

# R&S® UDS Series Digital Multimeter Getting Started



1179163502

Version 02

**ROHDE & SCHWARZ**

Make ideas real



This manual describes the instruments of the R&S®UDS multimeter series and its options:

- R&S®UDS600 Digital Multimeter (3658.6470.03)
- R&S®UDS600-G Digital Multimeter (3658.6470.05)
- R&S®UDS500 Digital Multimeter (3658.6470.02)
- R&S®UDS500-G Digital Multimeter (3658.6470.04)

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

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# 1 Safety and regulatory information

The product documentation helps you use the product safely and efficiently. Follow the instructions provided here and in the following sections.

## Intended use

The R&S UDS digital multimeters (DMMs) are electrical test and measurement instruments capable of making multiple types of measurements such as alternating current (AC) or direct current (DC) voltage, AC or DC current, resistance, temperature, capacitance, and other parameters. It is designed for industrial use, e.g. production testing, maintenance and engineering labs.

Use the product and its accessories only for their designated purpose. Observe the operating conditions and performance limits stated in the specifications document.

## Target audience

Only connect, set up and use a multimeter if you are an electrically skilled person. Such persons have the education and experience needed to recognize risks and to avoid hazards of working with electricity.

This document provides information throughout the life cycle of the product for installers, operators, technicians, maintenance and service personnel.

Follow the safety instructions provided in [Section 1.1, "Safety instructions"](#), on page 6 and the additional information provided during setup or operation procedures.

## 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 [Section 1.1, "Safety instructions"](#), on page 6. 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.

Only people skilled in electrical work should connect, set up and use the product. Such persons have the education and experience needed to recognize risks and avoid hazards of working with electricity. 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 support at <https://www.rohde-schwarz.com/support>.

### Lifting and carrying the product

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

To move the product 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 to live parts, which can lead to electric shock, serious personal injury or death if you touch the casing.

Unless otherwise specified, you can operate the product up to an altitude of 2000 m above sea level. The product is suitable for pollution degree 2 environ-

ments 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

The product is an overvoltage category II product. 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. Replace parts that are relevant to safety only by original parts, e.g. power cables or fuses.

Take the following measures for your safety:

- 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 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.
- Only connect the product to a power source with the safety fuse specified in the data sheet.
- 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.

### 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.

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

- Before each measurement, inspect all components for damage and replace them if necessary.
- Do not touch exposed connections and components when power is applied.
- Casing, chassis and all measuring terminals are connected to a grounding connection. Never disconnect a grounding connection on the product.
- Switch off the power before connecting or disconnecting the terminal block to the rear panel connector. Tighten all wires connected to the terminal block.
- Only use the wires and terminal blocks delivered with the product.
- Only use insulated wires, not stripped wires, for the terminal connections.
- Turn the mains switch off when the product is not in use.
- When operating measuring accessories, only use the cables delivered with the accessory. If you have to use cables from other manufacturers, make sure that they are of the required overvoltage category.

Do not operate the product in series or parallel unless that setup is supported. If accessories are provided for a product, only use them for that product. See the data sheet.

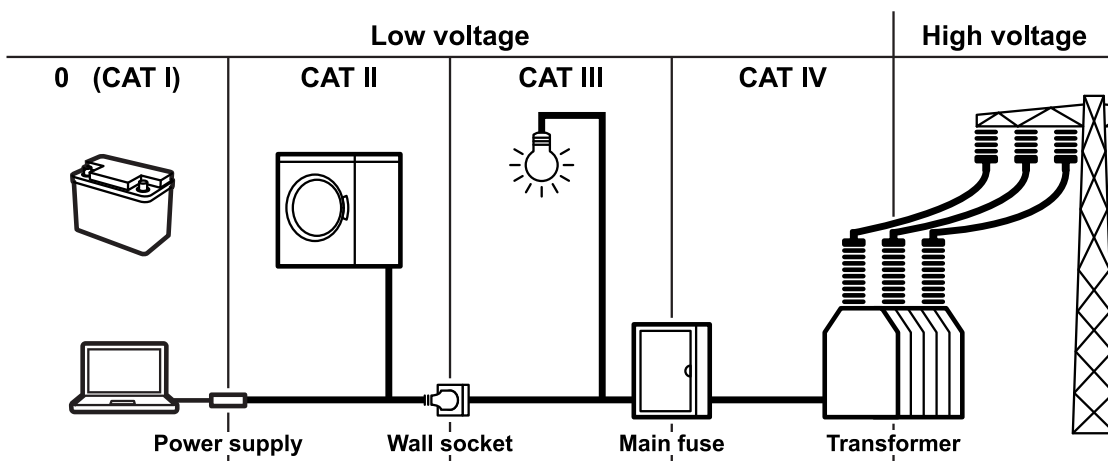
In series or parallel setups, protect yourself against electric shock before connecting access ports such as the Ethernet port or the USB port using one of the following measures:

- Ensure that all products are grounded by connecting them to the AC power.
- Disconnect all power connections to the product, including outputs.

### 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.







## 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.
	Hot surface Do not touch. Risk of skin burns. Risk of fire.
	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 R&S UDS




Labels on the casing inform about:

- Personal safety, see "[Meaning of safety labels](#)" on page 10.
- Product and environment safety, see "[Labels regarding product and environment safety](#)" on page 10.
- Identification of the product, see the serial number on the [rear panel](#).

### Labels regarding product and environment safety

	Labeling in line with EN 50419 for disposal of electrical and electronic equipment after the product has come to the end of its life.
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	Grounding terminal (earth ground contact)
---	---

	Chassis grounding terminal
	ON (supply voltage)
	OFF (supply voltage)

### 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.

#### **DANGER**

Imminently hazardous situation. Will result in death or serious injury if not avoided.

#### **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 Welcome to R&S UDS

R&S UDS instruments are 5.5-digit/6.5-digit digital multimeters (DMMs) capable of displaying multiple high precision measurements simultaneously. They are equipped with a high-resolution color TFT display providing up to 200 measurements per second. All R&S UDS instruments support USB, LAN and optional GPIB interfaces and can be controlled using SCPI (Standard Commands for Programmable Instruments) programming language.

### 2.1 Documentation overview

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

#### 2.1.1 Manuals

You find the documents on the R&S UDS product page at:

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

##### **Getting started**

Introduces the R&S UDS multimeter series and describes how to set up and start working with the instrument. The printed document is delivered with the instrument.

##### **User manual**

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

The *online version* of the user manual provides the complete contents for immediate display on the internet.

##### **Printed 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 UDS in secure areas. It is available for download on the internet.

### 2.1.2 Specifications

The specifications document contains the technical specifications of the R&S UDS. It also lists all options with their order numbers and accessories.

See [www.rohde-schwarz.com/brochure-datasheet/uds](http://www.rohde-schwarz.com/brochure-datasheet/uds)

### 2.1.3 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.

### 2.1.4 Application notes, application cards, videos

These documents contain information about possible applications and background information on various topics:

See [www.rohde-schwarz.com/appnotes/uds](http://www.rohde-schwarz.com/appnotes/uds).

## 3 Preparing for use

Here, you can find basic information about setting up the product for the first time.

### 3.1 Lifting and carrying

See "[Lifting and carrying the product](#)" on page 6.

### 3.2 Unpacking and checking

1. Unpack the R&S UDS carefully.
2. Retain the original packing material. Use it when transporting or shipping the R&S UDS later.
3. Using the [Delivery package](#) list, check the equipment for completeness.
4. Check the equipment for damage.

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

#### Delivery package

The delivery package contains the following items:

- R&S UDS preloaded with one 230 V fuse
- Four power cables
- One test lead (P/N: 3594.3919.02)
- One 115 V fuse (replace the preloaded fuse with this fuse depending on the mains voltage, see "[To change the fuse](#)" on page 20 for more information)
- One Getting Started manual
- One document folder with multilingual safety instruction and CE certificate

### 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 specifications document.

For safety information, see "[Choosing the operating site](#)" on page 6.

#### 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 specifications document.

- 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 R&S UDS

See also:

- "[Setting up the product](#)" on page 7
- "[Intended use](#)" on page 5

#### 3.4.1 Placing the R&S UDS on a bench top

##### To place the product on a bench top

1. Place the product on a stable, flat and level surface. Ensure that the surface can support the weight of the product. For information on the weight, see the specifications document.

## Setting up the R&amp;S UDS

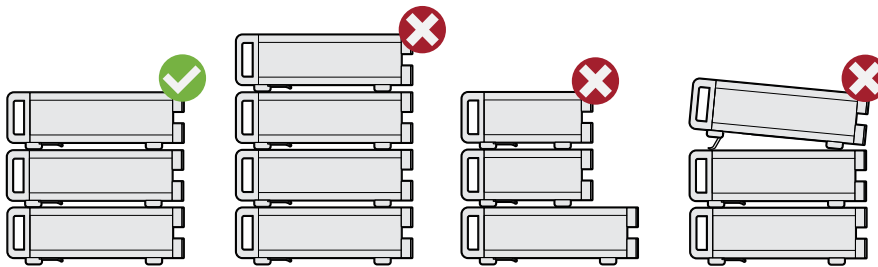
2. **CAUTION!** Foldable feet can collapse. For safety information, see "[Setting up the product](#)" on page 7.

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

3. **WARNING!** A stack of products can fall over and cause injury. Never stack more than three products on top of each other. Instead, mount them in a rack.

Stack as follows:

- If the products have foldable feet, fold them in completely.
- All products must have the same dimensions (width and length).
- Do not exceed a total load of 50 kg placed on the product at the bottom of the stack.



- Left = Stacked correctly  
 Middle left = Stacked incorrectly, too many products  
 Middle right = Stacked incorrectly, different dimensions  
 Right = Stacked incorrectly, folded-out feet

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 R&S UDS in a rack

#### To prepare the rack

1. Observe the requirements and instructions in "[Setting up the product](#)" on page 7.

## Considerations for test setup

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 UDS in a rack**

1. Use an adapter kit that fits the dimensions of the R&S UDS to prepare the R&S UDS for rack mounting.
  - a) Order the rack adapter kit designed for the R&S UDS. For the order number, see specifications document.
  - b) Mount the adapter kit. Follow the assembly instructions provided with the adapter kit.
2. Lift the R&S UDS to shelf height.
3. Push the R&S UDS 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 R&S UDS at the rack.

**To unmount the R&S UDS from a rack**

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

## 3.5 Considerations for test setup

**Cable selection and electromagnetic interference (EMI)**

Electromagnetic interference (EMI) can affect the measurement results.

**To suppress electromagnetic radiation during operation**

1. Use high-quality shielded cables, especially for the following connector types:
  - Connectors for external devices  
Double-shielded data cables. The length of data cables must not exceed 3 m.
  - Connectors for signal transmission

## Preparing for mains voltage

- Shielded cables (RG58/U coaxial cable). The length of signal cables must not exceed 1 m.
- USB  
Double-shielded USB cables. The length of passive USB cables must not exceed 1 m.
  - LAN  
At least CAT6+ cables
  - IEEE-488 (GPIB)  
Double-shielded cables. We recommend that you use the double-shielded cable "R&S HZ72" from Rohde & Schwarz.
2. Always terminate open cable ends.
  3. Ensure that connected external devices comply with EMC regulations.

**Signal input and output levels**

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

## 3.6 Preparing for mains voltage

The R&S UDS is designed for 115 V or 230 V mains voltage. The range is specified on the label next to the AC power supply, see [Instrument tour > AC power supply \(12\)](#), and in the specifications document.

If the mains voltage exceeds the permissible range, contact the Rohde & Schwarz customer service, see [Section 7, "Contacting customer support"](#), on page 47.

Take care to adjust the R&S UDS to the supplied mains voltage. When delivered, the R&S UDS is configured for 230 V mains voltage.

The product is protected with a line fuse. The suitable fuse type depends on the supplied mains voltage. [Table 3-1](#) shows the suitable fuse types.

**Table 3-1: Fuse types**

Mains voltage	Fuse F1/F2
115 V	IEC60127-2/5 - T1H/250 V
230 V	IEC60127-2/5 - T500H/250 V

### 3.6.1 Preparing for 115 V or 230 V

If you want to supply the R&S UDS with 115 V or 230 V voltage, you need:

- ["To change the fuse"](#) on page 20
- ["To set the supplied mains voltage"](#) on page 21

#### To change the fuse

The fuse for 115 V/230 V mains voltage is delivered with the R&S UDS.

1. **WARNING!** The fuse is part of the AC power supply. Handling the fuse while the power is on can lead to electric shock.  
Before changing the fuse, disconnect the product from the power source.
2. Insert a flat-head screwdriver with a blade width of approximately 2 mm under the small opening tab of the fuse holder.



**Figure 3-1: AC power connector**

- 1 = Power switch
- 2 = Opening tab of the fuse holder
- 3 = Power supply connector

When unlocking the mechanism, the fuse holder is pushed outwards by compression springs.

3. Pull out the fuse holder.
4. Lever out the fuse.  
Keep the fuse for later use, if intact.

5. **WARNING!** If the fuse protection is insufficient, the R&S UDS can overheat and even cause a fire.  
Check the fuse rating on the cap of the fuse that is delivered with the R&S UDS. Make sure that the fuse type matches the characteristics that are indicated next to the fuse holder for 115 V/230 V mains voltage.
6. Inspect the compression springs of the fuse holder carefully. With deformed or protruding springs, you cannot insert the fuse properly. In case you require assistance, contact Rohde & Schwarz at <http://www.customersupport.rohde-schwarz.com>.
7. Insert the fuses into the groove of the fuse holder.
8. Align the fuse holder with the guide bar facing the socket.
9. Carefully slide the fuse holder against the spring pressure into the slot until both plastic locks latch.

### To set the supplied mains voltage

The [Voltage selector \(14\)](#) is at the [rear panel](#).


- ▶ To set to 115 V/230 V mains voltage, use a tool e.g. a flat screwdriver to slide the voltage selector so that the label indicates *115 V/230 V*.

## 3.7 Connecting to power

For safety information, see:

- ["Connecting to power"](#) on page 7
- [Section 3.6, "Preparing for mains voltage"](#), on page 19

### To ground the chassis

You can ground the chassis, if necessary, before connecting to power. The protective ground terminal  on the [Rear panel](#) enables you to connect a ground cable firmly with a screw, see [Ground terminal \(15\)](#).

See also [Section 1.2, "Labels on the R&S UDS"](#), on page 10

1. Unscrew the screw of the ground terminal using a cross-recess screw driver.
2. Attach a ground cable with a ring terminal and pass the screw through it.


3. Tighten the screw to 1.2 Nm using a torque wrench.
4. Connect the cable to the ground.

### To connect to AC supply

1. If necessary, ground the chassis of the R&S UDS. See ["To ground the chassis"](#) on page 21.
2. **WARNING!** If the fuse protection is insufficient, the R&S UDS can overheat and even cause a fire.  
Ensure that R&S UDS is prepared for the supplied mains voltage. See [Section 3.6, "Preparing for mains voltage"](#), on page 19.
3. Plug the AC power cable into the AC power supply connector. Only use the AC power cable delivered with the R&S UDS.
4. Plug the AC power cable into a power outlet with ground contact.  
Do not use a cheater plug or other means to bypass or disconnect the protective ground lead.  
The required ratings are listed on the rear panel of the R&S UDS, see [Rear panel](#).

## 3.8 Switching on or off

Before switching on the instrument, check that the [voltage selector](#) corresponds to the mains voltage. See [Table 3](#) for the available mains voltage. By default, the product automatically switches on when connected to the power source.

 You can define the power-up settings in the "Miscellaneous" menu ([SETUP] > "Misc" > "POWER UP").

### To switch on the product

The product is off but connected to power.

1. Set the switch on the power supply to position [I].  
For the location of the switch, see [Section 4, "Instrument tour"](#), on page 26.  
The LED of the [Power] key turns red.
2. Press the [Power] key on the [front panel](#) of the R&S UDS.

The instrument performs a system check, boots the operating system and starts the R&S UDS firmware.

During startup, the R&S UDS is loaded with the last saved instrument settings from memory location "M1" and auto-saved parameters. See "Store and Recall" in the user manual.

### To shut down the product

- ▶ Press the [Power] key.

All current settings are saved and the operating system shuts down. The LED of the power key changes to red.

### 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 after a while.
2. Disconnect the product from the power source.

## 3.9 Connecting to LAN

### Establishing the LAN connection

The R&S UDS provides Ethernet (LAN) connectivity. If the corresponding rights are assigned, you can use these interfaces for remote control and data transfer from a controller PC. The controller PC must also be connected in the network.

The LAN connector is at the [Rear panel](#) of R&S UDS.

To connect R&S UDS to the LAN:

1. **NOTICE!** Recommendation on secure operation. The R&S UDS is designed to operate at local workplaces or in secured networks (LAN). It should not be accessible from the internet because of a potential security risk, for example, attackers could misuse or damage your device.

Always install the latest firmware

By default, the R&S UDS configuration uses DHCP that assigns the IP address automatically.

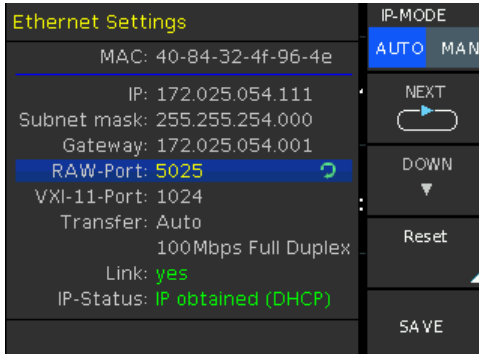
2. Connect the LAN socket using an RJ-45 cable to the LAN.
3. **NOTICE!** If the R&S UDS cannot obtain an IP address automatically, or cannot establish the connection, the "Link" status shows "no" in the [Ethernet Settings dialog](#).

Possible reasons are that the LAN does not support DHCP or requires a specific TCP/IP configuration, or that the connection is missing.

To troubleshoot the problem, proceed as follows:

- a) Check if you have connected both the R&S UDS and the controller PC to the LAN.
- b) Consult your network administrator to request support for an IP address, if necessary.
- c) If necessary, assign the IP address manually as described in the UDS manual.

If switched on and connected, the R&S UDS indicates the address information and LAN parameters in the [Ethernet Settings dialog](#).



**Figure 3-2: Ethernet Settings dialog**

## 3.10 Connecting USB devices

The USB Type-A connector is located at the [Rear panel](#). You can connect or disconnect all USB devices from the R&S UDS during operation. But do not remove an external USB memory stick while the instrument is performing firmware update and storing of screen captures, since it leads to unsuccessful updates and loss of data.

**To connect USB storage devices**

USB storage devices, such as memory sticks, allow easy data transfer from or to the R&S UDS. You can also use them for firmware updates.

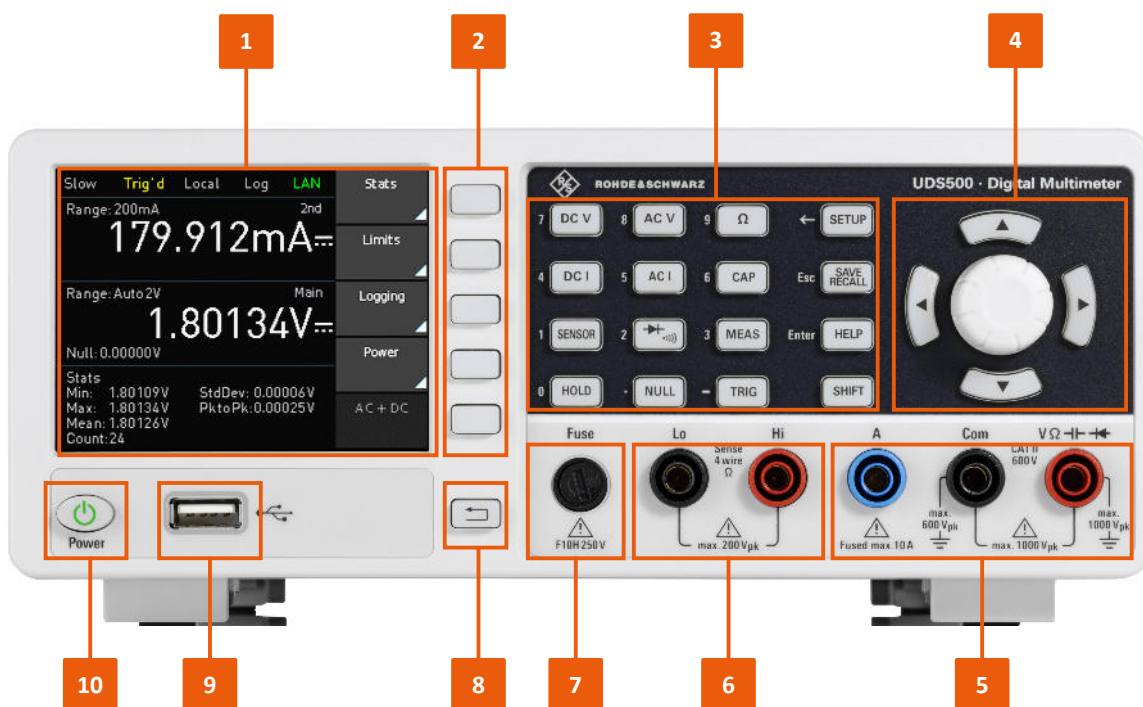
- ▶ Connect the USB storage device to the USB type A connector.  
If you use the front panel connectors, connect the USB storage device directly, without connecting cable. Connecting cables can cause electromagnetic radiation and impair the measurement result.

## 4 Instrument tour

This chapter provides an overview of the control elements and connectors of the R&S UDS.

The meanings of the labels on the R&S UDS are described in [Section 1, "Safety and regulatory information"](#), on page 5.

### 4.1 Front panel



**Figure 4-1: R&S UDS front panel**

- 1 = Display, see ["Display \(1\)"](#) on page 27
- 2 = Interactive softkeys, see ["Interactive softkeys \(2\)"](#) on page 27
- 3 = Function keys, see ["Function keys \(3\)"](#) on page 27
- 4 = Navigation controls, see ["Navigation controls \(4\) \(8\)"](#) on page 27
- 5 = A, Com, V, see ["A, Com, V \(5\)"](#) on page 27
- 6 = LO, HI, Sense, see ["LO, HI \(6\)"](#) on page 27
- 7 = Measurement circuit fuse, see ["Fuse \(7\)"](#) on page 28

- 8 = Back key, see "[Navigation controls \(4\) \(8\)](#)" on page 27
- 9 = USB host connector, see "[USB connector \(9\)](#)" on page 28
- 10 = POWER key, see "[Power \(10\)](#)" on page 28

## Display (1)

The color display indicates the measurement readings and dialogs for configuring the instrument and measurement settings. The screen display provides status and setting information and allows you to access functions and settings with the interactive softkeys.

See "[Understanding the display information](#)" on page 42.

## Interactive softkeys (2)

The interactive softkeys to the right of the display set the view of the measuring mode and provide access to submenus and functions.

## Function keys (3)

The function keys are means of input for manual operation of the instrument settings and functions. For detailed description on function keys, see chapter "Function keys" in the user manual.

## Navigation controls (4) (8)

The navigation controls include a rotary knob, navigation keys, and the return key. They allow you to navigate within the display or within dialogs, see [Manual operation](#).

## A, Com, V (5)

These are 4 mm safety sockets.

- "A": Input for current measurement.
- "Com": Common (shared) ground for voltage, resistance, temperature and capacity measurement.
- "V"  $\Omega$ -H  $\oplus$ : Common measurement input for voltage, frequency, resistance and temperature measurements.

## LO, HI (6)

These are 4 mm safety sockets for resistance and temperature measurements.

## Fuse (7)

This fuse socket is used for securing the line voltage. The fuse is factory fitted.

## USB connector (9)

USB type A connector is provided for connecting a USB flash drive to perform firmware update, data logging and store screen captures.

The USB flash drive file system supports a maximum capacity of up to 4GByte, FAT32 only. See also [Connecting USB devices](#).

## Power (10)

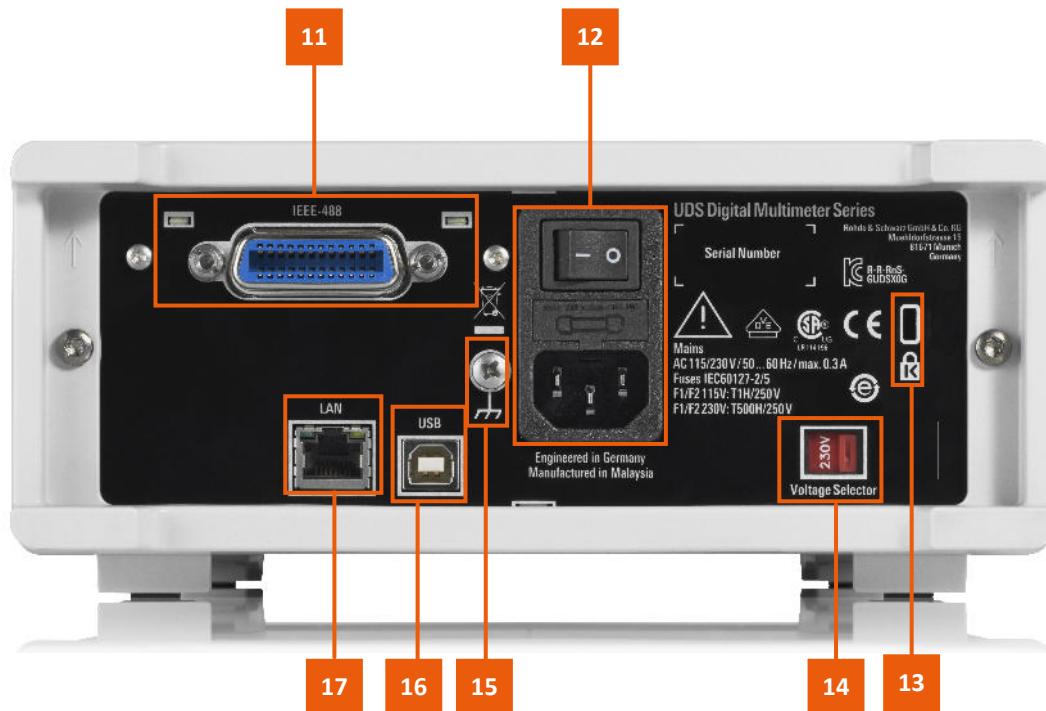
The [Power] key switches the instrument from the standby to the ready state or vice versa.

The LED of the [Power] key indicates the instrument state, see [Switching on or off](#).

**Table 4-1: Power key state**

Power key state	Descriptions
Power on, ready state.	The LED turns off. The instrument is ready for operation.
Power on, standby mode.	The LED turns red. The instrument is connected to power.
Power off or booting state.	The LED turns off during startup and operation, or when the instrument is not connected to the mains.

## 4.2 Rear panel



**Figure 4-2: R&S UDS rear panel**

- 11 = GPIB interface (instrument models -G), see "[IEEE-488 \(GPIB\) interface \(11\)](#)" on page 29
- 12 = AC power supply, see "[AC power supply \(12\)](#)" on page 30
- 13 = Kensington lock, see "[Kensington lock \(13\)](#)" on page 30
- 14 = Supply voltage selector switch, see "[Voltage selector \(14\)](#)" on page 30
- 15 = Ground terminal, see "[Ground terminal \(15\)](#)" on page 30
- 16 = USB interface, see "[USB \(16\)](#)" on page 30
- 17 = Ethernet (LAN) interface, see "[LAN \(17\)](#)" on page 30

### IEEE-488 (GPIB) interface (11)

The general purpose interface bus (GPIB) interface is used for the remote control of the instrument.

Use this interface to connect a computer for remote control of the R&S UDS. To set up the connection, use high-quality shielded cables.

For more information, see chapter "Interfaces and protocols" in the user manual.

## AC power supply (12)



### Main supply cord

Use a detachable mains supply cord according to IEC60320-1 standard. The power cable must be plugged in before signal circuits can be connected. Never use the product if the power cable is damaged.

Mains power supply with power switch and IEC socket.

- Mains power switch  
Switch for connecting and disconnecting the internal power supply from the power source, see [Switching on or off](#).
- IEC socket  
Power supply connector for connecting the R&S UDS to the mains, see [Connecting to power](#).

## Kensington lock (13)

A Kensington lock can be anchored to the R&S UDS power supply housing to secure it to a workstation mechanically.

## Voltage selector (14)

This switch is used to select the line voltage 115 V or 230 V.

See [Section 3.7, "Connecting to power"](#), on page 21.

## Ground terminal (15)

This protective ground terminal is used to secure the R&S UDS, e.g. with a ground external conductor, see [Section 1.2, "Labels on the R&S UDS"](#), on page 10.

## USB (16)

This USB connector at the rear panel is a Type-B female connector for remote control operation via USB TMC or USB VCP.

For more information, see chapter "USB connection" in the user manual.

## LAN (17)

This RJ-45 connector is used for establishing remote control via SCPI. For more information on the connection setup, see [Connecting to LAN](#).

## 5 Trying out the instrument

This chapter describes some basic functions that can be performed with the R&S UDS.

### 5.1 Measuring DC/AC voltage


R&S UDS allows you to measure a DC or an AC voltage.

#### To measure DC or AC voltage

1. Connect a AC/DC voltage source to the Com and V connectors of the multimeter via silicon test leads.
2. Press the [DC V]/[AC V] key on the front panel.

**Tip:** Pressing the [DC V]/[AC V] key lights up the respective key on the front panel indicating that the function has been activated.

The DC or AC voltage value appears on the multimeter display.

 **Figure 5-1** shows the DC voltage value on the multimeter display once you press the [DC V] key.



**Figure 5-1: Connections for AC/DC voltage measurement**


**i** For an AC measurement, RMS values appear on the display.

In addition, it is possible to show a second function ("2nd Function") on the display. The "2nd Function" softkey and the knob allow you to select "AC V", "DC I", "dB" or "dBm". The selected function is shown above the main measurement value display. The menu display changes depending on the selected second function. The "Remove 2nd" softkey allows you to hide the second function from the display.


**i** R&S recommends you to use AC range < DC range selection for "AC V"/"DC I" "2nd Function".

You can select the "Slow", "Medium" or "Fast" option using "AC FILTER" softkey and knob. A lower setting ("Slow") ensures more stable measurement values.


However, the measurement is slow and signal elements of higher frequency are attenuated. Depending on the input frequency, this function smoothens the displayed value. The "Medium" setting is saved as the default value. Select the "Slow" option for an input frequency of less than 50 Hz, and select the "Fast" option for values greater than 1 kHz.


 The AC filter represents a display filter and not a lowpass filter. So, the signal is not circumcised but the fluctuating signals can be better read using this filter.

To compensate for the line resistance of measurement cables, it is necessary to short circuit the measurement cables and press the [NULL] key. This triggers the offset correction of the entire measurement section. This value is shown next to the "NULL" softkey and below the main measurement value on the multimeter display. The line resistance of the measurement cable, contact resistances and thermoelectric voltages between different metals are intentionally eliminated using this offset correction. The compensation values are not stored after the instrument is switched off and have to be redetermined. In addition, you can also enter the [NULL] value numerically or via knob. The "ADC RATE" softkey and the knob allow you to set the display refresh rate to "Slow" (5 measurements per second), "Medium" (10 measurements per second) or "Fast" (200 measurements per second).


 Set the "ADC RATE" to "Slow" to achieve maximum accuracy in measurements.

The "AUTO ZERO" function on the second page of the [DC V] main menu can be activated (ON) or deactivated (OFF). If this function is activated, the instrument automatically compensates for the connected measurement cables and deducts this offset from the measurement result (automatic zero measurement).

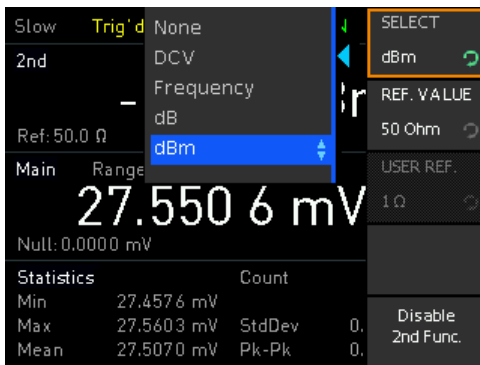
 The "AUTO ZERO" function is only available when "2nd Function" is Off.

 If the "ADC RATE" is set to "Fast", the "AUTO ZERO" function is deactivated automatically.

The impedance setting depends on the measurement range and can be set to 10 MOhm or >10 GOhm using "INPUT IMP." softkey.

 The impedance setting is only available when "2nd Function" is Off and range is less than or equal to 2 V.

If the second function ("2nd Function") is activated ("dB" or "dBm"), you have the option to define a reference value. For "dB" function, the reference value is the voltage ("REF. VALUE"). You can set the reference value numerically or via knob. If a reference value is defined, you can reset the previously selected reference value using "NULL" softkey.



**Figure 5-2: AC V menu with 2nd function**

For "dBm" function, the reference value is resistance and is often used for RF signal measurements. If the "dBm" function is activated, the multimeter performs a measurement and calculates the power supplied to a reference resistance. The reference value ("REF. VALUE") in this case is "50 Ohm", "75 Ohm" or "600 Ohm". In addition, you can set a user-defined value ("User") either numerically or via knob.

## 5.2 Measuring DC/AC current

R&S UDS allows you to measure a DC or an AC current.


### To measure DC or AC current

1. Connect a power supply unit to the Com and A connectors of the multimeter using silicon test leads.

- Press the [DC I]/[AC I] key on the front panel.

**Tip:** Pressing the [DC I]/[AC I] key lights up the respective key on the front panel indicating that the function has been activated.

The DC or AC current value appears on the multimeter display.

 **Figure 5-3** shows the AC current value on the multimeter display once you press the [DC I] key.




**Figure 5-3: Connections for AC/DC current measurement**


In addition, it is possible to show a second function ("2nd Function") on the display. The "2nd Function" softkey and the knob allow you to select "AC I", "DC V", "dB" or "dBm". The selected function is shown above the main measurement value display. The menu display changes depending on the selected second function. The "Remove 2nd" softkey allows you to hide the second function from the display.

## Measuring DC/AC current

You can select the "Slow", "Medium" or "Fast" using "AC FILTER" softkey ("AC I" main function) and knob. A lower setting ("Slow") ensures more stable measurement values. However, the measurement is slow and signal elements of higher frequency are attenuated. Depending on the input frequency, this function smoothens the displayed value. The "Medium" setting is saved as the default value. Select the "Slow" option for an input frequency of less than 50 Hz, and select the "Fast" option for values greater than 1 kHz.

 The AC filter represents a display filter and not a lowpass filter. So, the signal is not circumcised but the fluctuating signals can be better read using this filter.

To compensate for the line resistance of measurement cables, it is necessary to short circuit the measurement cables and press the [NULL] key. This triggers the offset correction of the entire measurement section. This value is shown next to the "NULL" softkey and below the main measurement value on the multimeter display. The line resistance of the measurement cable, contact resistances and thermoelectric voltages between different metals are intentionally eliminated using this offset correction. The compensation values are not stored after the UDS is switched off and have to be redetermined. In addition, you can also enter the *NULL* value numerically or via knob. The "ADC RATE" softkey and the knob allow you to set the display refresh rate to "Slow" (5 measurements per second), "Medium" (10 measurements per second) or "Fast" (200 measurements per second).

 Set the "ADC RATE" to "Slow" to achieve maximum accuracy in measurements.

If the second function ("2nd Function") is activated ("dB" or "dBm"), you have the option to define a reference value. For "dB" function, the reference value is the current "REF. VALUE"). You can set the reference value numerically or via knob. If a reference value is defined, you can reset the previously selected reference value using "NULL" softkey.

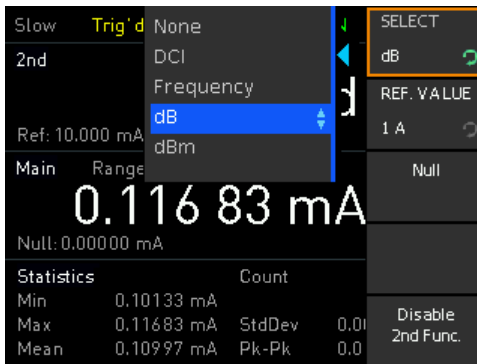


Figure 5-4: AC I menu with 2nd function

For "dBm" function, the reference value is resistance and is often used for RF signal measurements. If the "dBm" function is activated, the multimeter performs a measurement and calculates the power supplied to a reference resistance. The reference value ("REF. VALUE") in this case is "50 Ohm", "75 Ohm" or "600 Ohm". In addition, you can set a user-defined value ("User") either numerically or via knob.

### 5.3 Measuring resistance

R&S UDS allows you to perform resistance measurement.

#### To measure resistance

1. Connect the wire to the respective connectors on the front panel of the instrument as shown in [Figure 5-5](#) and [Figure 5-6](#) using measurement cables (with clamps).

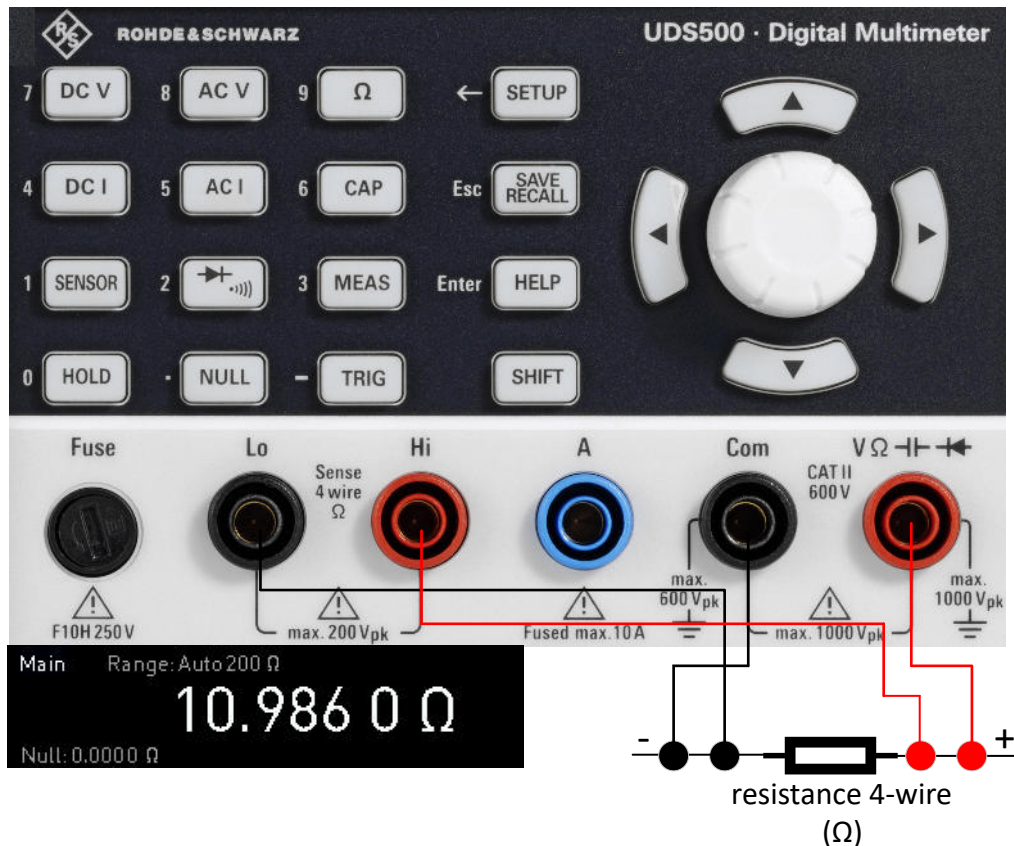
2. Press the [ $\Omega$ ] key.

**Tip:** Pressing the [ $\Omega$ ] key lights up the [ $\Omega$ ] key on the front panel indicating that the function has been activated.

The resistance value appears on the multimeter display.



Figure 5-5: Connections for two-wire resistance measurement



**Figure 5-6: Connections for four-wire resistance measurement**


- i** A two-wire measurement requires the Com and V connectors only. However, a four-wire measurement also requires the Lo/Hi connectors (SENSE). During a resistance measurement, the cable resistance (cable offset) requires particular attention.

Rohde & Schwarz recommends that you zero the measurement section especially for small resistances which can be close to the cable offset. A zero measurement is also called a relative measurement, that is, each measurement value indicates the difference between a saved zero value and the input signal. In this case, it is necessary to short circuit the measurement cables and press the [NULL] key. This triggers the offset correction of the entire measurement section. This value is shown on the display below the main measurement value. The line resistance of the measurement cable, contact resistances and thermoelectric voltages between different metals are intentionally eliminated by this offset correc-

## Measuring resistance

tion. The compensation values are not stored after the R&S UDS is switched off and have to be redetermined. In addition, enter the [NULL] value numerically or via a knob too.

On the second page of the [ $\Omega$ ] main menu, you can use the "MODE" softkey to distinguish between 2-wire operation (2w) and 4-wire operation (4w). The "ADC RATE" softkey and the knob allow you to set the display refresh rate for the 2-wire operation (2W) to "Slow" (5 measurements per second), "Medium" (10 measurements per second) or "Fast" (50 measurements per second). For the 4-wire operation (4w), you can set the display refresh rate to "Slow" (5 measurements per second), "Medium" (10 measurements per second) or "Fast" (25 measurements per second).

 The maximum accuracy in measurements is achieved using the "Slow" setting ("ADC RATE").

## 6 Instrument control

This chapter provides an overview on how to work with the R&S UDS. It introduces the possibilities for operating the instrument and describes the basic functionality of the control elements. If a measurement configuration requires specific operating steps, the corresponding settings description in the user manual points it out separately.


You can operate an R&S UDS in two ways:

- **Manual operation**  
Use the front panel controls to configure the R&S UDS settings.  
See [Section 6.1, "Manual operation"](#), on page 41 for basic information on the manual operation of the instrument.
- **Remote control**  
Create programs to automate repeating settings, tests and measurements. A controller PC with remote access to the instrument runs the programs.  
See [Remote control](#) for an overview of the interfaces provided for remote control.



### 6.1 Manual operation

To configure the R&S UDS manually, use the front panel controls, see [Section 4.1, "Front panel"](#), on page 26. The display shows the current settings, menus and dialogs, when you perform your settings.

For manual interaction with the R&S UDS, you have several methods that you can use as an alternative to perform a task:

- **Function keys, interactive keys and menus**  
The front panel function keys followed by the corresponding interactive keys provide nearly all the functions and controls needed to operate the instrument. When selected, i.e. a function is active, the corresponding function key lights up in white.  
You can access to the different instrument functions and parameters settings, operating modes and configure general instrument settings.
- **Navigation controls**  
The navigation controls include a rotary knob, arrow keys ([Up], [Down], [Left], [Right]) and  [Back] key.

The arrow keys when lights up allow you to navigate on the channel display area or dialogs and menus to set parameters. The rotary knob when pressed acts like the [ENTER] key.

In menus, the  [Back] key returns the menu to the previous level or closes the menu from the first level. In the alphanumeric entry, the  [Back] key allows you to abort changes made in the entry field.

- **Function keys / Sidebar menus**  
On the display screen, the view of the sidebar menus can be switched between narrow mode and wide mode. When in narrow mode, more space is available on screen to display the complete information.

For basic instructions on how to control the R&S UDS, see [Section 4, "Instrument tour"](#), on page 26.

This chapter briefly explains the controls and some additional features, e.g.:

- The information displayed on the screen, see [Display indicators and characteristics](#).
- The use of the interactive softkeys, see [Interactive softkeys](#).
- The illuminated system and function keys, including the integrated help function, see [System and function keys](#).
- The use of the arrow keys or alternatively the rotary knob to adjust settings, see ["Navigation controls"](#) on page 44.

## Understanding the display information


The color display screen shows a status bar at the top. It covers information on the operating mode, instrument functions and interface settings. The result field below the status bar displays the measured value, the value range and the unit of the parameters. In the lower part, the R&S UDS displays the results of mathematical functions, e.g. statistical calculations.

The instrument adjusts the display according to the selected parameters and operating mode. For more information in detail, see the corresponding sections in the user manual.

## Display indicators and characteristics

Additional display indicators and characteristics:

- General color coding:
  - **White:** parameter names and settings, activate functions, measurement readings

- **Grey**: inactive functions
- The R&S UDS highlights a selected parameter of a settings dialog or of a selection list in **orange** color.
- Information indicated in **red** denotes that the setting is inactive or erroneous.
- If the NULL function is activated, the R&S UDS displays deviations to the selected reference value on the screen.
- "---" dashes on the display indicate that the R&S UDS could not determine a value.
-  symbol indicates the operation with the rotary knob.
- Assistance for configuration  
For entries and settings, the R&S UDS shows you what to select for the next step or which key you can press to confirm or cancel an action.
- "Fallback" time, an adjustable time period:  
When this time period has elapsed, the instrument either closes a setting dialog, returns to a previous dialog or assigns a certain setting automatically without having confirmed manually.  
Settings in menus are not affected by the fallback time.

### Interactive softkeys

The interactive softkeys lead to submenus and functions. They allow you to set states directly or access further settings lists or menus. The instrument assigns the setting options for selection next to the softkeys on the right of the screen.

The interactive softkeys are not illuminated.

If your instrument model does not support a specific operating mode, function or parameter, the access is grayed out and blocked.

### System and function keys

The system and function keys on the front panel lead you to the main functions, measuring modes and general settings. When selected, i.e. a function is active, the corresponding function key lights up in white.

Lighting keys are:

- [power] key  
The color of the [power] key depends on the instrument state:
  - **Red**: standby state  
The instrument is connected to power.

- **Off:** booting state or turned off
- The illumination of the key is switched off during startup and operation, or when the instrument is not connected to the mains.
- [Function] keys  
The labeled function keys, used for setting parameters or selecting functions, light up when they are active.
- Arrow keys  
The navigation controls light up when you need them for your setting.
- [SHIFT] key  
Some parameters require to set numerical values directly. The [SHIFT] function switches the function keys to a numeric keypad.  
The labels above the keys show the corresponding values and functions to:
  - Insert numbers "0...9"
  - Insert a decimal point "."
  - Use the "-" (hyphen)
  - Delete a value "←" (backspace)
  - Abort with "ESC"
  - Confirm with "ENTER"If you enter a value using the keypad, you must confirm your entry with "ENTER", or the rotary knob. Otherwise, the changes do not take effect.
- [HELP] key  
The integrated help displays a short explanation to the currently selected function or parameter.  
At startup, a help topic appears automatically. Using the "Hide" softkey, you can close the topic. The "Hide Forever" softkey disables the help display at startup permanently. You can still query the help information with the [HELP] key for the function and values during operation.


## Navigation controls

The navigation controls include a rotary knob and arrow keys. They allow you to navigate within a setting, menus or dialogs.

- Rotary knob  
The rotary knob has several functions:
  - Moves the selection, e.g. to a parameter in a settings dialog by turning clockwise or counterclockwise.
  - Activates the edit mode of a parameter when pressed.

- Increments (by turning clockwise) or decrements (counterclockwise) a numeric parameter at a defined step size.
- Acts like the [Enter] key when pressed.
- Resets decimal digits to the right of the cursor, when it is pressed and held.

**Example:** When you edit a voltage value of 10.028 V with the cursor on the 1st decimal digit, press and hold the knob until the instrument sets the subsequent decimal digits to 0 (10.000 V).

- Arrow keys
  - Move the selection forward and backward, e.g. to a parameter in a settings dialog. The up and down keys have no function.
  - Return to a previous menu level (left arrow key).
  - In a numeric input field, navigate to the next or previous position.
- Back  key

The actions triggered by pressing this key vary, depending on where you press the key:

  - In menus:  
Returns to a previous level (similar to the left arrow key). The menu closes when you go back from the first menu level.
  - On the screen display:  
Resets an activated function, e.g. the edit mode.

## 6.2 Remote control

In addition to operating the R&S UDS directly on the instrument, it is also possible to operate and control it from a remote PC.

### Remote control interfaces

The R&S UDS provides several interfaces for remote control:

- Ethernet (LAN) interface
- USB standard interface
- IEE-488 bus interface (GPIB) (instrument models: UDS 500-G and UDS 600-G)

For detailed information on how to configure the remote control interfaces, see chapter "Interfaces and protocols" in the user manual.

See [Connecting to LAN](#) for an example of how to set up LAN connection for remote control.

## 7 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 7-1: QR code to the Rohde & Schwarz support page*



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