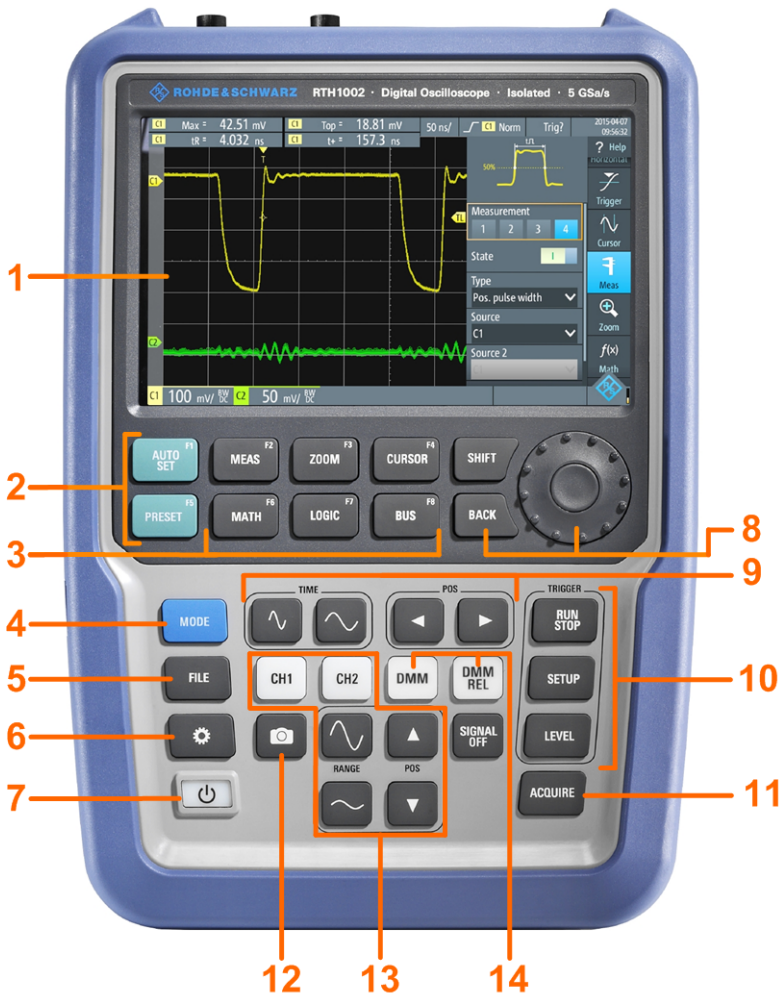


Figure 3-1: Front panel of the R&S RTH1002

- 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

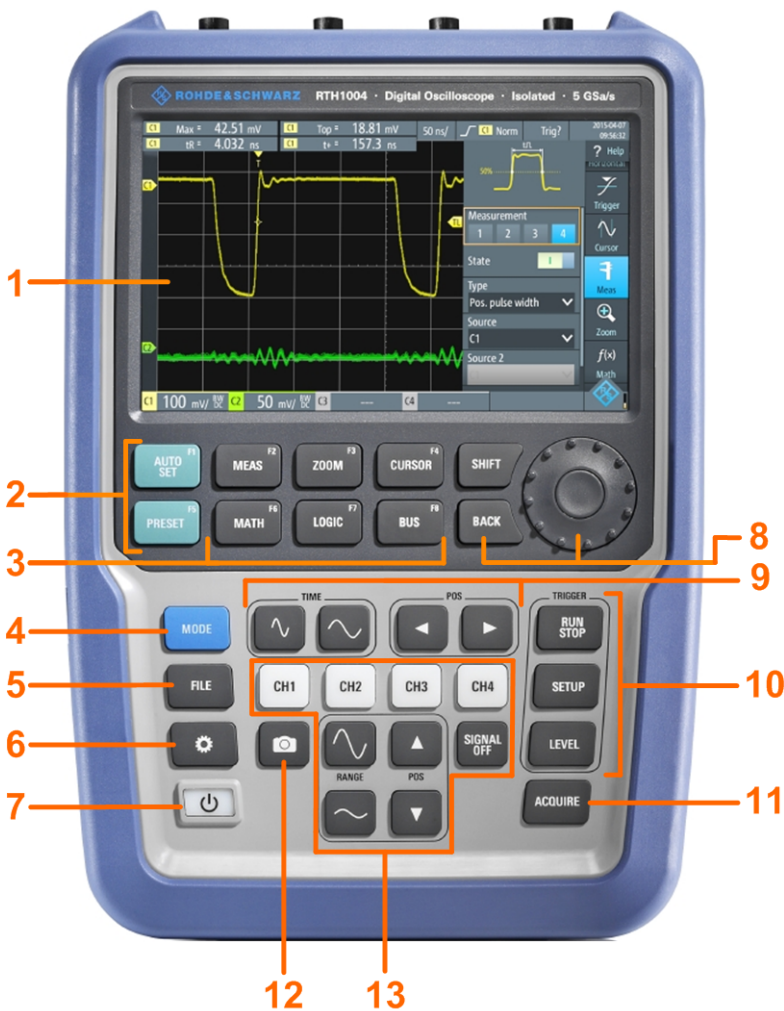


Figure 3-2: Front panel of the R&S RTH1004

- 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 33.

3.2 Top View

The R&S RTH1002 has two BNC input connectors CH1 and CH2, and two 4mm banana plug inputs for various multimeter measurements. The channel inputs have double channel-to-channel isolation that allows for independent floating measurements at each input. The DMM input is fully isolated from scope inputs, interfaces 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 allow for independent 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 are 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 measures to preclude direct contact with the measurement setup:

- Use only insulated voltage probes, 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

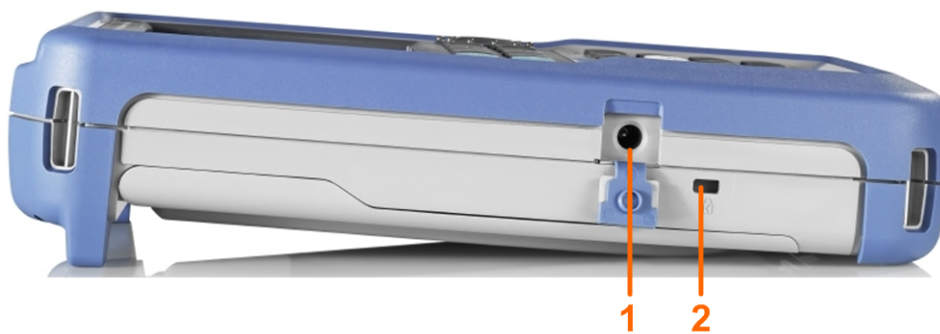
Input for the logic probe R&S RT-ZL04. Logic analysis requires Mixed Signal Option R&S RTH-B1, which includes the logic probe R&S RT-ZL04.

⚠ 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

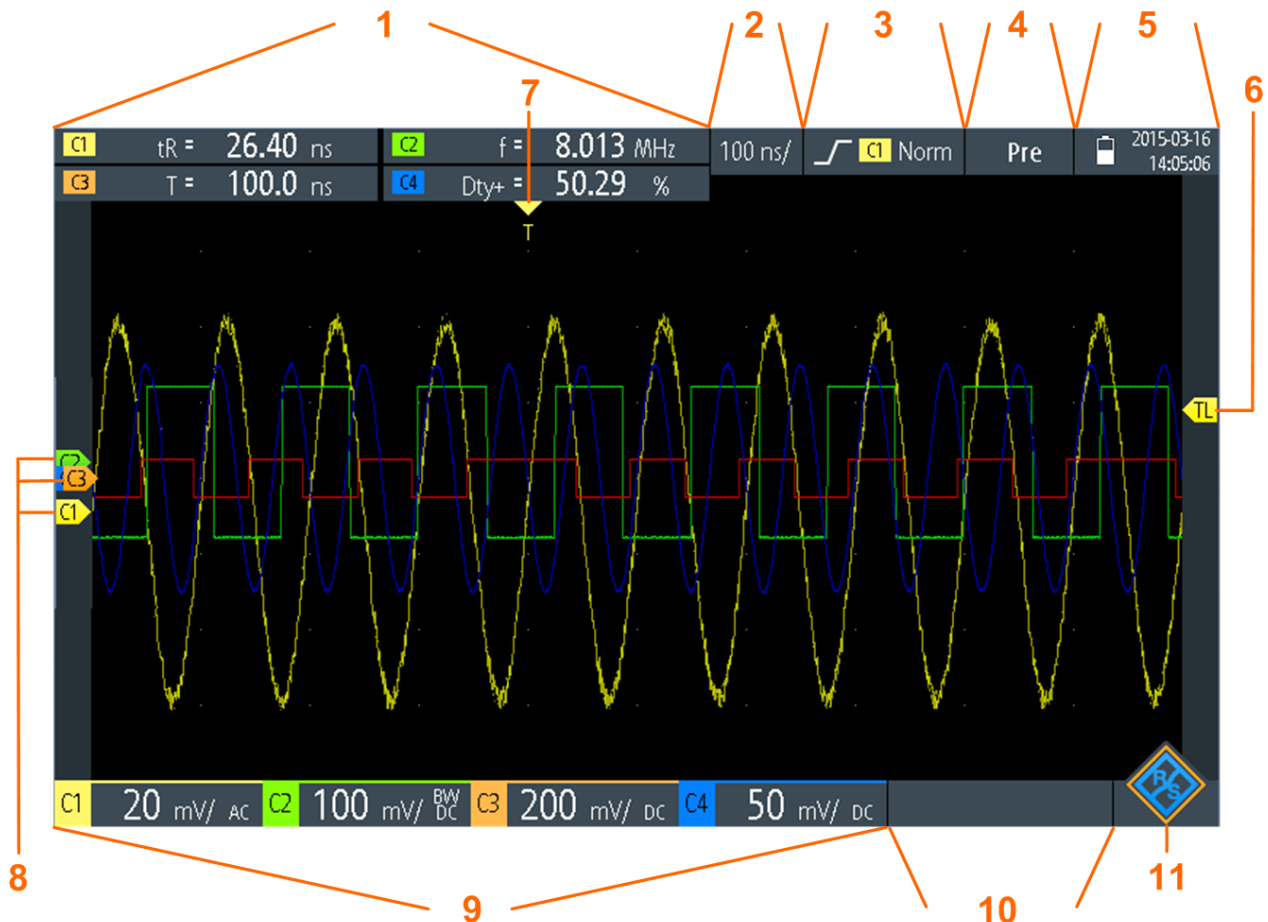
Connector for the power adapter to charge the battery.

Kensington lock slot

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

3.5 Display Overview

In the most important modes scope, mask and XY, the display shows the following 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
- 7 = Trigger position
- 8 = Channel marker 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

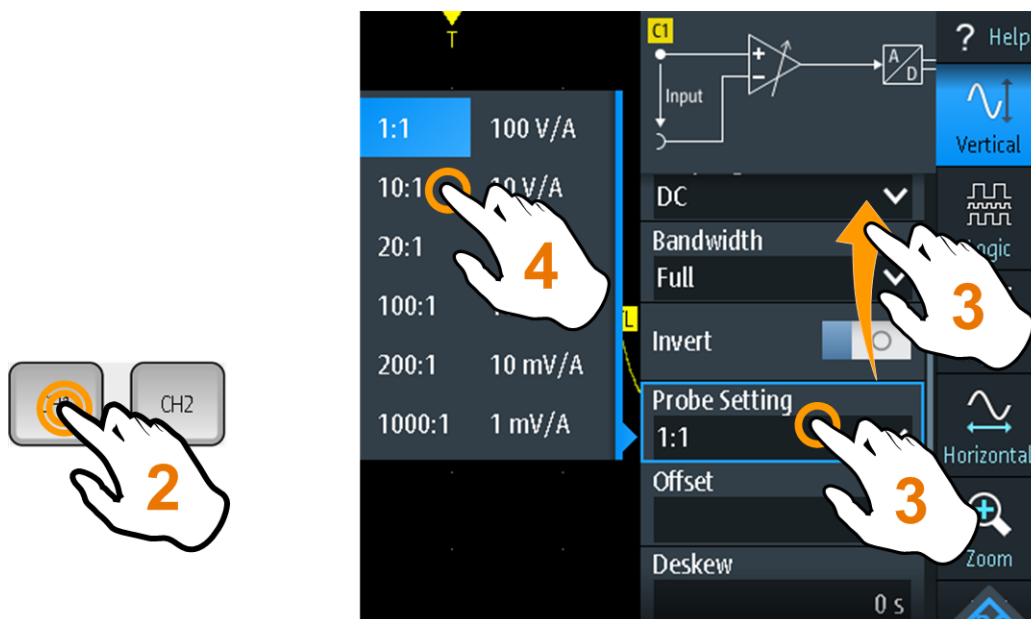
4.1 Connecting Probes

⚠ 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.

1. Connect the probe(s) first to the channel input(s) at the top of the instrument, and then to the DUT.
2. Press and hold the CH key of the used input.
3. Select "Probe Setting".
4. Select the attenuation factor of the probe.
The probe's attenuation factor is indicated on the probe.



Note: If you perform current measurements 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.

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 touchscreen. 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 quickly set up and perform measurement tasks.

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.

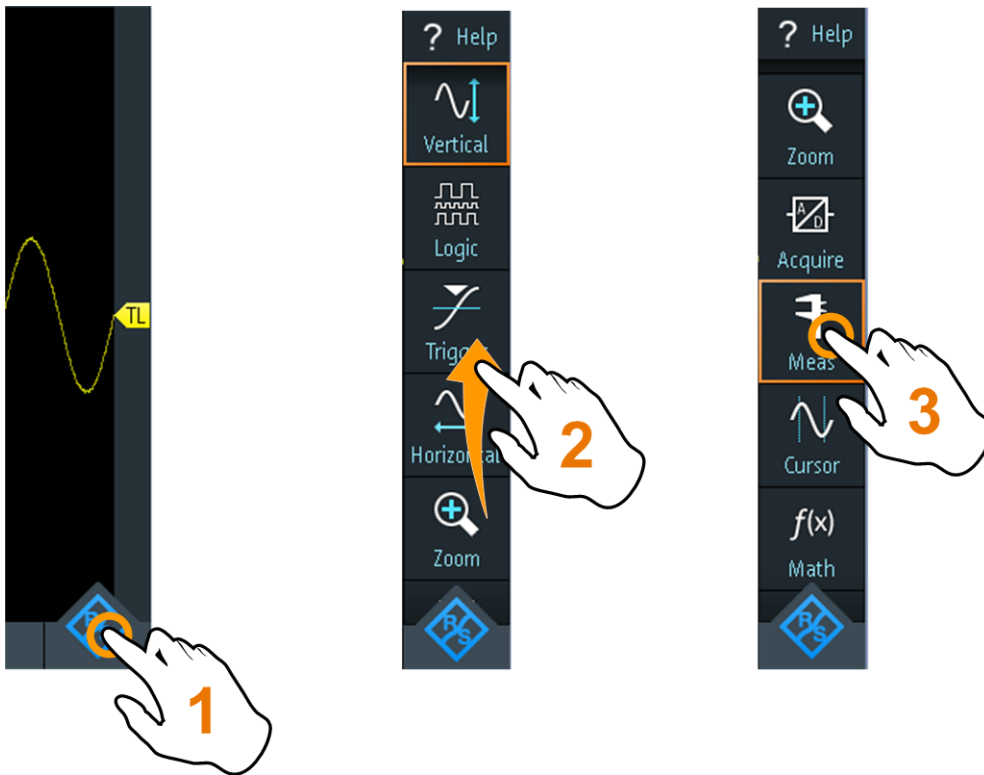


Figure 4-2: Open the menu and select a menu item



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

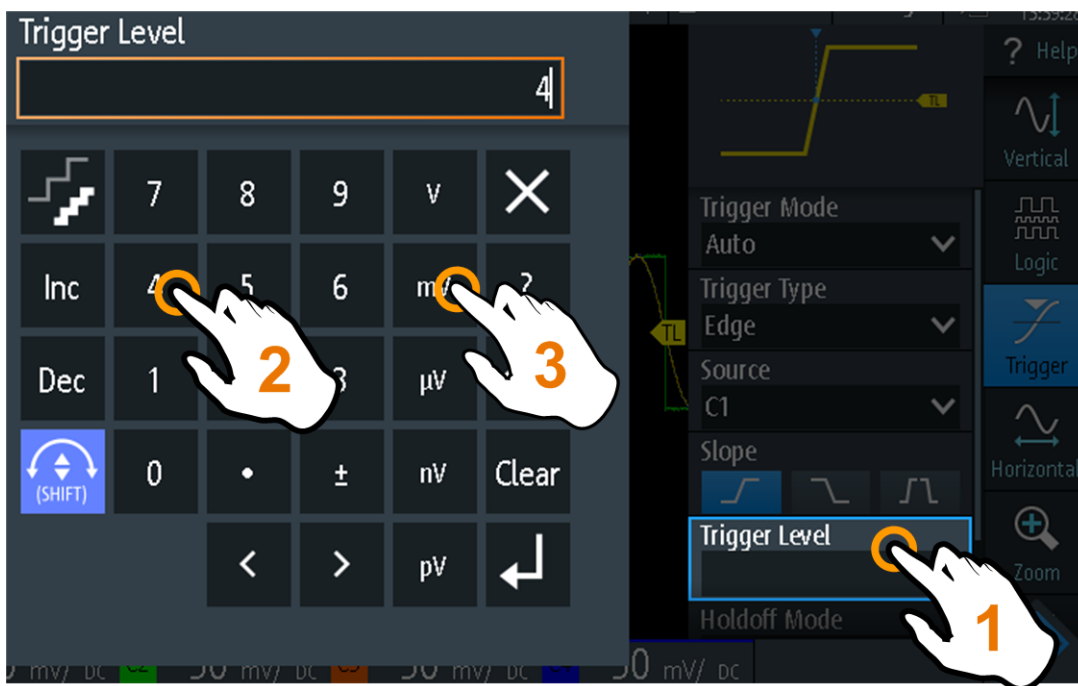


Figure 4-4: Enter numerical value and unit

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.

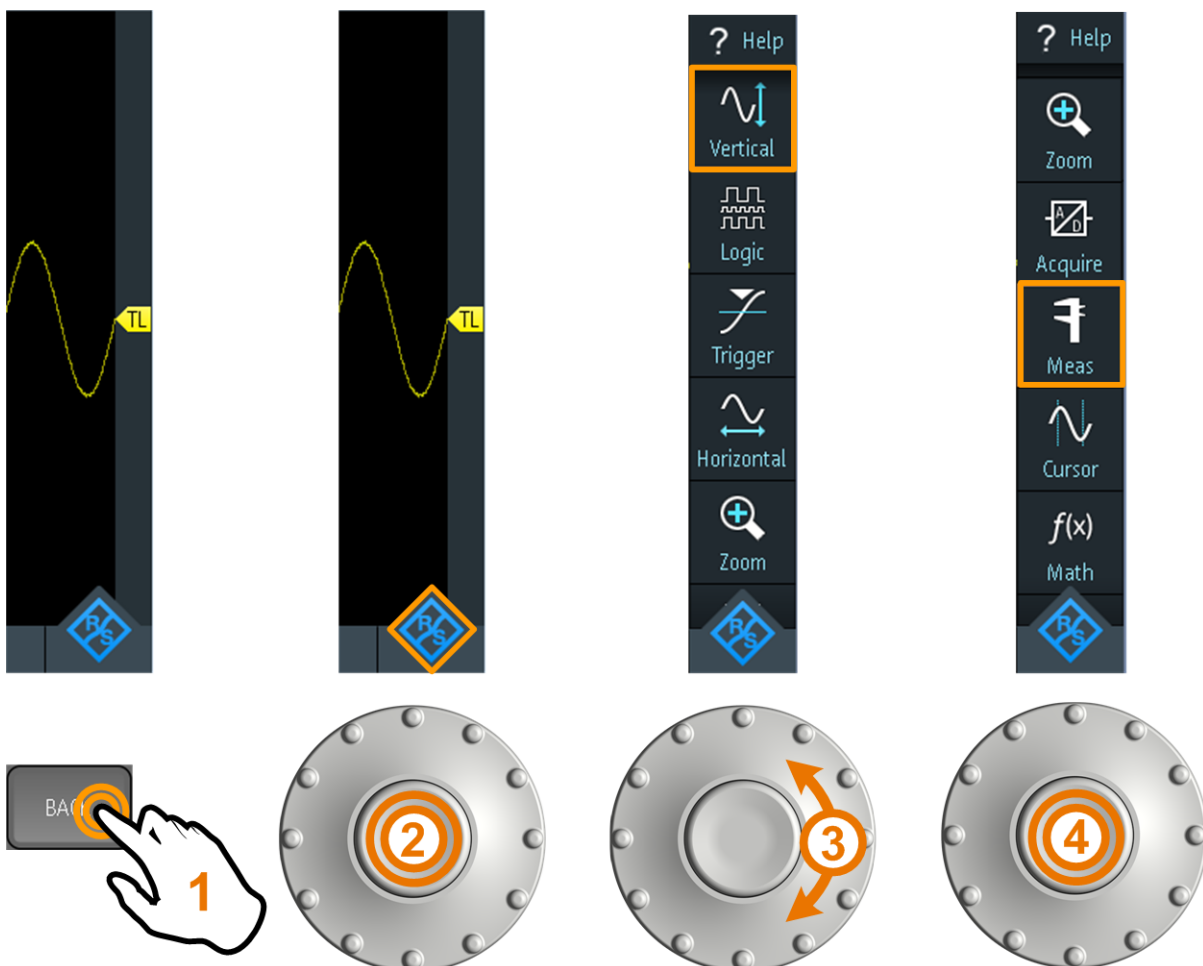


Figure 4-5: Open the menu and select a menu item

Set numerical value using the wheel

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

- Turn the wheel until the required value is shown.
- Press BACK.

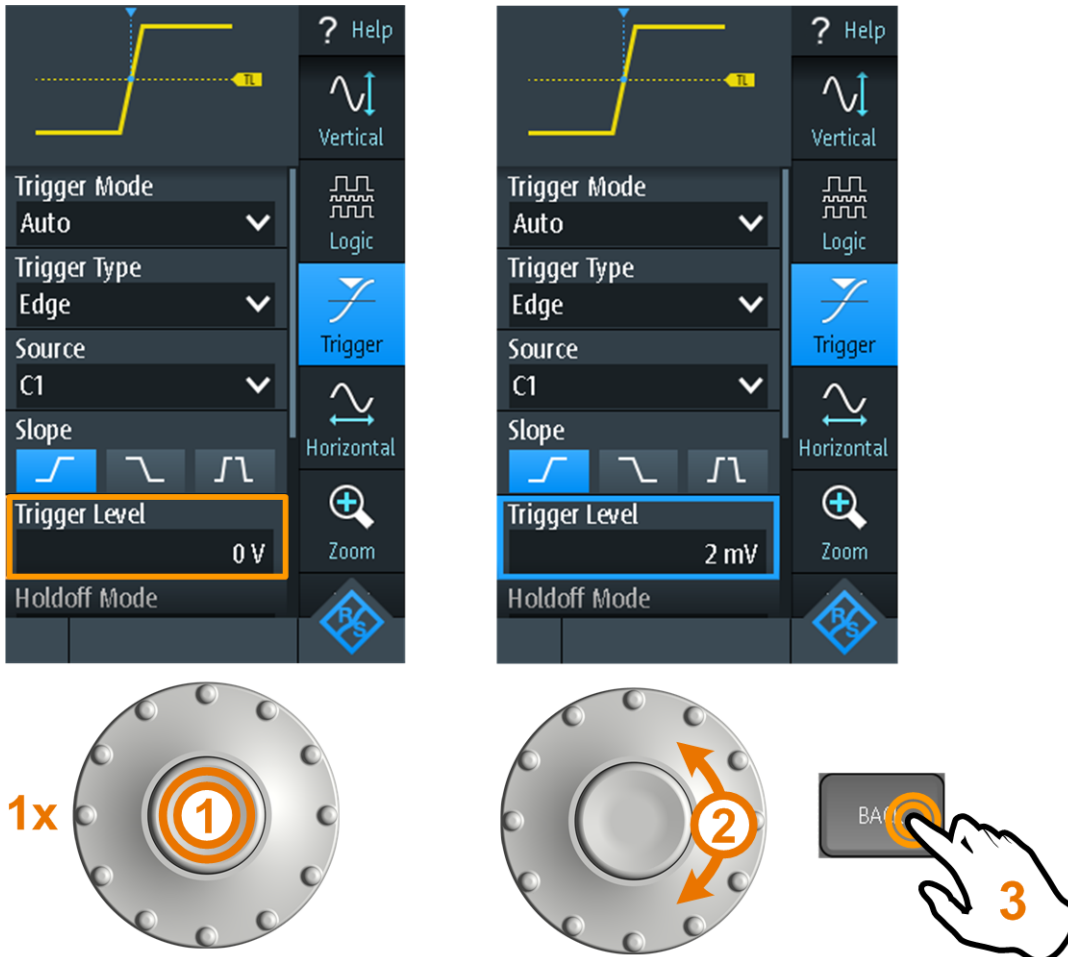


Figure 4-6: Set numerical value using the wheel

Data entry using wheel and keypad

You can enter precise numerical values on the keypad. See also [Figure 4-7](#).

- Set the focus to the required setting and press the wheel button *twice*.
- Turn the wheel until the focus is on the required number.
- Press the wheel button.
- Turn the wheel until the focus is on the required unit.
- Press the wheel button.

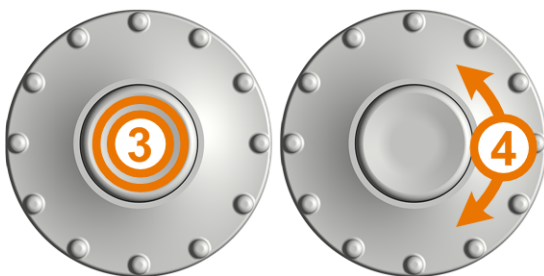
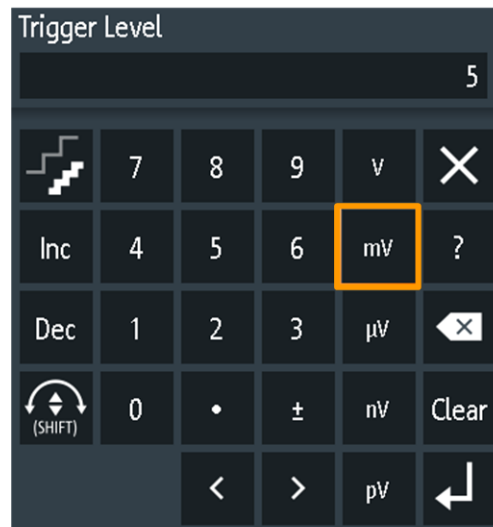
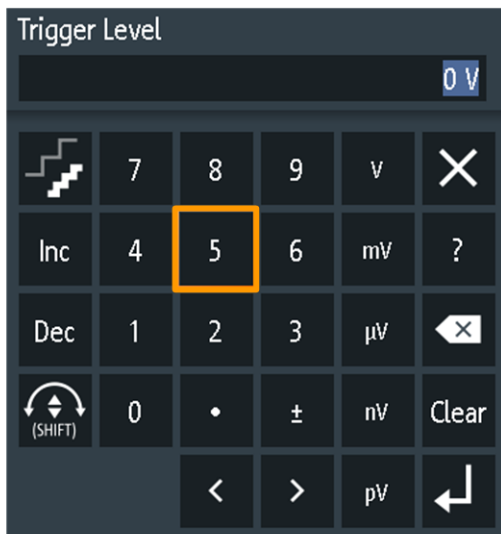
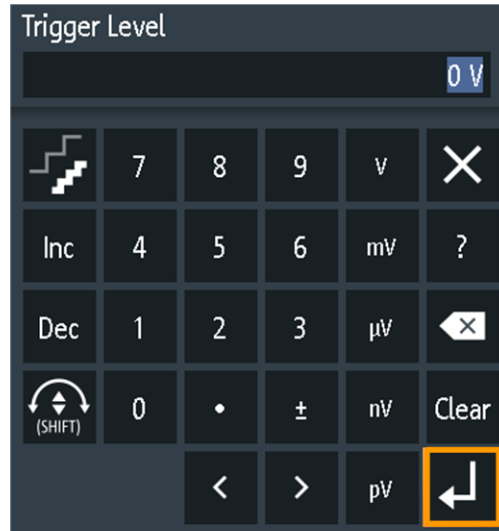





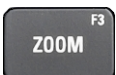

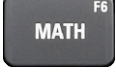

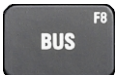
Figure 4-7: Enter numerical value and unit in the keypad



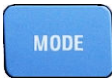
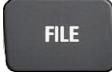



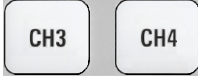

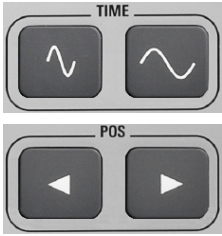









The SHIFT button toggles the wheel focus in the keypad. If the focus is on the entry field, turning the wheel changes the value. If the focus is in the lower part, the wheel selects numbers and unit.

4.3.3 Using Front Panel Keys

For an overview of the front panel keys, see [Figure 3-2](#)

Key	Short press	Long press
	AUTOSET analyses the active channels, adjusts the instrument settings, and displays stable waveforms.	
	PRESET sets the instrument to the default factory state.	
	MEAS starts or stops the last configured automatic measurements.	Opens or closes the "Meas" dialog to configure the measurements.
	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 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 switches the math waveform on or off.	Opens or closes the "Math" dialog to configure the math waveform.
	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 D0..D7 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.
	Requires at least one protocol option R&S RTH-K1 or R&S RTH-K2.	

Key	Short press	Long press
	SHIFT opens a dialog to save and load instrument settings.	
	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.	
  	Open or close the "Mode", "File" or "Setup" dialog, respectively.	
	Outputs measurement documentation: saves a screenshot, waveform data, results, logger record, instrument settings, and/or text comment. You can select the data for output.	Opens or closes the "Screenshot" dialog to configure the documentation output.
All R&S RTH:  Only R&S RTH1004: 	The effect depends on the channel state: If the channel is off, the key switches the channel on 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 correspondent channel to configure the channel settings.
Only R&S RTH1002: 	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 and POS adjust the horizontal time scale and position of the trigger point.	
	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	Short press	Long press
	SIGNAL OFF switches the focused waveform off.	
	RUN STOP starts and stops the acquisition.	
	SETUP opens or closes the "Trigger" dialog to select the trigger type and adjust the trigger settings.	
	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 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

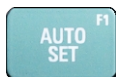
The R&S RTH can display unknown, complex signals automatically. The AUTOSET function analyzes the enabled channel signals, and adjusts the horizontal, vertical, and trigger settings to display stable waveforms.

1. Press the PRESET key.



PRESET 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.



The waveform is displayed.

4.5 Selecting the Mode

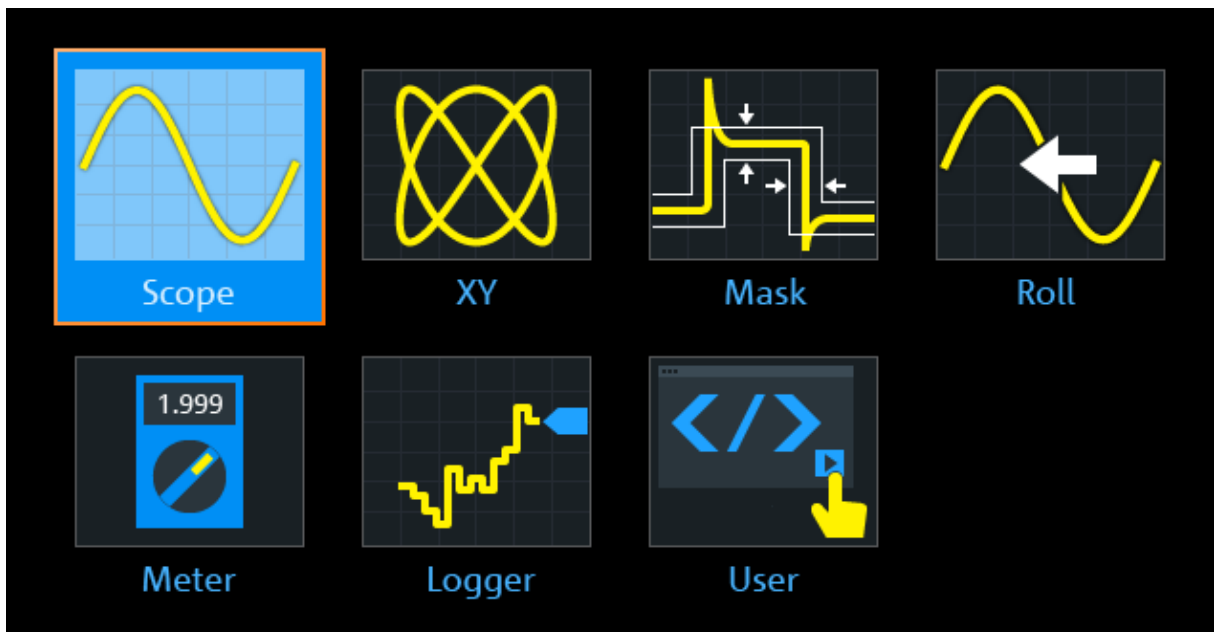
A mode comprises all settings and functions that are needed to perform a measurement task. Selecting the mode is the first setup step.

1. Press the MODE key.



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.

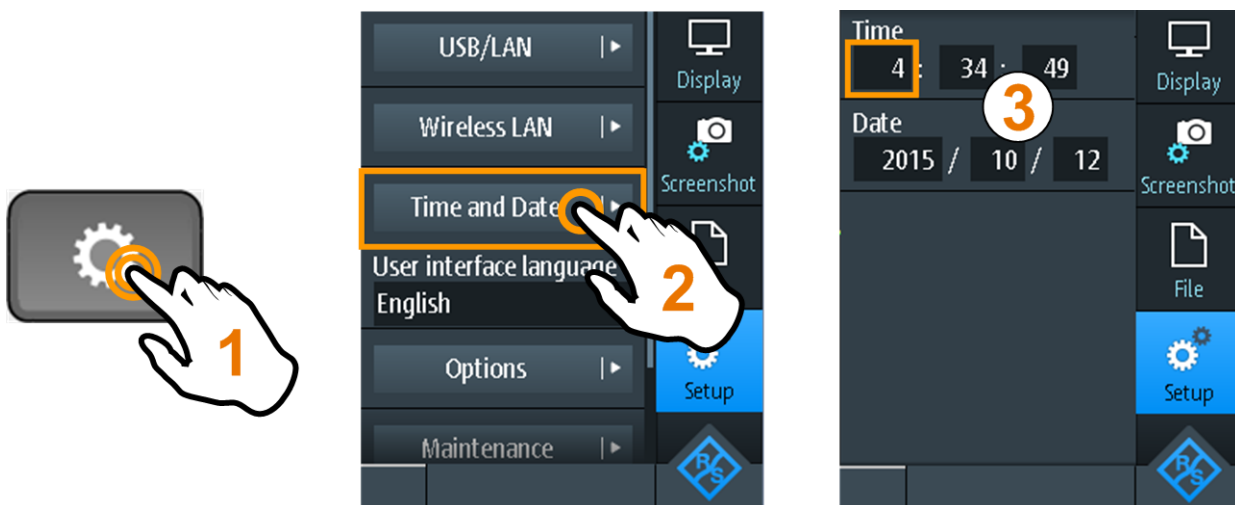


4.6 Setting the Date, Time and Language

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.

4.7.1 Displaying Help

- "To open the help window" on page 38
- "To show information on a setting" on page 38
- "To close the help window" on page 39

To open the help window

- ▶ Tap the "Help" icon on the top of the menu.

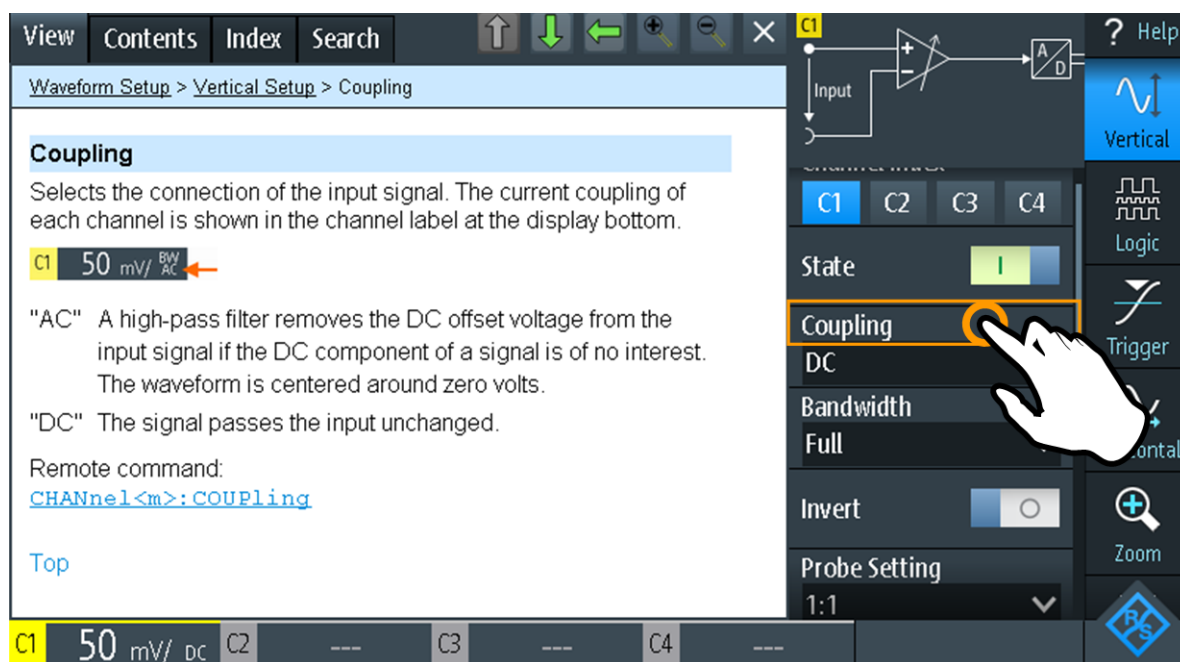


If a dialog is open, the dialog's help topic is shown beside the dialog.
If a menu is open, the table of contents is shown.

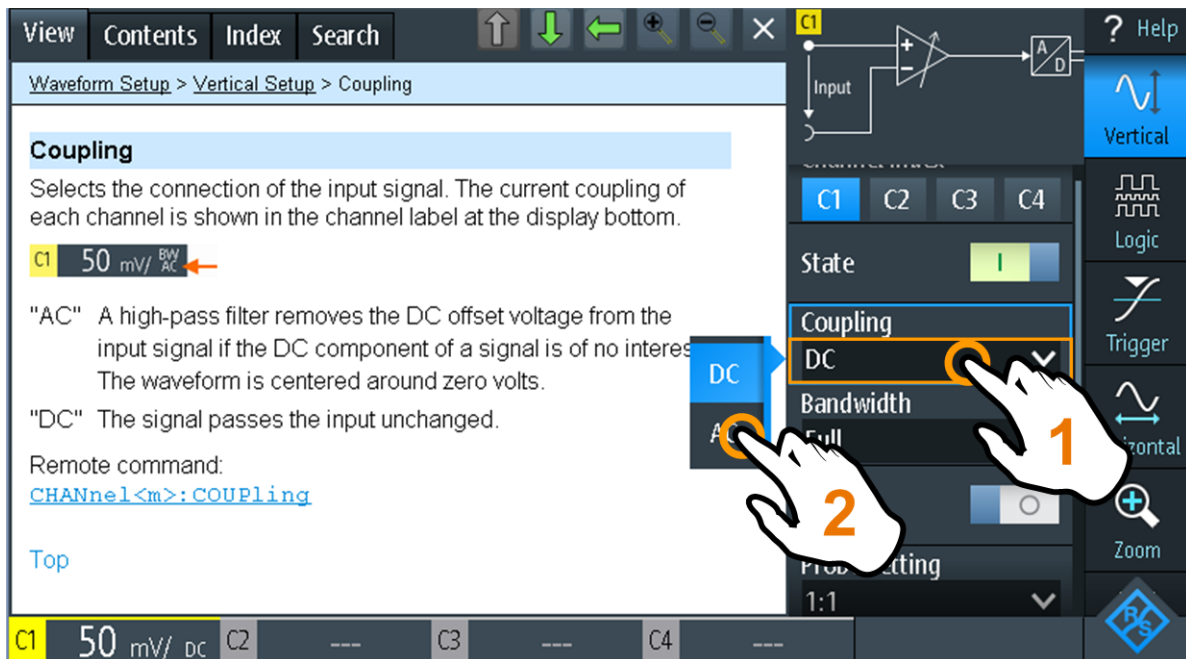
To show information on a setting

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": 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 a 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 that may damage the instrument. For example, cleaning agents that contain a solvent may damage the front panel labeling, plastic parts, or the display.

Never use cleaning agents such as solvents (thinners, acetone, etc), acids, bases, or other substances.

The outside of the instrument can be cleaned sufficiently using a soft, lint-free dust cloth.

5.2 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, a 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.

5.3 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.