

R&S[®]MXO 4 Series Oscilloscope Getting Started



1335532002

Version 03

ROHDE & SCHWARZ
Make ideas real



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1 Safety and regulatory information

The product documentation helps you to use the product safely and efficiently. Follow the instructions provided here and in the [Chapter 1.1, "Safety instructions"](#), on page 3.

Intended use

The R&S MXO 4 oscilloscope is designed for measurements on circuits that are only indirectly connected to the mains or not connected at all. It is not rated for any measurement category.

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

Where do I find safety information?

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

- In [Chapter 1.1, "Safety instructions"](#), on page 3. The same information is provided in many languages as printed "Safety Instructions". The printed "Safety Instructions" are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

1.1 Safety instructions

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

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

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

Reconfigure or adjust the product only as described in the product documentation or the data sheet. Any other modifications can affect safety and are not permitted.

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

In these safety instructions, the term "product" covers instruments (oscilloscopes), probes and their accessories.

Lifting and carrying the instrument

Check the data sheet for the maximum weight of the instrument. A single person can only carry a maximum of 18 kg safely depending on age, gender and physical condition. If your instrument is heavier than 18 kg, do not move or carry it by yourself.

Use the instrument handles to move or carry the instrument. Do not use the mounted accessories instead of the handles. Accessories are not designed to carry the weight of the instrument.

To move the instrument safely, you can use lifting or transporting equipment such as lift trucks and forklifts. Follow the instructions provided by the equipment manufacturer.

Choosing the operating site

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

Unless otherwise specified in the data sheet, you can operate the product up to an altitude of 2000 m above sea level.

The product is suitable for pollution degree 2 environments where nonconductive contamination can occur. For more information on environmental conditions such as ambient temperature and humidity, see the data sheet.

Setting up the product

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

If the product has foldable feet, always fold the feet completely in or out to ensure stability. The feet can collapse if they are not folded out completely or if the product is moved without lifting it. The foldable feet are designed to carry the weight of the product, but not an extra load.

If stacking is possible, keep in mind that a stack of products can fall over and cause injury.

If you mount products in a rack, ensure that the rack has sufficient load capacity and stability. Observe the specifications of the rack manufacturer. Always install the products from the bottom shelf to the top shelf so that the rack stands securely. Secure the product so that it cannot fall off the rack.

Connecting to power and grounding

The mains power supply input of the instrument complies with overvoltage category II. It has to be connected to a fixed installation used to supply energy-consuming equipment such as household appliances and similar loads. Be aware that electrically powered products have risks, such as electric shock, fire, personal injury or even death.

Take the following measures for your safety:

- Do not use an isolating transformer to connect the instrument to the mains power supply.
- Before switching on the product, ensure that the voltage and frequency indicated on the product match the available power source. If the power adapter does not adjust automatically, set the correct value and check the rating of the fuse.
- Only use the power cable delivered with the product. It complies with country-specific safety requirements. Only insert the plug into an outlet with protective conductor terminal.
- If a product has an exchangeable fuse, its type and characteristics are indicated next to the fuse holder. Before changing the fuse, switch off the instrument and disconnect it from the power source. How to change the fuse is described in the product documentation.

- Only use intact cables and route them carefully so that they cannot be damaged. Check the power cables regularly to ensure that they are undamaged. Also ensure that nobody can trip over loose cables.
- If the product needs an external power supply, use the power supply that is delivered with the product or that is recommended in the product documentation or a power supply that conforms to the country-specific regulations.
- Ensure that you can disconnect the product from the power source at any time. Pull the power plug to disconnect the product. The power plug must be easily accessible. If the product is integrated into a system that does not meet these requirements, provide an easily accessible circuit breaker at the system level.
- Replace parts that are relevant to safety only by original parts, e.g. power cables or fuses.

Performing measurements

Take the following measures for your safety:

- To ascertain voltage-free state, use an appropriate voltage tester. Any measurement setup including an oscilloscope is not suitable for this purpose.
- The maximum input voltage on channel inputs and the external trigger input must not exceed the value specified in the data sheet.
- Observe all voltage and current ratings of the instrument, the probes, and the accessories. Exceeding the allowed voltages can lead to an electric shock. Limits and ratings are marked on the products and listed in the data sheets. Consider that the rated voltage depends on the frequency. The voltage limitation curves or values are provided in the data sheet.
- Never cause any short circuits when measuring sources with high output currents.
- Use only probes and accessories that comply with the measurement category (CAT) of your measurement task. The measurement category of the products is defined in the data sheet. If you use other than Rohde & Schwarz accessories, make sure that they are suitable for the instrument and the measurement task.
- Set the correct 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.
- When working with high voltages and current probes, observe the additional operating conditions specified in this safety instructions.

Safety instructions

- The probe pins are extremely pointed and can easily penetrate clothes and the skin. Handle the probe pins with great care. To exchange a probe pin, use tweezers or pliers to avoid injuries. When transporting the accessories, always use the box supplied with the probe.
- Prevent the probe from receiving mechanical shock. Avoid putting excessive strain on the probe cable or exposing it to sharp bends. Touching a broken cable during measurements can cause injuries.
- Set up all probe connections to the instrument before applying power.

Working with hazardous voltages

Voltages higher than 30 V RMS, or 42 V peak, or 60 V DC are regarded as hazardous contact voltages. Direct contact with them can cause serious injuries.

Make sure that only electrically skilled persons use the products for measurements on hazardous contact voltages. These working conditions require special education and experience to perceive risks and to avoid hazards which electricity can create.

When working with hazardous contact voltages, use protective measures to preclude direct contact with the measurement setup:

- Do not touch exposed connections and components when power is applied.
- Switch off the test circuit while connecting and disconnecting probe leads.
- Use only insulated voltage probes, test leads and adapters.
- Make sure that the input leads fulfill the safety requirements for your measurement.
The delivered input leads might have a jacket wear indicator that indicates a worn jacket by different jacket color. In this case, do not use the input lead. Replace it with a new one.
- Do not use 4 mm banana plugs without protection against contact.

Working with current probes

When working with current probes, you can measure high-frequency currents or currents that contain high-frequency components.

- Switch off the test circuit while connecting the probe.
- Do not attach the clamp to bare unisolated conductors. To avoid injury from a short circuit, measure at a location on an insulated wire where the insulation is sufficient for the circuit voltage.

Safety instructions

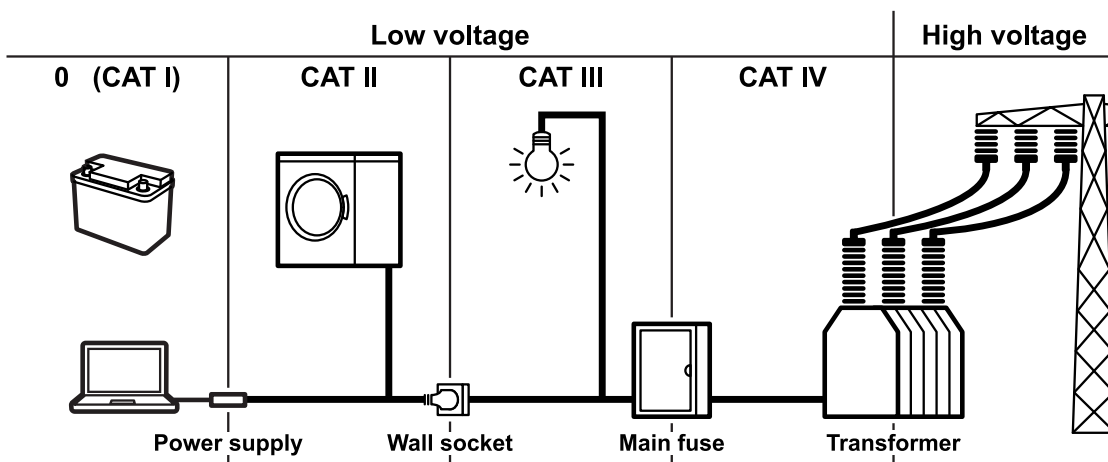
- Connect the probe only to the secondary side of a breaker. With this measure, you avoid injury, if a short circuit occurs.
- The following effects can cause burns and fire or damage to the measurement site:
 - Eddy current loss can cause heating of the sensor head.
 - Dielectric heating can cause heating of cord insulation and other materials.

Measurement categories

IEC 61010-2-030 defines measurement categories that rate instruments on their ability to resist short transient overvoltages that occur in addition to the working voltage. Use the measurement setup only in electrical environments for which they are rated.

- 0 - Instruments without rated measurement category
For measurements performed on circuits not directly connected to mains, for example, electronics, circuits powered by batteries, and specially protected secondary circuits. This measurement category is also known as CAT I.
- CAT II:
For measurements performed on circuits directly connected to the low-voltage installation by a standard socket outlet, for example, household appliances and portable tools.
- CAT III:
For measurements performed in the building installation, such as junction boxes, circuit breakers, distribution boards, and equipment with permanent connection to the fixed installation.
- CAT IV:
For measurements performed at the source of the low-voltage installation, such as electricity meters and primary overcurrent protection devices.

Labels on the product



Cleaning the product

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

Meaning of safety labels

Safety labels on the product warn against potential hazards.




	<p>Potential hazard</p> <p>Read the product documentation to avoid personal injury or product damage.</p>
	<p>Electrical hazard</p> <p>Indicates live parts. Risk of electric shock, fire, personal injury or even death.</p>
	<p>Protective conductor terminal</p> <p>Connect this terminal to a grounded external conductor or to protective ground. This protects you against electric shock should an electric problem occur.</p>

1.2 Labels on the product

Labels on the casing inform about:

- Personal safety, see "[Meaning of safety labels](#)" on page 9
- Product and environment safety, see [Table 1-1](#)
- Identification of the product

Table 1-1: Labels regarding product and environment safety

	Chassis grounding terminal
	Take care when handling electrostatic sensitive devices.
	Labeling in line with EN 50419 for disposal of electrical and electronic equipment after the product has come to the end of its service life. For more information, see the product user manual, chapter "Disposal".

1.3 Warning messages in the documentation

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

WARNING

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

CAUTION

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

NOTICE

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

1.4 CE declaration of conformity

ROHDE & SCHWARZ



Declaration of Conformity

This is to certify that:

Equipment Type	Stock No.	Designation
MXO4 - MXO44	1335.5050.04	Oscilloscope 4 Channel

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States.

Low Voltage Directive (2014/35/EU)

Harmonized standards applied: EN 61010-1:2010+A1:2019+A1:2019/AC:2019
EN 61010-2-030:2021

EMC Directive (2014/30/EU)

Harmonized standards applied: EN 61326-1:2013
EN 61326-2-1:2013
EN 55011:2016 + A1:2017 + A11:2020

Restriction of Hazardous Substances Directive (2011/65/EU)

Harmonized standards applied: EN IEC 63000:2018

The immunity test requirements for equipment intended to be used in industrial electromagnetic environment (acc. to EN 61326-1, Table 2) have been used as a basis.
The limits of radio interference for Group I, Class A equipment (acc. to EN 55011) have been used as a basis.

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 Munich

Munich, 2022-06-03
3705.3410.02 01.00

CE

Corporate Quality Management GF-QP / Robert Lambertus
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1.5 UKCA declaration of conformity

ROHDE & SCHWARZ



**UK
CA**

Declaration of Conformity

This is to certify that:

Equipment Type	Stock No.	Designation
MXO44	1335.5050.04	Oscilloscope 4 Channel

The object of the declaration described above is in conformity with the relevant UK Statutory Instruments (and their amendments):

Electrical Equipment (Safety) Regulations 2016 (S.I. 2016/1101)

Harmonized standards applied: EN 61010-1:2010+A1:2019+A1:2019/AC:2019
EN 61010-2-030:2021

Electromagnetic Compatibility Regulations 2016 (S.I. 2016/1091)

Harmonized standards applied: EN 61326-1:2013
EN 61326-2-1:2013
EN 55011:2016 + A1:2017 + A11:2020

Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (S.I. 2012/3032)

Harmonized standards applied: EN IEC 63000:2018

The immunity test requirements for equipment intended to be used in industrial electromagnetic environment (acc. to EN 61326-1, Table 2) have been used as a basis.
The limits of radio interference for Group I, Class A equipment (acc. to EN 55011) have been used as a basis.

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UKCA

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1.6 Korea certification class A



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

1.7 Where to find key documents on Rohde & Schwarz

Certificates issued to Rohde & Schwarz that are relevant for your country are provided at www.rohde-schwarz.com/key-documents, e.g. concerning:

- Quality management
- Environmental management
- Information security management
- Accreditations

2 Documentation overview

This section provides an overview of the R&S MXO 4 user documentation.

2.1 Manuals and instrument help

You find the manuals on the product page at:

www.rohde-schwarz.com/manual/mxo4

Getting started manual

Introduces the R&S MXO 4 and describes how to set up the product. A printed English version is included in the delivery.

User manual and help

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

The contents of the user manual are available as help in the R&S MXO 4. The help offers quick, context-sensitive access to the complete information on the instrument and its firmware.

The user manual is available for download or for immediate display on the internet.

Safety instructions

Provides safety information in many languages. The printed document is delivered with the product.

Instrument security procedures manual

Deals with security issues when working with the R&S MXO 4 in secure areas. It is available for download on the internet.

Release notes, open source acknowledgment

Service manual

Describes the performance test for checking compliance with rated specifications, firmware update, adjustments, installing options and maintenance. The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS, <https://gloris.rohde-schwarz.com>).

2.2 Specifications and brochure

The data sheet contains the technical specifications of the R&S MXO 4. It also lists the firmware applications and their order numbers, and optional accessories. The brochure provides an overview of the instrument and deals with the specific characteristics.

www.rohde-schwarz.com/brochure-datasheet/mxo4

2.3 Calibration certificate

The document is available on <https://gloris.rohde-schwarz.com/calcert>. You need the device ID of your instrument, which you can find on a label on the rear panel.

2.4 Release notes, open source acknowledgment

The release notes list new features, improvements and known issues of the current firmware version, and describe the firmware installation. The open source acknowledgment document provides verbatim license texts of the used open source software. It can also be read directly on the instrument.

www.rohde-schwarz.com/firmware/mxo4

3 Preparing for use

Here, you can find basic information about setting up the instrument for the first time or when changing the operating site.

3.1 Lifting and carrying

See: "[Lifting and carrying the instrument](#)" on page 4.

3.2 Unpacking and checking

1. Unpack the product carefully.
2. Retain the original packing material. Use it when transporting or shipping the product later.
3. Using the delivery notes, check the equipment for completeness.
4. Check the equipment for damage.

If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.

3.3 Choosing the operating site

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

See also "[Choosing the operating site](#)" on page 4.

Electromagnetic compatibility classes

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

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

3.4 Setting up the product

When setting up the instrument, follow the safety instructions:

- ["Setting up the product"](#) on page 5
- ["Intended use"](#) on page 3

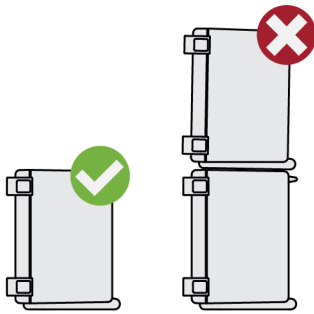
3.4.1 Placing the product on a bench top

For standalone operation, place the instrument on a horizontal bench with even, flat surface. The instrument can be used in horizontal position, standing on its feet, or with the support feet on the bottom extended.

To place the product on a bench top

1. Place the product on a stable, flat and level surface.
2. **CAUTION!** The top surface of the product is too small for stacking. If you stack another product on top of the product, the stack can fall over and cause injury.

If you want to save space, mount several products in a rack.



3. **CAUTION!** Foldable feet can collapse. See "[Setting up the product](#)" on page 5.

Always fold the feet completely in or out. With folded-out feet, do not place anything on top or underneath.

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

Prevent overheating as follows:

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

3.4.2 Mounting the product in a rack

The instrument can be installed in a rack using a rack adapter kit. The order number is given in the data sheet. The installation instructions are part of the adapter kit.

To prepare the rack

1. Observe the requirements and instructions in "[Setting up the product](#)" on page 5.
2. **NOTICE!** Insufficient airflow can cause overheating and damage the product. Design and implement an efficient ventilation concept for the rack.

To mount the R&S MXO 4 in a rack

1. Use an adapter kit that fits the dimensions of the R&S MXO 4 to prepare the instrument for rack mounting. For information on the dimensions, see data sheet.

Considerations for test setup

- a) Order the rack adapter kit designed for the R&S MXO 4. For the order number, see data sheet.
 - b) Mount the adapter kit. Follow the assembly instructions provided with the adapter kit.
2. Push the product onto the shelf until the rack brackets fit closely to the rack.
 3. Tighten all screws at the rack brackets with a tightening torque of 1.2 Nm to secure the product at the rack.

To unmount the product from a rack

1. Loosen the screws at the rack brackets.
2. Remove the product from the rack.
3. If placing the product on a bench top again, unmount the adapter kit from the product. Follow the instructions provided with the adapter kit.

3.5 Considerations for test setup

Observe safety instructions, see "[Performing measurements](#)" on page 6.

Cable selection and electromagnetic interference (EMI)

Electromagnetic interference (EMI) can affect the measurement results.

To suppress electromagnetic radiation during operation:

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

Measuring accessories

Use only probes and measuring accessories that comply with IEC 61010-031.

Signal input and output levels

Information on signal levels is provided in the data sheet. Keep the signal levels within the specified ranges to avoid damage to the product and connected devices.

Preventing electrostatic discharge (ESD)

Electrostatic discharge is most likely to occur when you connect or disconnect a DUT.

- ▶ **NOTICE!** Electrostatic discharge can damage the electronic components of the product and the device under test (DUT).

Ground yourself to prevent electrostatic discharge damage:

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

During operation, if the firmware observes a serious unexpected disturbance (e.g. due to ESD), it resets some hardware components and initiates a new alignment to ensure proper instrument functioning. Then it restores the user settings to the state before the disturbance.

3.6 Connecting to power

For safety information, see "[Connecting to power and grounding](#)" on page 5.

The R&S MXO 4 can be used with different AC power voltages and adapts itself automatically to it.

The nominal ranges are indicated on a label near the power connector on the instrument and in the data sheet.

1. Plug the AC power cable into the AC power connector on the rear panel of the product. Only use the AC power cable delivered with the product.
2. Plug the AC power cable into a power outlet with ground contact.

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

3.7 Switching on or off

The instrument is switched on or off with the power switch and the [Power] key. The [Power] key is located in the bottom left corner of the front panel. The power switch is located at the rear panel of the instrument.

Table 3-1: Overview of power states

Status	LED	Power switch
Off	● (unlighted)	[0] (off)
Standby	● yellow	[I] (on)
Ready	● green	[I] (on)

To switch on the product

The product is off but connected to power.


1. Set the switch on the power supply to position [I].
The power key on the front panel lights up.
2. Press the [Power] key on the front panel.
The instrument performs a system check, boots the operating system, and then starts the R&S MXO 4 firmware.
The [Power] key turns green and the illuminated keys on the front panel light up. If the previous session was terminated regularly, the oscilloscope uses the last settings.

Before you start measurements, be sure to comply with the warm-up phase specified in the data sheet.

To shut down the product

The product is in the ready state.

- ▶ Press the [Power] key.
All current settings are saved, and the software shuts down. The [Power] key turns yellow. The standby power supplies only the power switch circuits.

The  "Power" icon in the "Menu" shuts down only the firmware application. To shut down the instrument completely, use the [Power] key.

To disconnect from power

The product is in the standby state.

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

The LED of the [Power] key is switched off.

2. Disconnect the product from the power source.

3.8 Connecting external devices

The following interfaces for external devices are provided:

- USB connectors at the front and rear panel of the instrument
- HDMI connector at the rear panel of the instrument

3.8.1 Connecting USB devices

You can connect USB flash drives to save screenshots and measurement results, and keyboard and/or mouse to simplify the operation and the entry of data. You can connect or disconnect all USB devices during operation of the instrument.

USB devices are plug&play, the operating system automatically uses the suitable device driver.

3.8.2 Connecting an external monitor

Using the HDMI connector on the rear panel, you can connect an external monitor or projector to the R&S MXO 4.

Before connecting an external monitor, ensure that the monitor and the R&S MXO 4 are connected to a ground contact. Otherwise the instrument can be damaged.

The touchscreen of the R&S MXO 4 has a screen resolution of 1920x1080 pixels. If the screen resolution of the monitor is set higher than the instrument's resolution, the application window uses a 1920x1080 pixels area of the monitor display. For full screen display, adjust the monitor's screen resolution.

4 Instrument tour

This section describes the front, rear and side view of the instrument including all function keys and connectors.

The meanings of the labels on the product are described in [Chapter 4, "Instrument tour"](#), on page 23.

4.1 Front view

This section provides an overview of the R&S MXO 4 front panel.

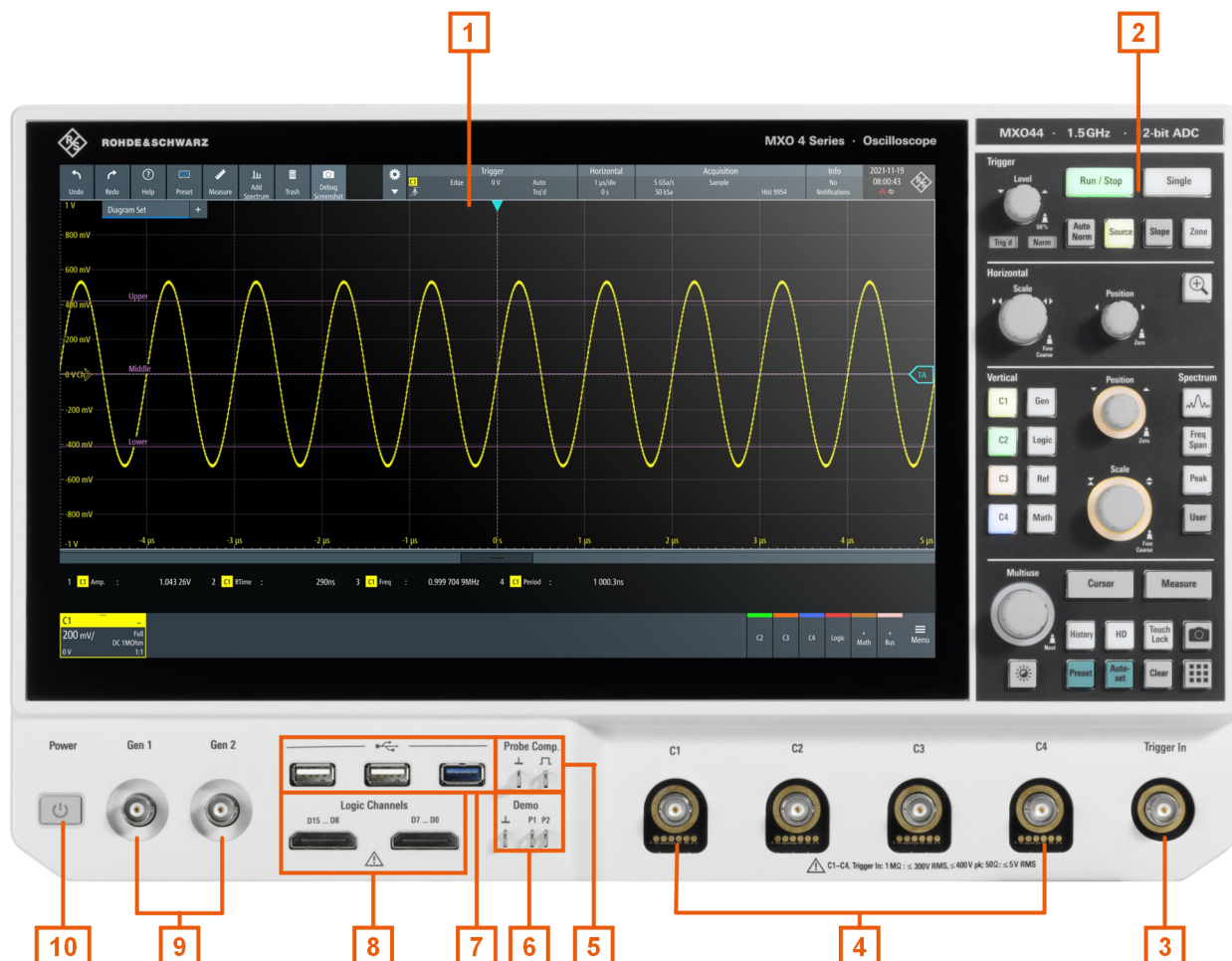


Figure 4-1: Front panel of R&S MXO 4 with 4 input channels

- 1 = Display
- 2 = Keys and controls
- 3 = External trigger input
- 4 = Analog input channels
- 5 = Connectors for probe compensation
- 6 = Connectors for demo signal output
- 7 = USB connectors
- 8 = Connectors for logic probe (R&S MXO4-B1 Mixed Signal Option)
- 9 = Connector for optional function generator output (BNC, R&S MXO4-B6 Arbitrary waveform generator option)
- 10 = [Power] key

4.1.1 Input connectors

Channel inputs

The R&S MXO 4 has four channel inputs (4) to connect the input signals.

For channel connectors, the input impedance is selectable, the values are 50 Ω and 1 M Ω .

The maximum input voltage on channel inputs is:

- 400 V (V_p) and 300 V (RMS) at 1 M Ω input impedance
- 30 V (V_p) and 5 V (RMS) at 50 Ω input impedance

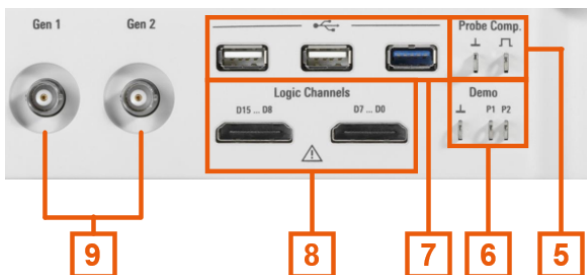
Trigger input

The external trigger input (3) is used to control the measurement by an external signal. The trigger level can be set from -5 V to 5 V.

For the external trigger input, the maximum input voltage is 400 V (V_p) and 300 V (RMS) at 1 M Ω input impedance.

Transient overvoltages on all input connectors must not exceed 400 V (V_p).

4.1.2 Other connectors on the front panel



Gen: Function Generator (9)

BNC output of the function generator, requires option R&S MXO4-B6.

Logic Channels (8)

Two connectors for logical probes with 8 digital channels each (D0 to D7 and D8 to D15). Using logic channels requires the Mixed Signal Option R&S MXO4-B1.

The maximum input voltage is 40 V (V_p) at 100 kΩ input impedance. The maximum input frequency for a signal with the minimum input voltage swing and medium hysteresis of 800 mV (V_{pp}) is 400 MHz.

USB (7)



Two USB 2.0 type A and one USB 3.0 interfaces. They are used to connect a mouse or keyboard, a USB flash drive for storing and reloading instrument settings and measurement data, and to update the firmware.

Demo (6)

The pins are intended for demonstration purposes.

Probe Comp. (5)

Probe compensation terminal to adjust passive probes to the oscilloscope channel.

-  Square wave signal for probe compensation.
-  Ground connector for probes.

4.2 Side view



Figure 4-2: Side view of R&S MXO 4

1 = Grounding

On the side of the instrument, you can find the ground connector for probes.

4.3 Rear view

On the rear panel of the R&S MXO 4, you find more connectors and the power supply switch.

Rear view

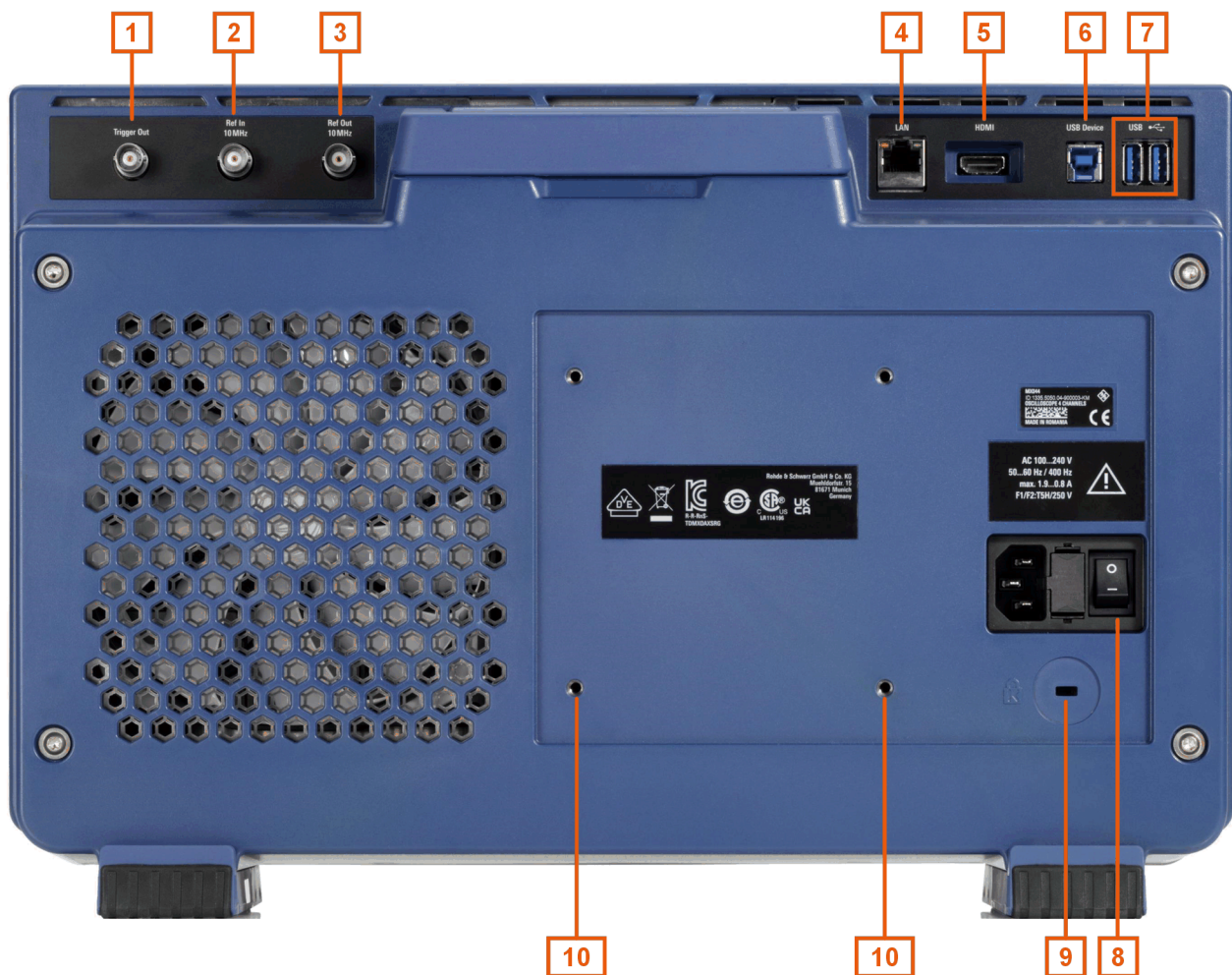


Figure 4-3: Rear panel view of R&S MXO 4

- 1 = Aux Out connector
- 2 = Ref. In 10MHz
- 3 = Ref. Out
- 4 = LAN connector
- 5 = HDMI display output
- 6 = USB B connector, type B
- 7 = USB connector
- 8 = AC power supply connector and main power switch
- 9 = Kensington lock slot to secure the instrument against theft
- 10 = VESA mounting holes to mount the instrument at a monitor arm

Aux Out

BNC output that can function as pass/fail output or trigger output.

Ref. In 10MHz

BNC input connector for 10 MHz reference frequency signals.

Ref. Out

BNC output for 10 MHz frequency reference. Can be switched between internal and external reference.

LAN

8-pin connector RJ-45 used to connect the instrument to a Local Area Network (LAN). It supports up to 1 Gbit/s.

HDMI

HDMI Version 2.0 connector for an external monitor or projector. The monitor shows the complete content of the instrument's screen.

AC power supply connector and main power switch

The instrument supports a wide range power supply. It automatically adjusts to the correct range for the applied voltage. There is no line voltage selector.

The AC main power switch disconnects the instrument from the AC power line.

When you power up the instrument, be sure to comply with the warm-up phase specified in the data sheet before you start measurements.

4.4 Keys and controls

For an overview of the front panel keys, see [Figure 4-1](#).

4.4.1 Power key

The [Power] key is located on the lower left corner of the front panel. It starts up and shuts down the instrument's software.

The light of the key shows the instrument state, see [Chapter 3.7, "Switching on or off"](#), on page 20.

4.4.2 Trigger controls

The keys and knob in the Trigger functional block adjust the trigger and start or stop acquisition.



[Level]

The rotary knob sets the trigger level for all trigger types that require one level. For trigger types with two levels, the knob sets the lower level. Turn clockwise to move up the trigger level. Press the knob to set the trigger level to 50% of the signal amplitude.

[Run / Stop]

Starts and stops the continuous acquisition. The [Run / Stop] key lights green when the acquisition is running. When the acquisition is stopped, the key lights red.

[Single]

Starts a defined number of acquisitions. The [Single] key lights green when the acquisition is running. When the acquisition is stopped, the key lights red.

Press the key again to stop a running acquisition. To set the number of acquisitions, select "Menu" > "Acquisition", and set "N-single/Avg count".

[Auto Norm]

Toggles the trigger mode between "Auto" and "Normal". The current setting is shown on the trigger label.

Auto	The instrument triggers repeatedly after a time interval if the trigger conditions are not fulfilled. If a real trigger occurs, it takes precedence. The time interval depends on the time base.
Norm	The instrument acquires a waveform only if a trigger occurs. The "Norm" LED lights up in green.

[Source]

Toggles the trigger source: C1, C2, C3, C4. The key lights up in the color of the selected channel.

[Slope]

Toggles the trigger slope or trigger polarity, dependent on the trigger type. The current setting is shown on the trigger label.

[Zone]

For future use.

4.4.3 Horizontal controls

The rotary knobs in the Horizontal functional block adjust the horizontal parameters. These settings are effective for all channel waveforms. In addition, a [Zoom] key is available.

**[Position]**

The rotary knob changes the horizontal position of the waveforms. Turn clockwise to move the waveforms to the right. To set the value to zero, press the knob. The current value is shown in the "Horizontal" label above the diagram.

The horizontal position defines the zero point of the diagram. It is the time distance to the reference point, which marks the rescaling center of the time scale.

[Scale]

The rotary knob adjusts the time scale for all signals. The time scale is also known as timebase.

Turn clockwise to stretch the waveforms. Doing so, the scale value *time/div* decreases. Press the knob to toggle between coarse and fine scale adjustment.

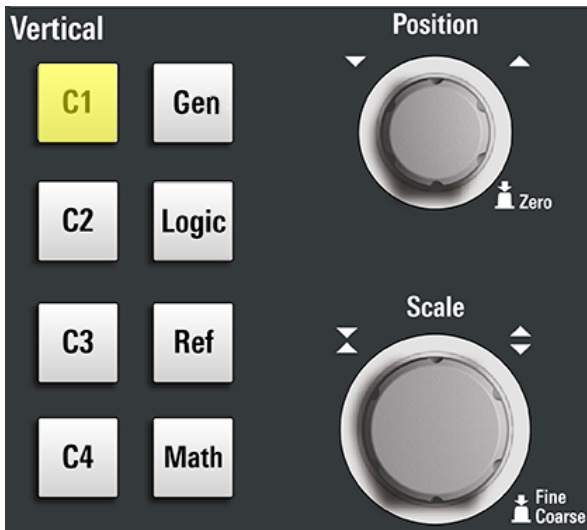
[Zoom]

Activates a zoom and supports the zoom setup.

If no zoom is on, the first press opens a zoom diagram for the active diagram. If at least one zoom is shown, the keypress opens the "Zoom" dialog. If only one zoom is defined, the next press closes the dialog and removes the zoom. If several zooms are defined and the dialog is open, the key toggles the zooms.

4.4.4 Vertical controls

The keys and knobs in the Vertical functional block select a signal and adjust the vertical scale and position of the selected signal.



[C <n>]

Turns on and selects a channel. If the channel is active, the key lights up in the corresponding channel color.

The effect of the keypress depends on state of the channel:

- If channel is off: turns on the channel and selects it.
- If the channel is on and in focus (selected): opens the corresponding channel dialog.
- If the channel is on, but not in focus (not selected): selects the channel waveform.
- If the channel is selected, and the dialog is open: turns off the channel, and closes the dialog.

The vertical rotary knobs are focused on the selected waveform. They are illuminated in the color of the selected waveform.

[Position]

The vertical [Position] knob changes the vertical offset or the position of the selected waveform. The horizontal axis and the selected waveform are moved vertically. You can select whether the knob changes the offset or the position in the "Menu" > "Settings" > "Frontpanel" > "Knobs" dialog.

- Position indicates the vertical location in divisions.
- Offset moves the vertical center of the selected channel to the offset value.

If the selected waveform is a math or reference waveform, serial bus, or logic channel, the knob changes its vertical position.

The knob lights up in the color of the selected waveform. Turn clockwise to move up the waveform. To set the value to zero, press the knob.

The current offset value is shown in the channel icon.

[Scale]

Sets the vertical scale in Volts per division. The vertical scale defines the displayed amplitude of the selected waveform.

The [Scale] knob lights up in the color of the selected waveform.

Turn the knob clockwise to stretch the waveform. Doing so, the scale value V/div decreases. Press the knob to toggle between fine and coarse adjustment. For analog waveforms, the scale value is shown in the signal icon.

To get the maximum resolution of the waveform amplitude, make sure that the waveforms cover most of the diagram's height.

[Gen]

Opens the "Waveform Generator" dialog, if option R&S MXO4-B6 is installed.

The waveform generator can generate various function and arbitrary waveforms, sweeps, and parallel patterns. For detailed specifications, refer to the data sheet.

[Logic]

Opens the "Logic" dialog to configure and enable the logic buses L1 to L4. A logic bus (or parallel bus) has up to 16 logic (digital) channels. If logic buses are active, pressing the key toggles these buses.

The key lights up if at least one logic bus is enabled.

[Ref]

Opens the "Reference" dialog box, where you can configure and display reference waveforms. Press the key repeatedly to switch the reference waveform.

If a reference waveform is selected, the vertical rotary knobs are illuminated in white or light gray (default colors), depending on the selected waveform.

[Math]

Opens the "Math" dialog, where you can configure the calculation of mathematical waveforms using various mathematic operations on other waveforms. Press the key repeatedly to toggle the selected math waveform. If no math waveform is active, the key closes the dialog.

If a math waveform is selected, the vertical rotary knobs are illuminated in blue (default color).

4.4.5 Spectrum keys



[Spectrum]

Opens and closes the "Spectrum" dialog. The key lights up if an FFT is active.

[Freq Span]

Opens and closes the overlay menu to configure the spectrum settings.

[Peak]

Opens the overlay menu to identify the peaks and to create a peak list table of a spectrum. If the "Spectrum" dialog is open, the keypress opens and closes the peak list table.

4.4.6 Analysis keys

The controls in the bottom functional block have various functions.



[Multiuse]

The multiuse knob changes the element that is in focus. It lights up when a function is active on the knob.

- If a numeric entry field in a dialog has the focus: turn to increase or decrease the value.
- If a cursor set has the focus: press to toggle the cursor line, and turn to adjust its position.
- If a zoom has the focus: press to toggle the edges of the zoom, and turn to adjust its position.
- To change the intensity, press the [Intensity] key and turn the knob.

[Intensity]

Adjusts the intensity of the waveforms on the screen: Press the [Intensity] key and turn the [Multiuse] knob. The current value is shown in the input box in the upper right corner of the screen.

[Cursor]

Starts a cursor measurement: sets vertical and horizontal cursors in the active diagram, and displays results of the cursor measurement. If cursors are already set, the keypress opens the "Cursor" dialog, where you can adjust the settings. The next keypress closes the dialog.

Cursors are markers which are placed at points of interest on a waveform. The instrument measures the cursor positions and delta values between parallel cursors.

[Measure]

Opens the "Measurement" dialog, where you can set up various measurements.

[History]

Activates the history and opens the history player. The next keypress closes the player. The history shows stored acquisitions that were acquired before the current one. The key is illuminated as long as the history is active.

[HD]

Activates the high definition mode and opens the "HD Mode" dialog box.

[Touch Lock]

Locks the touchscreen to prevent unintended use. When the touchscreen is off, the key is illuminated. Press again to unlock the touchscreen.

Camera 

Saves a screenshot of the waveform display.

[Preset]

Resets the instrument to a predefined state and starts the continuous acquisition. All measurements, mask tests, zoom, and most individual settings are deleted, and all channels except for channel 1 are disabled. You can define preset configurations and save them to a file. The [Preset] key can be configured to set either factory defaults or a user-defined preset configuration.

[Autoset]

The instrument analyzes the enabled channel signals, and adjusts appropriate horizontal, vertical, and trigger settings to display stable waveforms.

[Clear]

Deletes all measurement results including long-term measurement and statistics, all waveforms, and the history.

Apps 

Opens the "Apps" dialog, where you can start an application, serial protocol or another analysis function.

[User]



For future use.

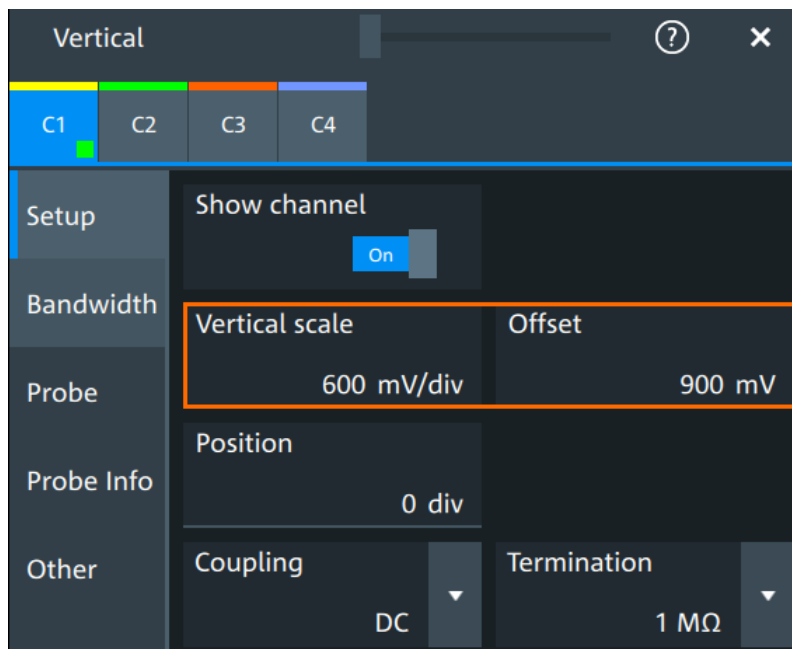
4.5 Checking the functionality

To check if the instrument works correctly, you can use the probe compensation signal and check the displayed signal.

1. Perform a self-alignment of the instrument:
 - a) Warm up the instrument. The minimum warm-up time is indicated in the data sheet.
 - b) Remove all probes from the input connectors.
 - c) Open the "Menu", and select "Settings" > "Maintenance" > "Alignment".
 - d) Tap "Start Alignment". Wait until the alignment has finished successfully.

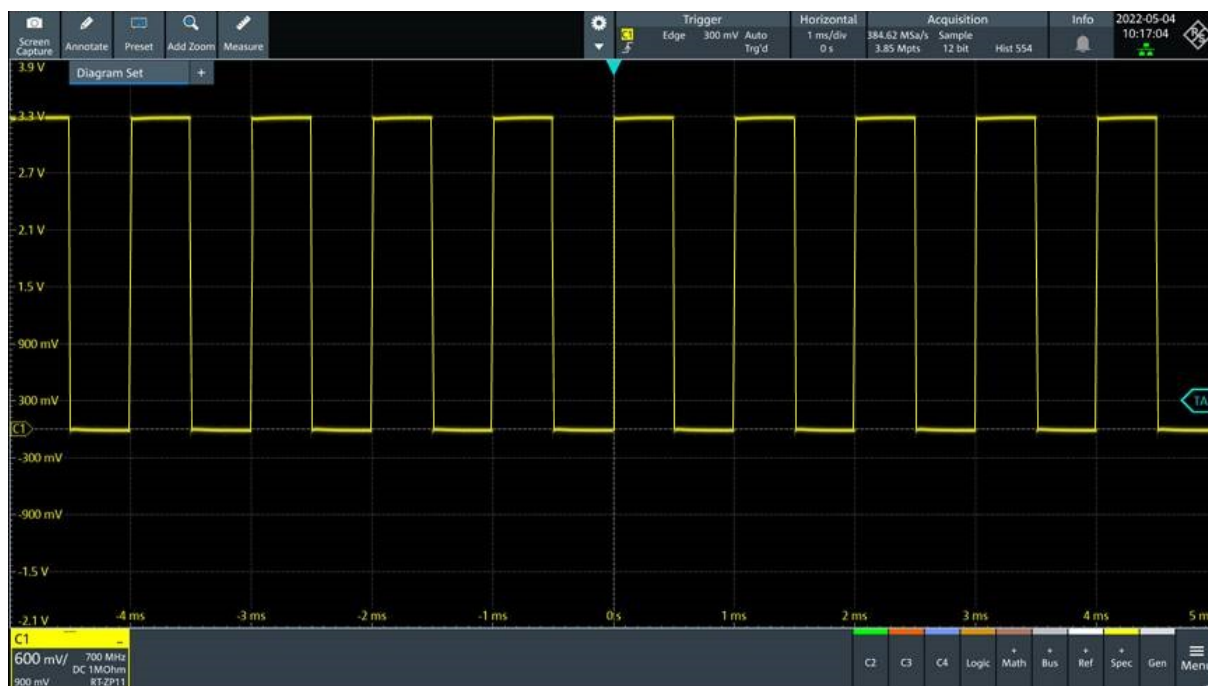
Checking the functionality

2. Connect the probe's ground connector to the ground pin , and the tip to the square wave pin .
3. Press the [Preset] key.
4. Connect the probe to the input connector [C1].
The instrument recognizes the probe, and a signal is displayed in the diagram.
5. Tap the signal icon of C1 to open the vertical settings.
6. In the "Vertical" > "Setup" dialog, adjust the following:
 - "Vertical scale" = 600 mV/div
 - "Offset" = 900 mV



7. Turn the horizontal [Scale] knob to set the horizontal scale to 1 ms/div.
8. Press the [Source] key to set the trigger source to C1. The color of the key indicates the selected channel.
9. Turn the [Level] knob to set the trigger level to 300 mV.
10. Check the rectangle signal on the screen. The displayed signal should have an amplitude of about 3.3 V, which covers 5.5 divisions.

Checking the functionality



11. Repeat steps 4 to 10 for channels C2, C3 and C4. Make sure to adjust the vertical settings for the connected channel, and also to set the trigger source to the connected channel.

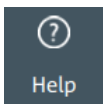
5 Getting information and help

If you need information on the instrument's functionality, you can use the instrument help. It provides contextual information on a setting or dialog. If the help window is open, you can browse and search for further information using links, table of contents, and search.

5.1 Displaying help

To display the context help

1. Enable the "Help" icon on the toolbar.



2. Tap the parameter for which you need information.

The "Help" window opens and displays the comprehensive description and the corresponding remote command. You can browse the help for further information.

To open a dialog help

1. Open a dialog.
2. Tap the ⓘ "Help" icon on the right side of the dialog header.
3. Tap a subtab or menu item.

The help window opens with the dialog help page, where you can select the topics.

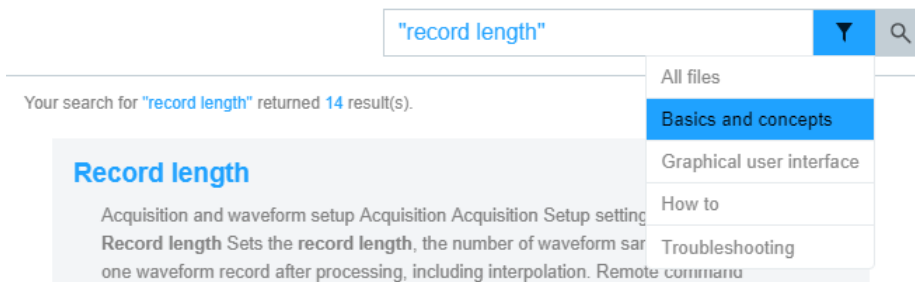
5.2 Using help

You can find a specific information and navigate the contents by following means:

- Table of contents
- Buttons in the help window title:



- "Home": Go to the start page
- "Back", "Forward": Browse the pages that you visited before
- Search with filter:



- Enter the word to be found, or a phrase in quotes.
- Tap the filter icon and select the information type.



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