

# R&S<sup>®</sup>MXO 5 Series Oscilloscope Getting Started

**dataTec**

Mess- und Prüftechnik. Die Experten.

Ihr Ansprechpartner /  
Your Partner:

**dataTec AG**

E-Mail: [info@datatec.eu](mailto:info@datatec.eu)

>>> [www.datatec.eu](http://www.datatec.eu)



1802335202

Version 02

**ROHDE & SCHWARZ**  
Make ideas real



This manual describes the following R&S®MXO5 models with firmware version 2.0 and higher:

- R&S®MXO54, 4 channels (1802.1008k04)
- R&S®MXO58, 8 channels (1802.1008k08)

© 2023 Rohde & Schwarz

Muehldorfstr. 15, 81671 Muenchen, Germany

Phone: +49 89 41 29 - 0

Email: [info@rohde-schwarz.com](mailto:info@rohde-schwarz.com)

Internet: [www.rohde-schwarz.com](http://www.rohde-schwarz.com)

Subject to change – data without tolerance limits is not binding.

R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG.

The terms HDMI, HDMI High-Definition Multimedia Interface, HDMI trade dress and the HDMI Logos are trademarks or registered trademarks of HDMI Licensing Administrator, Inc.

All other trademarks are the properties of their respective owners.

1802.3352.02 | Version 02 | R&S®MXO 5 Series

Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol, e.g. R&S®MXO 5 series oscilloscope is indicated as R&S MXO 5.

# 1 Safety and regulatory information

The product documentation helps you to use the product safely and efficiently.

## 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 in printed format. The printed "Safety Instructions for Oscilloscopes and Accessories" are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

## Intended use

The R&S MXO 5 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.

## 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 for Oscilloscopes and Accessories" document. 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 outdoor use of your product, e.g. a protective cover, 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 the product

Unless specified otherwise in the data sheet, only connect the interfaces and measurement ports of the product to other products or circuits that have double or reinforced insulation to protect against dangerous live voltages. This protective measure against electric shock is known as SELV (safety extra-low voltage).

## Connecting to power and grounding

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

Take the following measures for your safety:

- 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.
- 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 product

## Safety instructions

and disconnect it from the power source. How to change the fuse is described in the product documentation.

- Only use the power cable delivered with the product. It complies with country-specific safety requirements. Only insert the plug into an outlet with protective conductor terminal.
- Only use intact cables and route them carefully so that they cannot be damaged. Check the power cables regularly to ensure that they are undamaged. Also ensure that nobody can trip over loose cables.
- If you connect the product to an external power supply, use the one delivered with the product or recommended in the product documentation. The external power supply must conform 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. If the product is rated for any measurement category, the permitted category is indicated on the product and 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 these 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.

- When connecting to the DUT, keep your fingers behind finger guard. Remove jewelry, watches, and other metallic objects. Only use 4 mm safety banana plugs.

## 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.
- 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.
- When measuring current that includes a high-frequency component, consider the derating characteristics of the probe. Do not measure any current that exceeds the rated current.
- Using the probes with high frequencies or strong magnetic fields may cause the device to become abnormally hot, resulting in fire, equipment damage, or burns.

## 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.

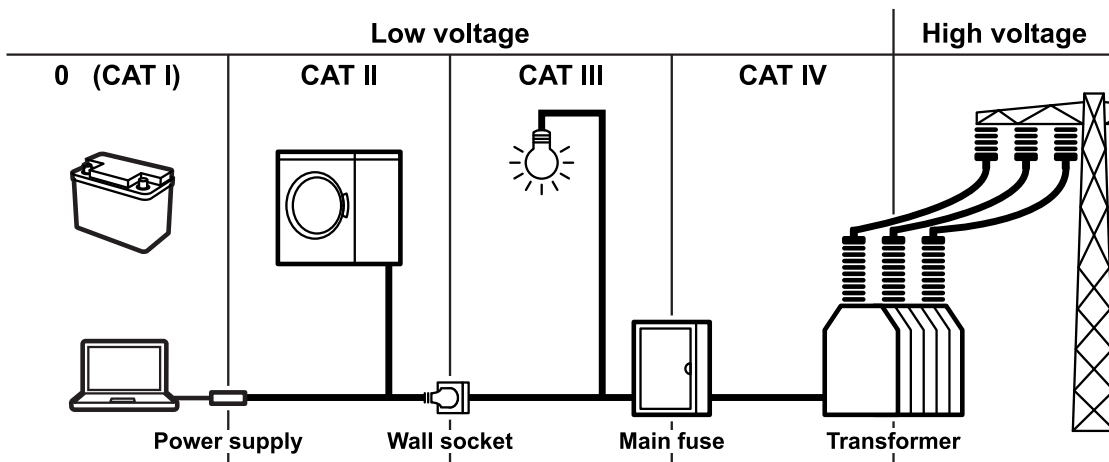
- 0 - Instruments without rated measurement category  
For measurements performed on circuits not directly connected to mains, for example, electronics, circuits powered by batteries, and specially protected secondary circuits. This measurement category is also known as CAT I.
- CAT II:  
For measurements performed on circuits directly connected to the low-voltage installation by a standard socket outlet, for example, household appliances and portable tools.
- CAT III:



Safety instructions

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.



**Cleaning the product**

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

**Meaning of safety labels**

Safety labels on the product warn against potential hazards.




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

## 1.2 Labels on the product

Labels on the casing inform about:

- Personal safety, see "[Meaning of safety labels](#)" on page 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 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](http://www.rohde-schwarz.com/key-documents), e.g. concerning:

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

## 1.5 Korea certification class A



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

## 2 Key features

The R&S MXO 5 series oscilloscope is a next generation oscilloscope with 4 or 8 channels, evolved for more challenges.

Using the R&S MXO 5, you can:

- Acquire, process and display signals with unrivaled speed.
- Detect signal details, faults and anomalies instantly.
- Increase your statistical confidence.

The R&S MXO 5 series oscilloscopes utilize advanced technologies:

- Fastest update rate of up to 4.5 million waveforms/s thanks to MXO-EP ASIC
- 12 bit ADC at all sample rates, and 18 bit vertical resolution in HD mode
- Bandwidth up to 2 GHz, and up to 5 Gsample/s sample rate
- Deepest standard memory: 500 Mpoints per channel
- High-precision digital trigger with best-in-class trigger jitter, also available in HD mode
- Nearly zero blind time: up to 99% real-time signal activity capture
- Lowest measurement noise
- Eco-friendly design: low power consumption, automatic power-up capability, scarcely audible

Features and applications help achieve fast and accurate results, for example:

- Segmented memory & history mode to analyze previous acquisitions
- Superior spectrum analysis with 45 000 FFT/s, which allows capture of spurious spectrum events  
4 simultaneous spectrums with independent time and frequency control
- Integrated arbitrary waveform generator
- Logic analysis with 16 digital channels
- Dual-path serial protocol analysis
- Frequency response analysis (Bode plots)
- Large high-resolution touchscreen, R&S SmartGrid, configurable toolbar, intuitive navigation
- Wide selection of compatible probes

## 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.

For safety information, see "[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

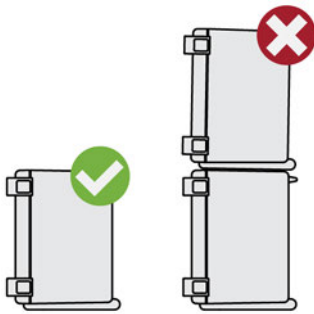
### 3.4.1 Placing the product on a bench top

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. For safety information, 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 to provide sufficient airflow and ventilation.
- Do not place the product next to heat-generating equipment such as radiators or other products.

### 3.4.2 Mounting the product on a monitor arm

You can mount the oscilloscope to a monitor arm with VESA mount.

1. **NOTICE!** Only use a VESA mount compatible to FDMI MIS-D, up to 14kg with M4x10 screws and standard 100 mm × 100 mm pattern.  
Order the VESA adapter R&S MXO5-Z7. For the order number, see data sheet.
2. Mount the adapter to the rear panel of the oscilloscope. Follow the assembly instructions provided with the adapter.
3. Mount the VESA mount of the monitor arm to the VESA adapter.

### 3.4.3 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 oscilloscope in a rack**

1. Use an adapter kit to prepare the product for rack mounting.
  - a) Order the rack adapter kit designed for the R&S MXO 5 series oscilloscope. For the order number, see data sheet.
  - b) Mount the adapter kit. Follow the assembly instructions provided with the adapter kit.
2. Lift the product to shelf height. If the rack is high, use a safe climbing aid when placing on upper shelves.
3. Grip the product by the handles. Slide the product onto the shelf until the rack brackets fit closely to the rack.
4. 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.

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 5 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 that is 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.

If the voltage dips at the AC power connector (according to EN 61326-2-1 6.4.101), a restart of the R&S MXO 5 can happen. All instrument settings are restored after the restart.

## 3.7 Connecting to LAN

For remote operation of the instrument using a computer, you need a local area network (LAN) connection.

### Network environment

Before connecting the product to a LAN, consider the following:

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

### To connect a LAN cable

- ▶ Connect an RJ-45 cable to the LAN connector on the rear panel, and to the LAN.

For supported LAN interfaces, refer to the data sheet.

By default, the R&S MXO 5 is configured to use DHCP. Configuration of a static IP address is not required.

## 3.8 Connecting external devices

### 3.8.1 Connecting USB devices

You can use USB connectors on the front panel and on the side or rear panel to connect various devices:

- Connect a keyboard and a mouse for operation and data entry, alternatively or in addition to the touchscreen functionality.
  - Connect USB flash drives to save screenshots, and to transfer files to and from the instrument without a network connection.
- ▶ Connect the USB device to any of the USB connectors.

You can connect or disconnect USB devices during operation of the instrument.

### 3.8.2 Connecting external monitors

Using the HDMI or DisplayPort connector on the side panel, you can connect one external monitor or projector to the oscilloscope. The display connectors are *not* plug & play, the monitor is recognized by the instrument during the boot process.

1. **NOTICE!** Missing ground contact can damage the oscilloscope.  
Ensure that the monitor and the oscilloscope are connected to a ground contact. See also: [Chapter 3.6, "Connecting to power"](#), on page 17.
2. **NOTICE!** Use only standard-compliant monitor cables.  
Connect the monitor or projector to a monitor connector on the rear panel.
3. Switch on the oscilloscope. See also ["To switch on the product"](#) on page 20.  
The oscilloscope recognizes the external monitor. During the running session, you can disconnect the monitor and connect it again.

If the monitor provides touch functionality, an additional connection can be required, e.g. a USB connection. Refer to the documentation of your monitor.

The oscilloscope outputs a Full HD image with 1920x1080 pixel. The instrument's display is duplicated. If the screen resolution of the monitor is set higher than the

instrument's resolution, the application window uses a 1920x1080 area of the monitor display. For full screen display, adjust the monitor's screen resolution.

### 3.9 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 5 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.

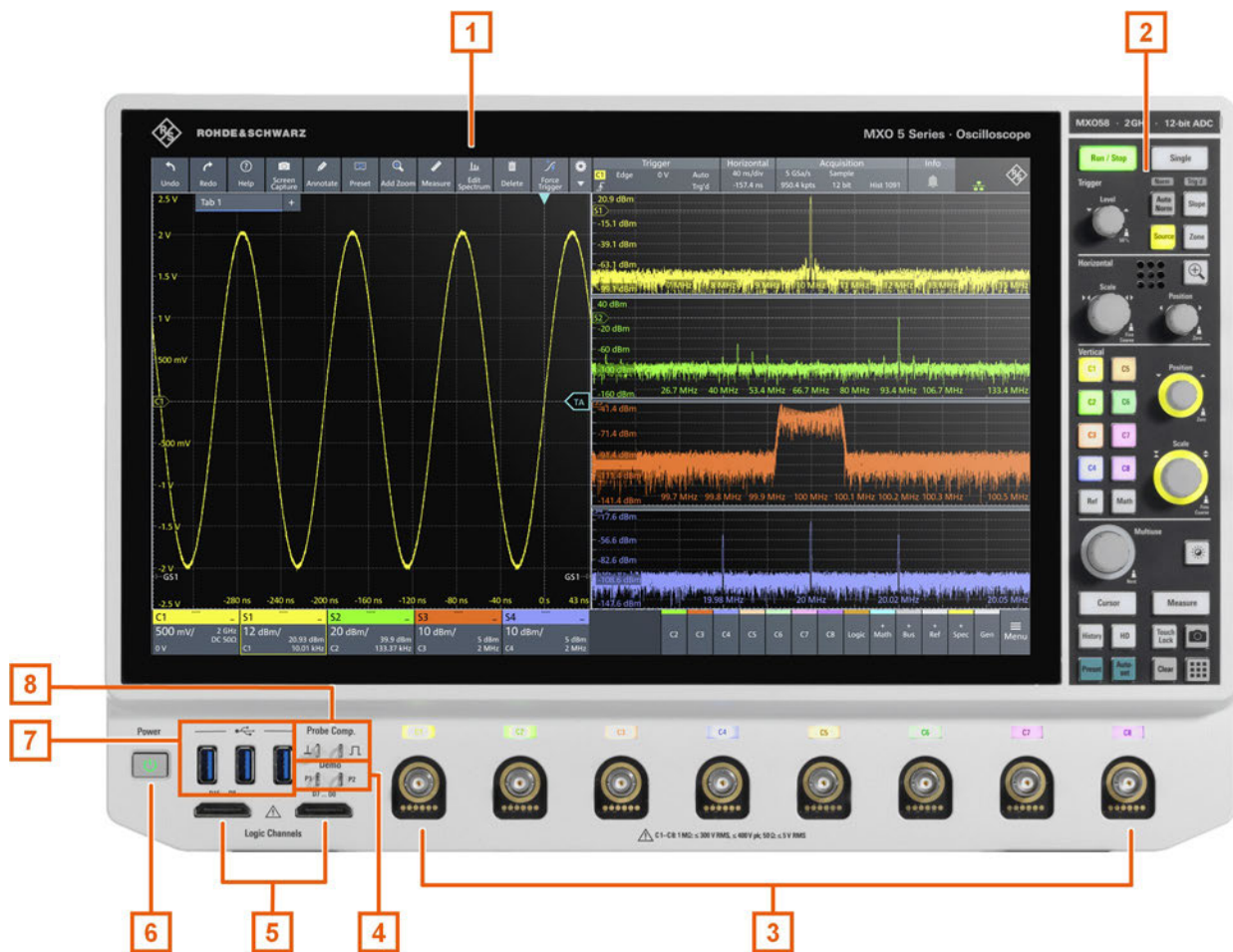
1. **NOTICE!** Risk of data loss. If you disconnect the product from power when it is in the ready state, you can lose settings and data. Shut it down first.  
Set the switch on the power supply to position [0].  
The LED of the [Power] key is switched off.
2. Disconnect the product from the power source.

## 4 Instrument tour

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

### 4.1 Front view

This section provides an overview of the R&S MXO 5 front panel.



**Figure 4-1: Front view of R&S MXO58, with 8 input channels**

- 1 = Display
- 2 = Keys and controls
- 3 = Analog input channels
- 4 = Connectors for demo signal output
- 5 = Connectors for logic probe (R&S MXO5-B1 Mixed Signal Option)

- 6 = [Power] key
- 7 = USB connectors
- 8 = Connectors for probe compensation

### Analog channel inputs

The R&S MXO 5 has 4 or 8 channel inputs to connect the input signals, depending on the model.

You can connect probes with Rohde & Schwarz probe interface or BNC connectors. The input impedance is selectable, the values are 50  $\Omega$  and 1 M $\Omega$ .

The maximum input voltage on channel inputs is:

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

### Demo

The pins are intended for demonstration purposes.

### Logic Channels

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 MXO5-B1.



The maximum input voltage is 40 V ( $V_p$ ) at 100 k $\Omega$  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

Three USB 3.1 gen1 interfaces of type A. 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.

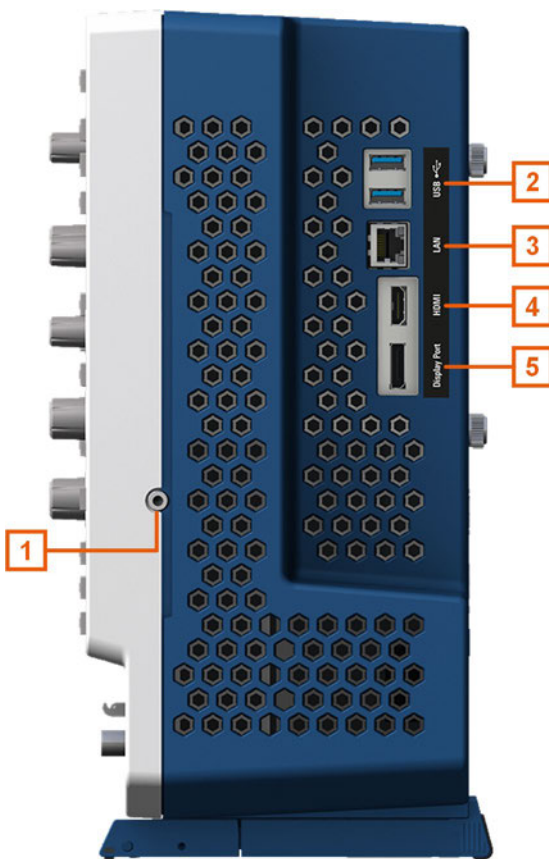
### Probe Comp.

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

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

## 4.2 Side view

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



**Figure 4-2: Side view of R&S MXO 5**

- 1 = Grounding terminal
- 2 = USB connector
- 3 = LAN connector
- 4 = HDMI display output
- 5 = DisplayPort connector

### Grounding terminal ↴

4 mm banana jack to connect ground of DUT and test fixtures, and wrist strap.

### USB

Two USB 3.1 gen1 interfaces of type A.

### 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.

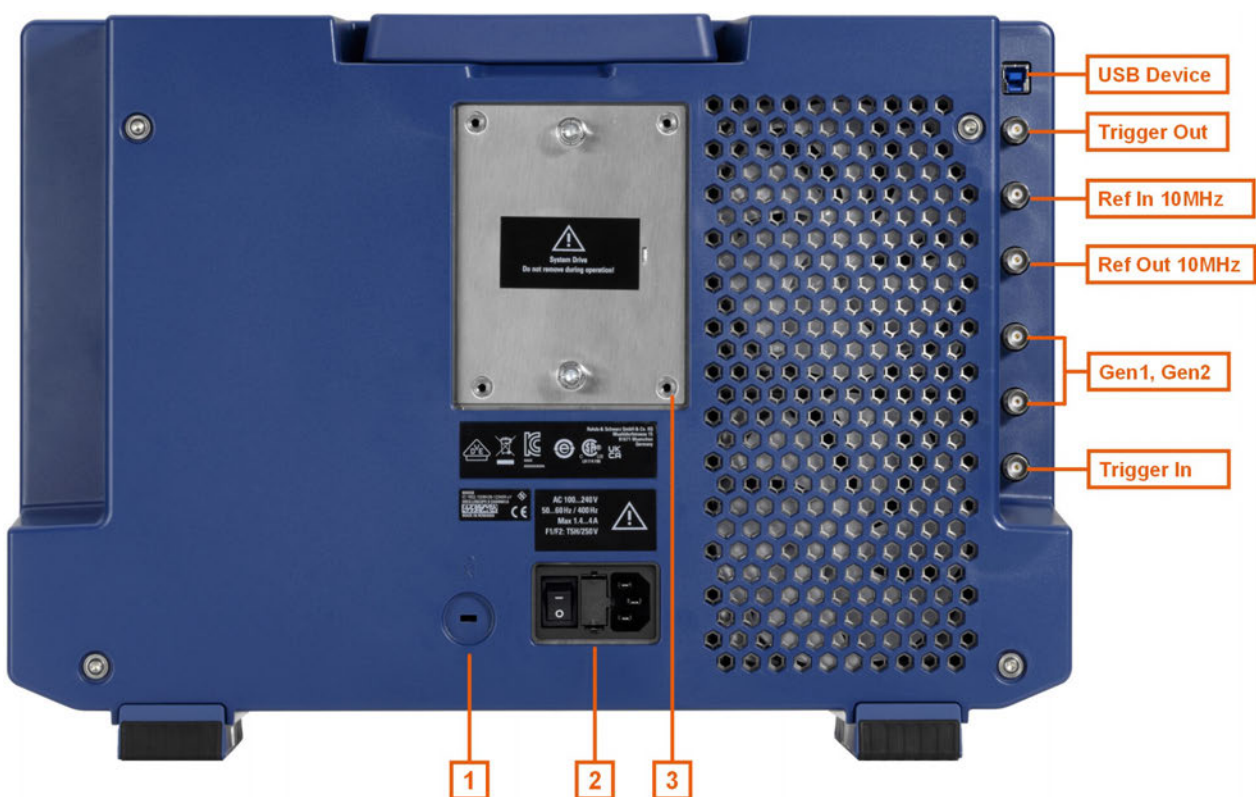


## DisplayPort

DisplayPort connector for an external monitor or projector. It supports DisplayPort ++ version 1.3.

## 4.3 Rear view

On the rear panel of the R&S MXO 5, you find more connectors and the power supply switch.



**Figure 4-3: Rear panel view of R&S MXO 5**

- USB Device = USB connector, type B
- Trigger Out = BNC connector for trigger out signal
- Ref In 10MHz = BNC connector for incoming reference signal
- Ref Out 10MHz = BNC connector for outgoing reference signal
- Gen1, Gen2 = BNC connectors for optional function generator output (option R&S MXO5-B6)
- Trigger In = BNC connector for external trigger input
- 1 = Kensington lock slot to secure the instrument against theft
- 2 = AC power supply connector and mains power switch
- 3 = Exchangeable solid state disk (SSD, option R&S MXO5--B19)

**USB Device**

USB 3.1 gen1 interface of type B (device USB), to be used for remote control of the instrument.

**Trigger Out**

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

**Ref In 10 MHz**

BNC input connector for 10 MHz reference frequency signals.

**Ref Out 10 MHz**

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

**Gen1, Gen2: Function generator**

BNC output of the function generator, requires option R&S MXO5-B6.

**Trigger In**

The external trigger input is a BNC connector that 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 $\Omega$  input impedance.

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

**AC power supply connector and mains 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 mains 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 [Chapter 4.1, "Front view"](#), on page 22.

### 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 3.9, "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.



#### [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.

#### [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 between the channels: C1...C8. 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]

Opens a dialog to configure the zone trigger. A zone trigger combines the trigger condition with the intersection or non-intersection of one or more zones or masks.

### 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.



Figure 4-4: Vertical controls of R&S MXO 5 with 4 input channels



Figure 4-5: Vertical controls of R&S MXO 5 with 8 input channels

### [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, which 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]**

Available only for R&S MXO 5 with 4 input channels.

Opens the "Waveform Generator" dialog, if option R&S MXO5-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]**

Available only for R&S MXO 5 with 4 input channels.

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.

**[Bus]**

Available only for R&S MXO 5 with 4 input channels.

Opens and closes the "Protocol" tab in the "Apps" dialog, where you can select the required serial protocol and proceed to the protocol setup. The key lights up if the decoding of a serial bus is active.

**[FFT]**

Available only for R&S MXO 5 with 4 input channels.

Opens and closes the "Spectrum" dialog. The key lights up if a spectrum is active.

**[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.

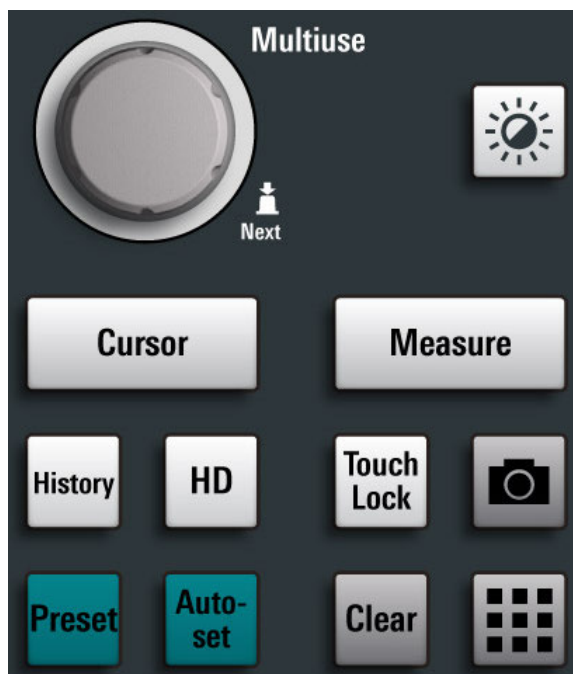
**[Math]**

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 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.

**[Intensity]**

Adjusts the intensity of the waveforms on 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.

If the dialog is open, pressing the key closes the dialog. If the dialog is closed, the key disables the high definition mode. The key is illuminated as long as the HD mode is active.

**[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.

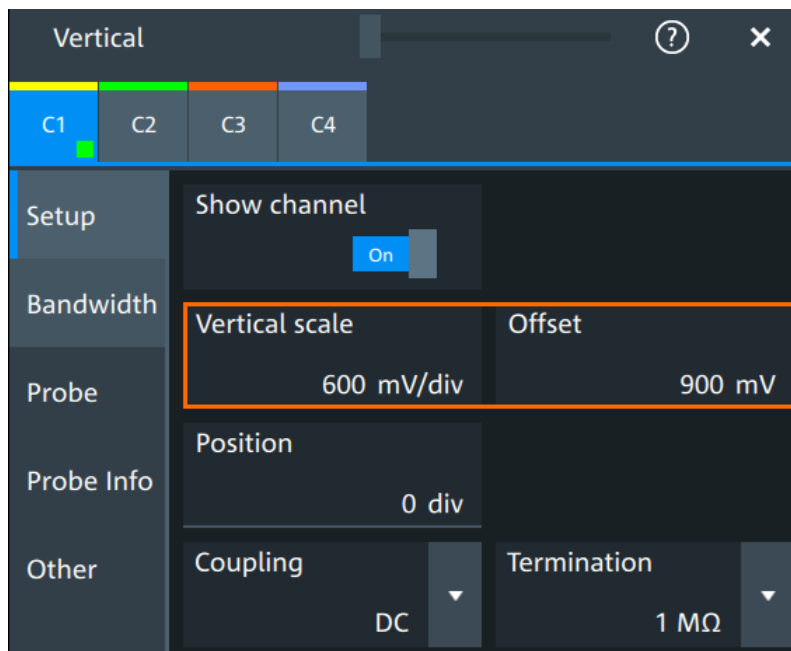
## 4.5 Checking the functionality

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

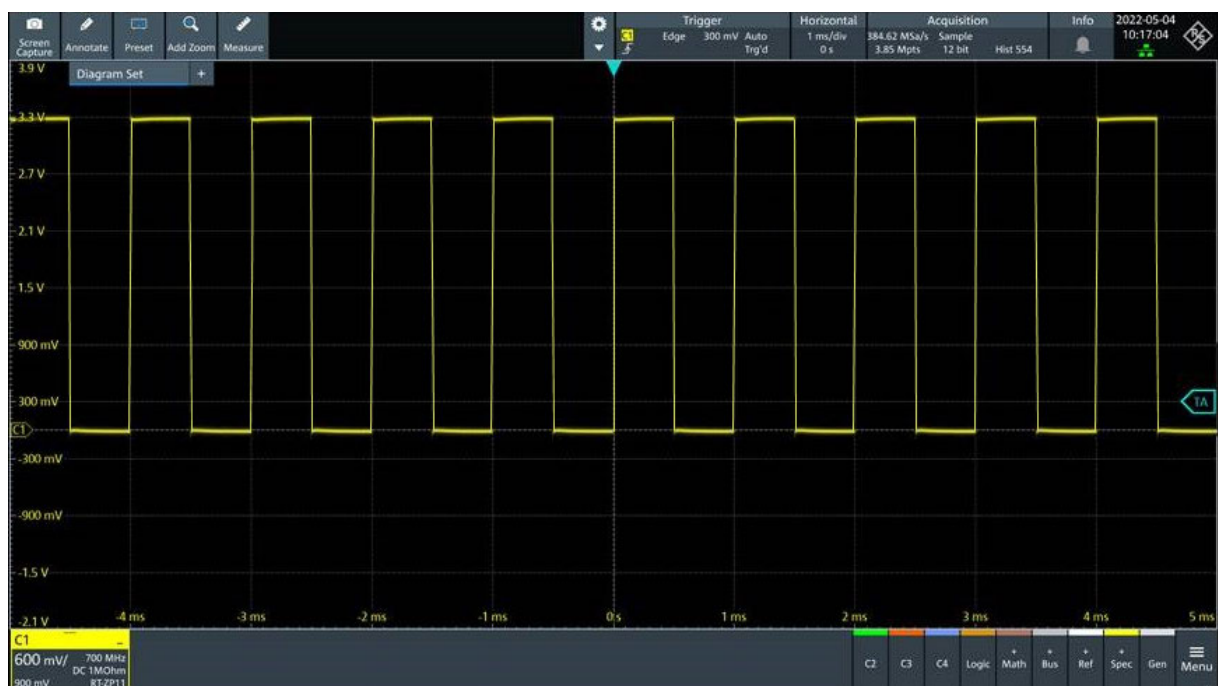
1. Perform a self-alignment of the instrument:
  - a) Warm up the instrument. The minimum warm-up time is indicated in the data sheet.
  - b) Remove all probes from the input connectors.
  - c) Open the "Menu", and select "Settings" > "Maintenance" > "Alignment".
  - d) Tap "Start Alignment". Wait until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

## Checking the functionality



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 all other channels. Make sure to adjust the vertical settings for the connected channel, and also to set the trigger source to the connected channel.

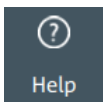
## 5 Getting user assistance

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 in 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.

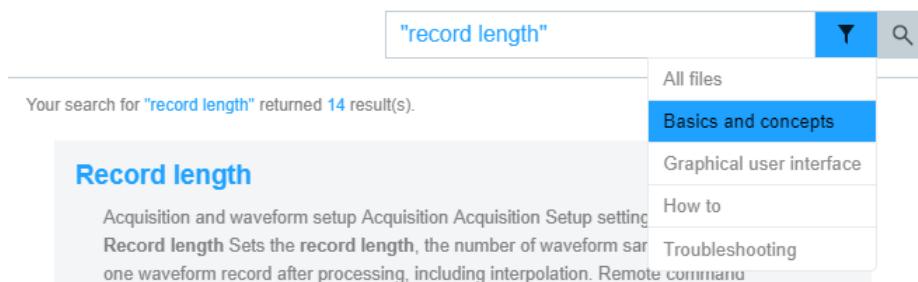
### 5.2 Using help

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.

## 6 Contacting customer support

### Technical support – where and when you need it

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

### Contact information

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



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



Mess- und Prüftechnik. Die Experten.

**Ihr Ansprechpartner /  
Your Partner:**

**dataTec AG**

E-Mail: [info@datatec.eu](mailto:info@datatec.eu)

>>> [www.datatec.eu](http://www.datatec.eu)