

R&S®UDS Series Digital Multimeter User Manual



1179167002
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 (3658.6470.03)
- R&S®UDS600-G (3658.6470.05)
- R&S®UDS500 (3658.6470.02)
- R&S®UDS500-G (3658.6470.04)

© 2025 Rohde & Schwarz

Muehldorfstr. 15, 81671 Muenchen, Germany

Phone: +49 89 41 29 - 0

Email: info@rohde-schwarz.com

Internet: 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.

Trade names are trademarks of the owners.

1179.1670.02 | Version 02 | R&S®UDS Series

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

Contents

1	Safety and regulatory information.....	9
1.1	Safety instructions.....	9
1.2	Labels on the R&S UDS.....	13
1.3	Warning messages in the documentation.....	14
1.4	Where to find key documents on Rohde & Schwarz.....	14
1.5	Korea certification class A.....	15
2	Welcome to R&S UDS.....	16
2.1	Documentation overview.....	16
2.1.1	Manuals.....	16
2.1.2	Specifications.....	17
2.1.3	Calibration certificate.....	17
2.1.4	Application notes, application cards, videos.....	17
3	Getting started.....	18
3.1	Preparing for use.....	18
3.1.1	Lifting and carrying.....	18
3.1.2	Unpacking and checking.....	18
3.1.3	Choosing the operating site.....	18
3.1.4	Setting up the R&S UDS.....	19
3.1.5	Considerations for test setup.....	21
3.1.6	Preparing for mains voltage.....	21
3.1.7	Connecting to power.....	23
3.1.8	Switching on or off.....	24
3.1.9	Connecting to LAN.....	25
3.1.10	Connecting USB devices.....	26
3.2	Instrument tour.....	26
3.2.1	Front panel.....	27
3.2.2	Rear panel.....	29
3.3	Instrument control.....	30
3.3.1	Manual operation.....	31
3.3.2	Remote control.....	34
3.4	Trying out the instrument.....	34

3.4.1	Measuring DC/AC voltage.....	35
3.4.2	Measuring DC/AC current.....	37
3.4.3	Measuring resistance.....	39
4	Operating basics.....	43
4.1	Setting parameters.....	43
4.1.1	Displaying measurement values.....	43
4.1.2	Selecting the parameters.....	43
4.1.3	Softkeys.....	44
4.1.4	Displaying several measurement values.....	44
4.1.5	Automatic/Manual selection of the measurement range.....	45
5	Instrument functions.....	46
5.1	Measuring frequency.....	46
5.2	Measuring resistance.....	47
5.3	Measuring capacitance.....	50
5.4	Mathematical functions.....	51
5.4.1	Statistics.....	52
5.4.2	Limits.....	53
5.4.3	Logging.....	56
5.4.4	Measuring AC+DC.....	60
5.4.5	Power display.....	61
6	File and data management.....	62
6.1	Accessing, retrieving and handling data.....	62
6.2	Save and recall.....	63
6.3	Screenshots.....	66
7	General settings.....	69
7.1	Updates (instrument firmware).....	69
7.2	Remote control interface.....	71
7.3	Miscellaneous.....	71
7.3.1	Device infos.....	72
7.3.2	Date & time.....	74
7.3.3	Sound.....	74
7.3.4	Key brightness.....	76

7.3.5	Device name.....	77
7.3.6	CSV.....	78
7.4	Power up.....	81
7.5	Default.....	82
8	Network operation and remote control.....	83
8.1	Remote control interfaces and protocols.....	83
8.1.1	LAN interface.....	85
8.1.2	USB interface.....	86
8.1.3	GPIB interface (IEC/IEEE bus interface).....	87
8.1.4	SCPI.....	88
8.1.5	VISA.....	88
8.2	Remote access settings.....	89
8.2.1	Ethernet settings.....	89
8.2.2	GPIB settings.....	92
8.2.3	USB settings.....	93
8.3	Connecting the R&S UDS for remote access.....	94
8.3.1	Connecting to LAN.....	94
8.3.2	Connecting the R&S UDS to the USB interface.....	95
8.3.3	Connecting the R&S UDS to the IEC 625/IEEE 488 interface.....	96
8.4	Adjusting the interface addresses.....	96
8.4.1	How to configure the Ethernet settings.....	96
8.4.2	How to change the GPIB address.....	99
8.4.3	How to configure the USB connection.....	100
8.5	Starting and stopping remote control.....	101
8.6	Status reporting system.....	101
8.6.1	Structure of a SCPI status register.....	102
8.6.2	Contents of the status registers.....	104
8.6.3	Error queue.....	105
9	Remote control commands.....	106
9.1	Conventions used in SCPI command descriptions.....	106
9.2	Common commands.....	107
9.3	Configuration subsystem.....	110
9.3.1	Voltage configuration subsystem.....	111

9.3.2	Current configuration subsystem.....	116
9.3.3	Frequency configuration subsystem.....	120
9.3.4	Resistance configuration subsystem.....	123
9.3.5	Capacitance configuration subsystem.....	127
9.3.6	Diode configuration subsystem.....	129
9.3.7	Temperature configuration subsystem.....	130
9.3.8	Continuity configuration subsystem.....	132
9.3.9	Miscellaneous.....	133
9.4	Measurement subsystem.....	135
9.5	Mathematical functions.....	141
9.6	DISPlay subsystem.....	145
9.7	Data and file management commands.....	146
9.8	SYSTem subsystem.....	151
9.9	STATus subsystem.....	157
9.9.1	Status operation register.....	157
9.9.2	Status questionable register.....	159
10	Troubleshooting and notifications.....	162
10.1	Displaying status information and notifications.....	162
10.2	Problems during firmware update.....	162
10.3	Problems with remote control over LAN.....	163
10.3.1	Cannot establish a LAN connection.....	163
10.3.2	Cannot communicate over LAN.....	163
10.4	Contacting customer support.....	163
11	Transporting.....	165
12	Maintenance, storage and disposal.....	166
12.1	Cleaning.....	166
12.2	Changing fuses.....	166
12.3	Storage.....	166
12.4	Disposal.....	166
12.5	Contacting customer support.....	167

Glossary: List of often used terms and abbreviations.....	168
List of commands.....	171
Index.....	175

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 9 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 9. 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 environments where nonconductive contamination can occur. For more information on environmental conditions such as ambient temperature and humidity, see the data sheet.

Setting up the product

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

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

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

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

Connecting to power

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.

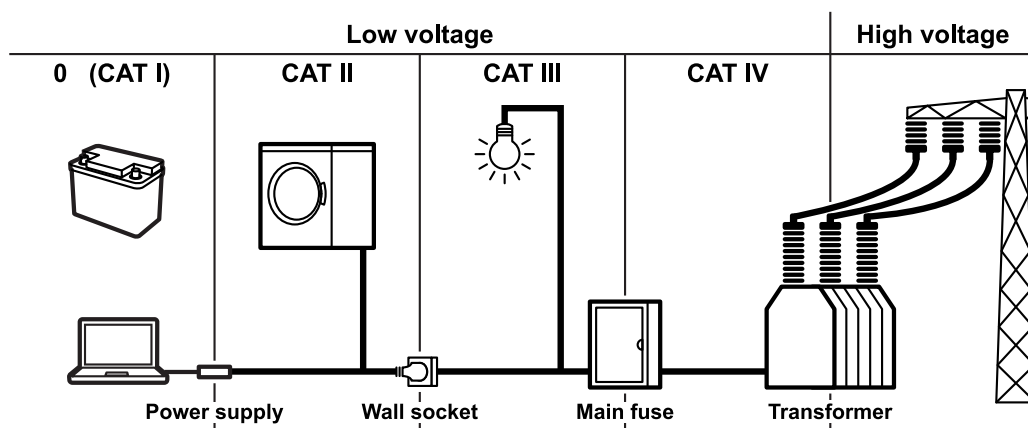
In series or parallel setups, protect yourself against electric shock before connecting access ports such as the Ethernet port or the USB port using one of the following measures:

- 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 13.
- Product and environment safety, see ["Labels regarding product and environment safety"](#) on page 13.
- 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.
	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, 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

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

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.

3 Getting started

3.1 Preparing for use

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

3.1.1 Lifting and carrying

See ["Lifting and carrying the product"](#) on page 10.

3.1.2 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.

See also: [Section 11, "Transporting"](#), on page 165.

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 22 for more information)
- One Getting Started manual
- One document folder with multilingual safety instruction and CE certificate

3.1.3 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 10.

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.

3.1.4 Setting up the R&S UDS

See also:

- ["Setting up the product"](#) on page 10
- ["Intended use"](#) on page 9

3.1.4.1 Placing the R&S UDS on a bench top

To place the product on a bench top

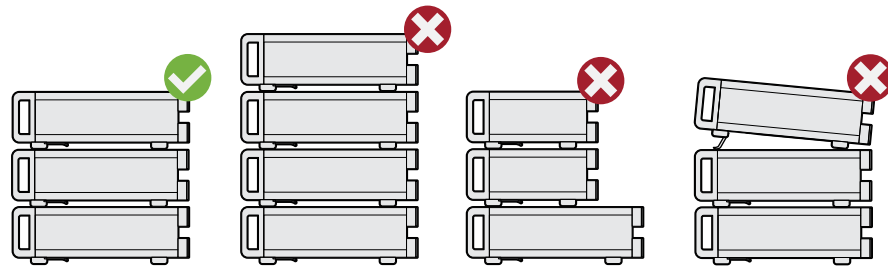
1. Place the product on a stable, flat and level surface. Ensure that the surface can support the weight of the product. For information on the weight, see the specifications document.
2. **CAUTION!** Foldable feet can collapse. For safety information, see ["Setting up the product"](#) on page 10.

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.

3.1.4.2 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 10.
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.

3.1.5 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
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.

3.1.6 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 10.4, "Contacting customer support"](#), on page 163.

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

3.1.6.1 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 22
- ["To set the supplied mains voltage"](#) on page 23

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*.

3.1.7 Connecting to power

For safety information, see:

- ["Connecting to power"](#) on page 11
- [Section 3.1.6, "Preparing for mains voltage"](#), on page 21

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 13

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 23.
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 3.1.6, "Preparing for mains voltage"](#), on page 21.

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](#).

3.1.8 Switching on or off

Before switching on the instrument, check that the [voltage selector](#) corresponds to the mains voltage. See [Table 3.1](#) 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 3.2, "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.

3.1.9 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](#).

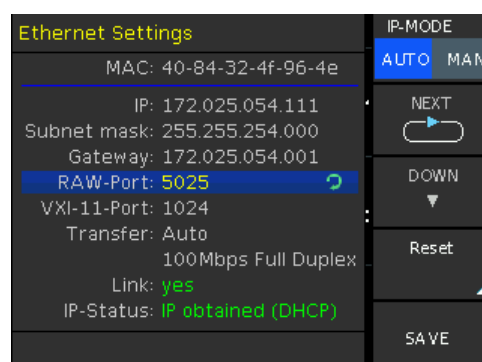


Figure 3-2: Ethernet Settings dialog

3.1.10 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.

3.2 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 9.

3.2.1 Front panel

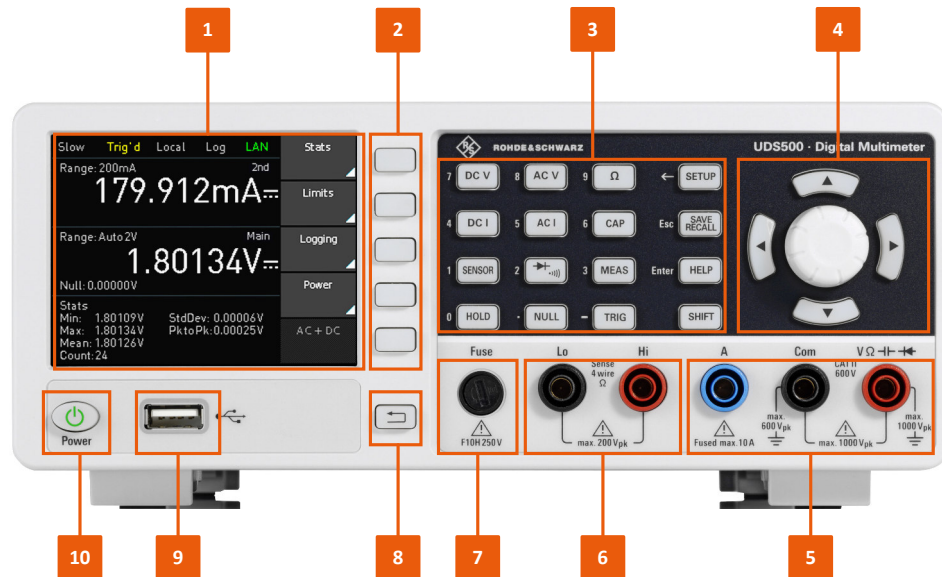


Figure 3-3: R&S UDS front panel

- 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 28
- 4 = Navigation controls, see ["Navigation controls \(4\) \(8\)"](#) on page 28
- 5 = A, Com, V, see ["A, Com, V \(5\)"](#) on page 28
- 6 = LO, HI, Sense, see ["LO, HI \(6\)"](#) on page 28
- 7 = Measurement circuit fuse, see ["Fuse \(7\)"](#) on page 28
- 8 = Back key, see ["Navigation controls \(4\) \(8\)"](#) on page 28
- 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 32.

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" Ω Hz mV : 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)

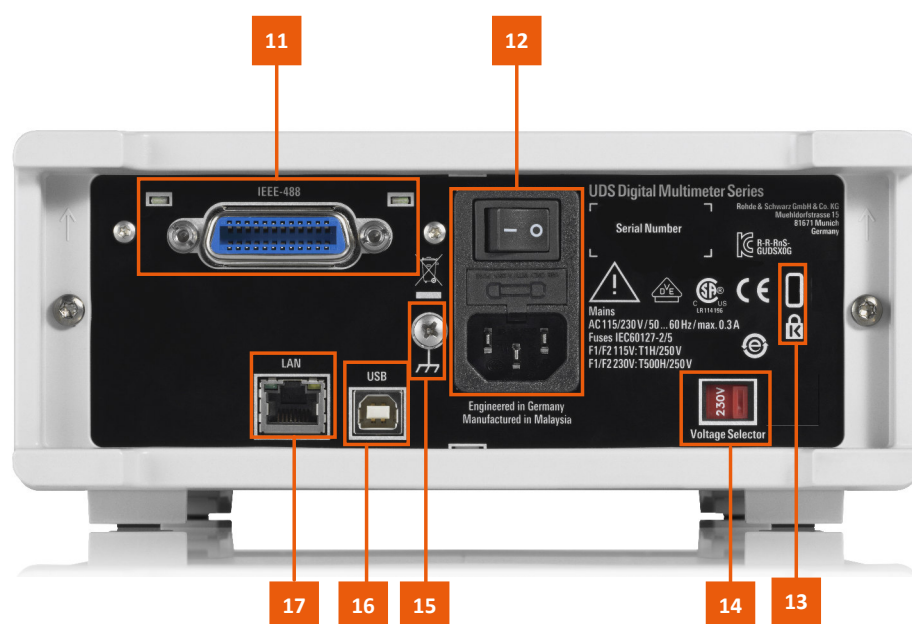
The [Power] key switches the instrument from the standby to the ready state or vice versa.

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

Table 3-2: 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.

3.2.2 Rear panel

**Figure 3-4: 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 3.1.7, "Connecting to power"](#), on page 23.

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 13.

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](#).

3.3 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 3.3.1, "Manual operation"](#), on page 31 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.

3.3.1 Manual operation

To configure the R&S UDS manually, use the front panel controls, see [Section 3.2.1, "Front panel"](#), on page 27. 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 3.2, "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 33.

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.

3.3.2 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)

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

3.4 Trying out the instrument

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

3.4.1 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 3-5 shows the DC voltage value on the multimeter display once you press the [DC V] key.



Figure 3-5: Connections for AC/DC voltage measurement



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.



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 circumscribed 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.

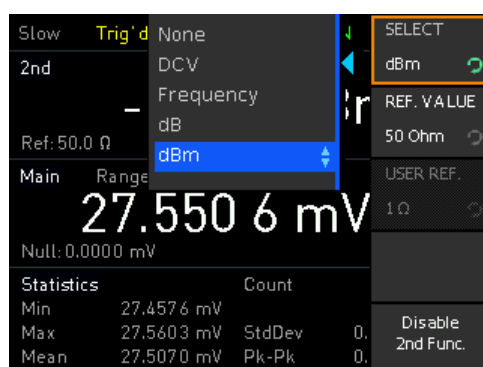


Figure 3-6: AC V menu with 2nd function

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.

3.4.2 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.
2. 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 3-7 shows the AC current value on the multimeter display once you press the [DC I] key.



Figure 3-7: 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.

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 circumscribed 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 re-determined. 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.

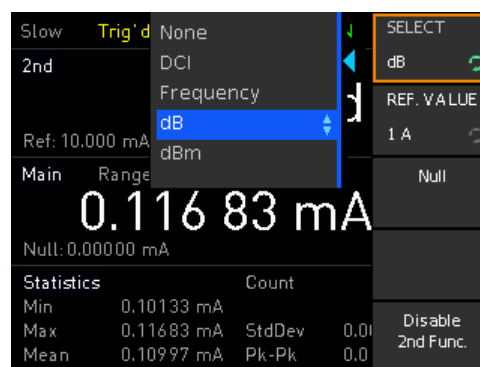


Figure 3-8: AC I menu with 2nd function

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.

3.4.3 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 3-9](#) and [Figure 3-10](#) using measurement cables (with clamps).
2. Press the [Ω] key.

Tip: Pressing the [Ω] key lights up the [Ω] key on the front panel indicating that the function has been activated.

The resistance value appears on the multimeter display.



Figure 3-9: Connections for two-wire resistance measurement

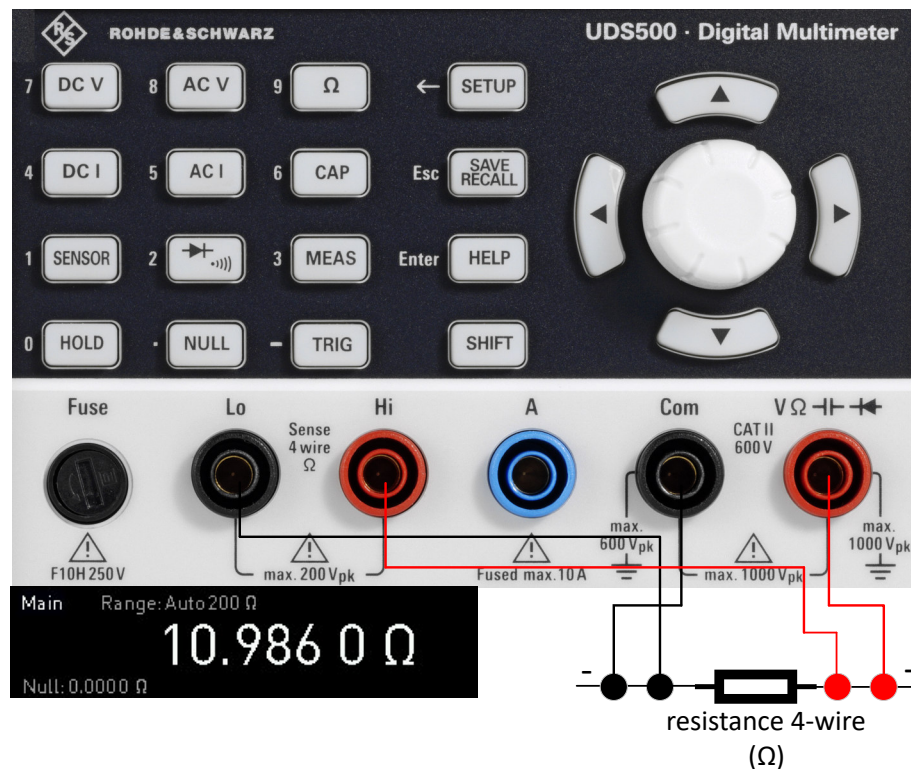


Figure 3-10: Connections for four-wire resistance measurement



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 correction. 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 [Ω] 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").

4 Operating basics

4.1 Setting parameters

4.1.1 Displaying measurement values

R&S UDS includes a brilliant TFT color display with 5 1/2 digits or 6 1/2 digits. The display can show up to 3 measurement values simultaneously. The display of the third measurement value is intended for the display of mathematical functions, such as statistic or limit display. The signal displays indicate the measurement units and the operating environment of the multimeter.

Figure 4-1 shows an overview of the screen layout.

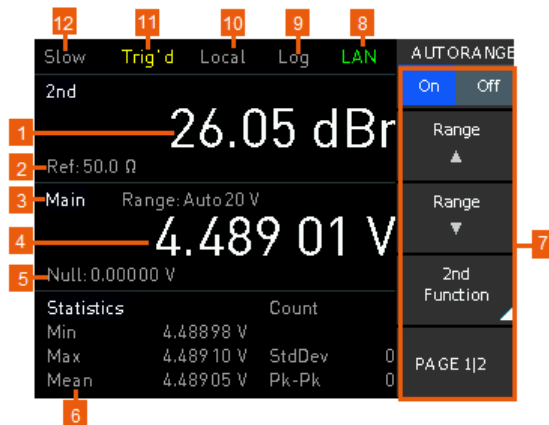


Figure 4-1: UDS display

- 1 = Second measurement value (2nd Function)
- 2 = Reference value
- 3 = Range (Main)
- 4 = Main measurement value
- 5 = Zero measurement
- 6 = Mathematical functions (for example, Statistics, Limits.)
- 7 = Soft menu functions
- 8 = LAN interface
- 9 = Logging
- 10 = Local/interface
- 11 = Trigger
- 12 = ADC rate

4.1.2 Selecting the parameters

Each function and operating mode of the multimeter can be selected with the keys on the front panel of the instrument. Use the respective function key to select the mea-

surement function. An active measurement function is highlighted by an illuminated white LED. Subsequent settings refer to the selected measurement function.

To set the signal parameters, two options are available:

- [Section 4.1.2.1, "Numeric keypad"](#), on page 44
- [Section 4.1.2.2, "Arrow keys and knob"](#), on page 44

Use the softkeys to select the respective menu item.

4.1.2.1 Numeric keypad

The easiest way to enter a value precisely and promptly is to use the numeric keypad. You can accept the entry by pressing a softkey with the corresponding unit.

To enter a numeric value via keypad

1. Press the [SHIFT] key to activate the numeric keypad.
2. Use the keypad to enter the desired value.
3. Confirm the parameter unit.

Note: Before confirming the parameter unit, you can delete any incorrect value by pressing [SHIFT] + [SETUP] key.

4. Press the [ESC] key to cancel the operation.

4.1.2.2 Arrow keys and knob

You can also use the knob to enter the parameter values. The input is modified gradually and the respective input parameter is set instantly. The nominal value is increased by turning the knob to the right, and it is decreased by turning it to the left. Dimensionless values, such as the ones used for setting the display, are only changed via knob. You can select the desired decimal point via arrow keys (for example, with activated *LIMITS* function for *HIGH LIMIT* and *LOW LIMIT* value). The upper and lower arrow keys of the multimeter have no function.

4.1.3 Softkeys

The softkeys on the upper right of the screen allow you to use the shown menu field on the display. Use the numeric keypad or the knob to set the respective selected parameter. If a menu field is selected using the softkeys, the selected function is marked in gray and is activated. If a specific setting makes an instrument setting unavailable, the respective softkey is deactivated and the label is displayed in gray. With the lowest softkey, a menu can be closed or a lower menu level can be returned.

4.1.4 Displaying several measurement values

R&S UDS offers the option (depending on the selected measurement function) to show multiple measurement values on the display simultaneously. The main measurement

value is labeled as "Main". A second measurement value can be activated using "2nd Function" softkey (depending on the measurement function). If you press the "2nd Function" softkey, use the "SELECT" softkey and the knob to select a second measurement value. The second measurement value ("2nd") is displayed above the display of the main measurement value ("Main"). If you select the *None* option using the knob, the second measurement value is deactivated.

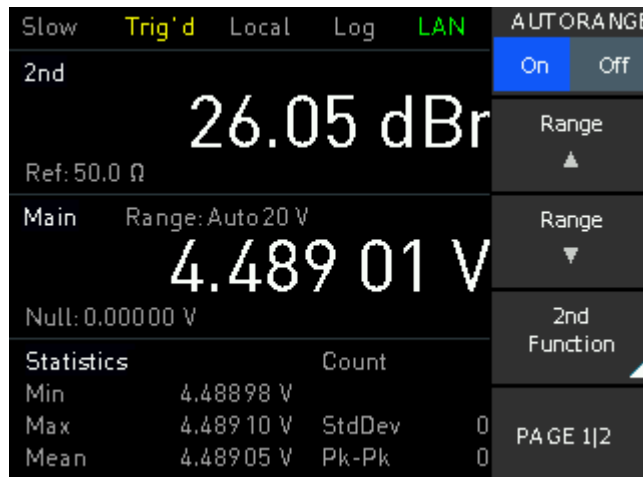


Figure 4-2: Display Main and 2nd function

4.1.5 Automatic/Manual selection of the measurement range

Depending on the selected measurement value, you can change the measurement range using *RANGE UP* or *RANGE DOWN* softkeys. Press *RANGE DOWN* to switch to the next lower measurement range and press *RANGE UP* to switch to the next higher measurement range. This deactivates the automatic selection of the measurement range (*AUTO RANGE*).

If the *AUTO RANGE* function is activated, the multimeter automatically selects the optimal measurement range. Activating the automatic mode enables you to switch to a higher measurement range when 90% of the respective range end value have been reached. Operation switches to the lower range if the value falls below 10% of the range end value.



If the set measurement value is too large (whether the measurement range is selected manually or automatically), an error message "OVER RANGE" appears on the display.

5 Instrument functions

5.1 Measuring frequency

R&S UDS allows you to perform the frequency measurement.

To perform the frequency measurement

1. Connect a frequency source to the "Com" and "A" connectors of the multimeter via silicon test leads.
2. Use the "SELECT" softkey to select "Frequency".
3. Set the gate time to "1s".

The frequency value appears on the multimeter display.



Figure 5-1: Connections for frequency measurement

The frequency display can be added in the [AC V] and [AC I] main function as the second measurement function (2nd). The measurement time can be set using "GATE

TIME" softkey. The gate time can vary between "10ms", "100ms" and "1s" is shown below the frequency information on the display.



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

The display refresh rate depends on the selected "ADC RATE" in the [AC V] or [AC I] mode. For the "Slow", "Medium" and "Fast" setting, the frequency measurement rates are 1, 10 and 100 measurements per second respectively.

5.2 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 3-9](#) and [Figure 3-10](#) using measurement cables (with clamps).
2. Press the [Ω] key.

Tip: Pressing the [Ω] key lights up the [Ω] key on the front panel indicating that the function has been activated.

The resistance value appears on the multimeter display.



Figure 5-2: Connections for two-wire resistance measurement

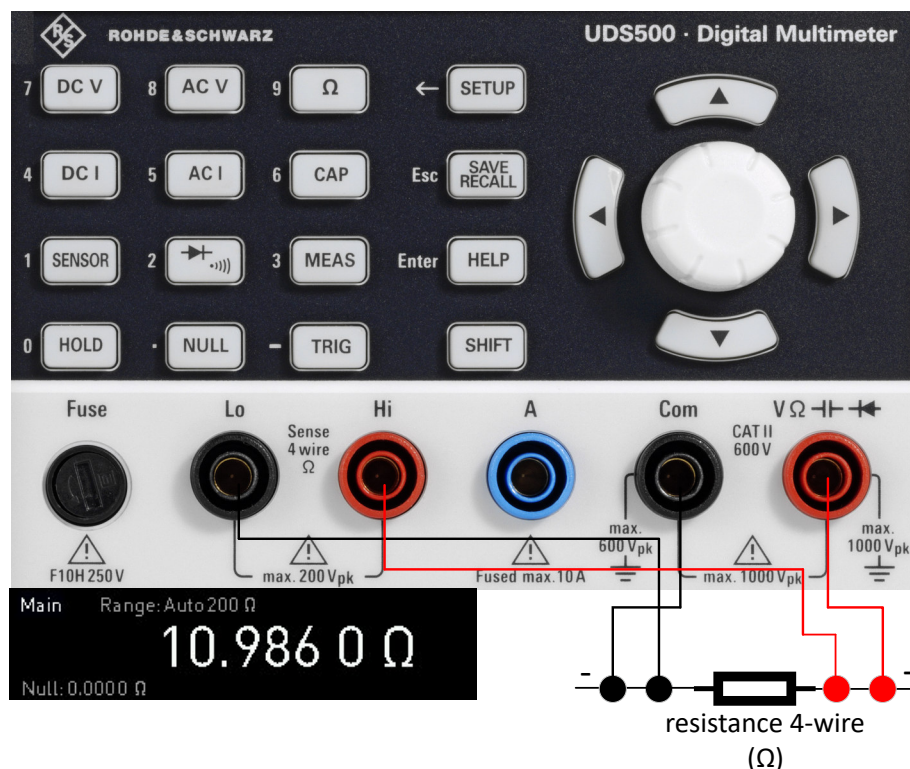


Figure 5-3: Connections for four-wire resistance measurement



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 correction. 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 [Ω] 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").

5.3 Measuring capacitance

R&S UDS allows you to perform capacitance.

To measure capacitance

1. Connect a capacitor to the "Com" and "V" connectors of the multimeter using silicon test leads.
2. Press the [Cap] key on the front panel.

The capacitance value appears on the multimeter display.



Figure 5-4: Connections for capacitance 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 "ACI", "DCV", "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" soft-key allows you to hide the second function from the display.

You can select "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" setting for an input frequency of less than 50 Hz, and select [Fast] for a setting of greater than 1 kHz.



The AC filter represents a display filter and not a lowpass filter. So, the signal is not circumscribed 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" soft-key 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 by 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.

5.4 Mathematical functions

In addition to the basic functions of the multimeter, mathematical functions are also available. These can be accessed by pressing the [MEAS] key on the front panel of the instrument.

[Table 5-1](#) describes the mathematical functions that can be used with different measurement functions.

Table 5-1: Measurement functions with possible math options

Measurement function	Stats	Limits	Hold	Null
DC V	Yes	Yes	Yes	Yes
AC V	Yes	Yes	Yes	Yes
DC I	Yes	Yes	Yes	Yes
AC I	Yes	Yes	Yes	Yes
Ω	Yes	Yes	Yes	Yes
CAP	Yes	Yes	Yes	Yes
SENSOR	Yes		Yes	Yes
				

• Statistics.....	52
• Limits.....	53
• Logging.....	56
• Measuring AC+DC.....	60
• Power display.....	61

5.4.1 Statistics

The R&S UDS includes a statistic function which is able to determine statistic values (Min/Max, Mean, Count) for current and voltage.

Access:

1. Press [Meas] key.
2. Select "Stats" softkey item to configure the statistic display of the instrument.

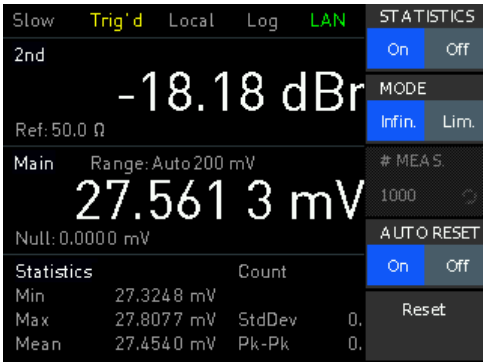


Figure 5-5: Statistics menu

If an error message "OVER RANGE" appears on the display, the statistic measurement values can be not captured. These values are displayed as "INVALID COUNT" in red.

Settings

Stats.....	52
MODE.....	53
#MEAS.....	53
AUTO RESET.....	53
Reset.....	53

Stats

Activates or deactivates the statistics measurement.

- | | |
|-------|--|
| "On" | Statistics measurement is activated. |
| "Off" | Statistics measurement is deactivated. |

Remote command:

n.a.

MODE

Sets data capturing mode.

"Infinite"	Infinite data capture. The limiting factor in this context is the size of the internal storage (512 kB max.) or of the connected USB flash memory (4 GB max., FAT/FAT32 formatted).
"Limit"	Number of measurement values to be captured.

#MEAS

Sets the number of measurement values to be included in the statistics measurement. The statistics measurement can be performed on a maximum of 50,000 measurement values. If "# MEAS." is set to 0, the statistics measurement is performed on all measurement values. However, if it is set to 7, the statistics measurement is performed on 7 measurement values.

AUTO RESET

If set to ON, the statistic measurement points ("COUNT") are not reset in "Auto Range" mode.

Reset

Resets the statistics measurement values.

5.4.2 Limits

The "Limits" soft menu allows you to define limit values for the voltage and current measurement. A test can be evaluated based on these limits and the result can be displayed as Passed or Failed. If a value falls below or exceeds the limits during a test, it is reflected by the color display of the measurement value. If the limits are observed, the measurement value is displayed in green. If the value falls below or exceeds the set limits, the limit value is displayed in red. The limits are displayed below the main measurement value ("Main").

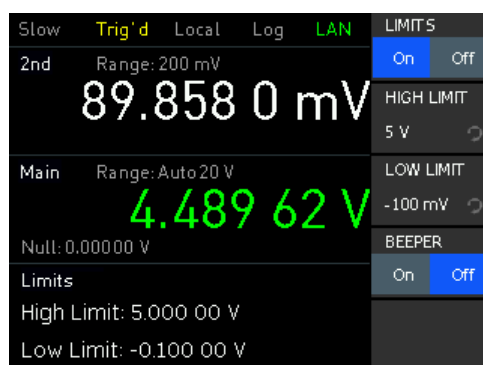


Figure 5-6: Limits menu

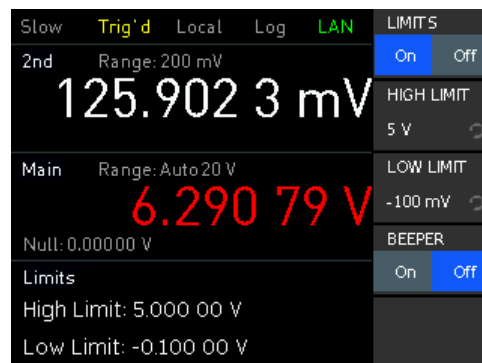


Figure 5-7: Value exceeding the set limits

Access:

1. Press the [Meas] key on the front panel.
2. Press the "Limits" softkey.

To configure the limits

1. Press the [Meas] key.
2. Set "LIMITS" to "On".
The "LIMITS" menu activates.
3. Press the "HIGH LIMIT" softkey.
4. Turn the rotary knob to set the upper limit value.
Alternatively, you can enter the value, using the keypad:
 - a) Press the [SHIFT] key.
 - b) Enter the value with the numeric keys of the keypad.
5. Press the "LOW LIMIT" softkey.
6. Proceed the same way as described in ["To configure the limits"](#) on page 54 to set the lower limit value.

Example of a measurement including limits display.

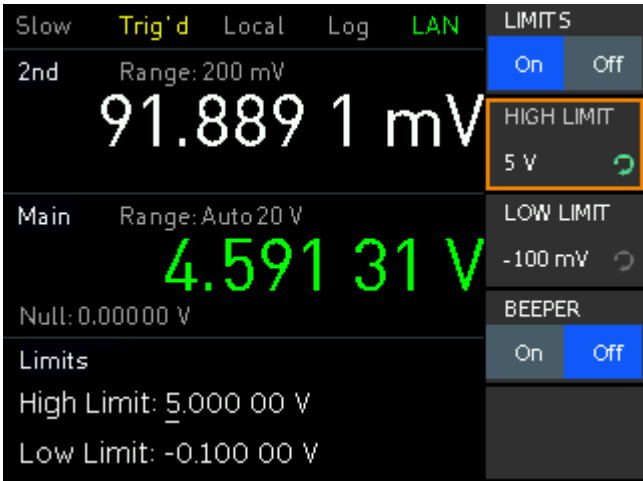


Figure 5-8: Setting the measurement limits

The R&S UDS shows the limit check result of the selected parameter in %, and the limit ranging from -100% to 100% in a bar graph.

Settings

LIMITS.....	55
HIGH LIMIT.....	55
LOW LIMIT.....	55
BEEPER.....	55

LIMITS

Activates or deactivates the measurement limits.

- "On" Activates the limits.
- "Off" Deactivates the limits.

Remote command:
n.a.

HIGH LIMIT

Sets the upper limit (maximum value) for the voltage/current measurement.

LOW LIMIT

Sets the lower limit (minimum value) for the voltage/current measurement.

BEEPER

Generates an acoustic signal when the value exceeds or falls below the set limits.

- "On" Beeps on error.
- "Off" No beep.

5.4.3 Logging

The "Logging" soft menu allows you to capture the measurement values and save them to internal memory of the R&S UDS or externally connected memory device, for example, USB flash memory. You can use the "Logging" softkey to activate (ON) or deactivate (Off) the capture and the storage of measurement values.



External USB hard disk drives (or USB extensions) are not supported. Only USB flash drives with FAT/FAT32 formatting (32 Gbyte max.) can be used.

Data log example

```
#Device;UDS600
#Device Name;
#Format;LOG
#Date;2025-10-21
#Version;01.005-02.430-03.730
#Serial No.;000000
#Mode;Unlimited
#Logging Interval[s];1.000
#Specified Logging Count;----
#Specified Logging Time[s];-----
#Logging Interval[s];1.000
#Specified Logging Count;6
#Specified Logging Time[s];-----
#ADC Rate;Slow
#AC Filter;Medium
#Input Imp.;10M
#Start Time;15:29:52
#Stop Time;15:29:57
Actual Count.;5
ACV[V];Freq[Hz];Flag;Timestamp
0.000000;0;;15:29:52:989
0.000000;0;;15:29:53:988
0.000000;0;;15:29:54:987
0.000000;0;;15:29:55:986
0.000000;0;;15:29:57:984
```

Access:

1. Press [Meas] key.
2. Select "Logging" softkey item to configure data logging function.
The "Logging" menu appears.



Figure 5-9: Logging menu

To configure logging menu settings

1. Select "INTERVAL" to set the desired measurement interval to capture measurement records.
2. Select "MODE" to set the desired data logging mode to capture measurements.
Refer to "MODE" on page 60 for details on the available modes.
3. Set "COUNT" to the desired value.
4. Set "LOGGING" to "On" to start the capture and storage of measurement records.
Remote commands:
[DATA:DATA?](#) on page 149
[DATA:LIST?](#) on page 150
[DATA:POINTs?](#) on page 150
5. To stop data logging, set "LOGGING" to "Off".
Alternatively, data logging stops when time span or the number of counts elapsed.

Example calculation of the logging time

The following calculation refers to the logging of DCV values with a maximum sampling rate of 200Sa/s and 4GB USB flash drive.

- The file header includes 374 bytes.
- One logging line includes 26 bytes.
- An empty 4GB USB flash drive has a capacity of approx. 3.72GB.

In this case you can log maximum of 153858348 measurement values. If the time interval is set to 5ms, you log 769291s = approx. 8 days, 41 minutes, 31 seconds.



Gaps in the logging may occur under the following circumstances:

- High load caused by SCPI commands over the interface
- Use of a “slow” USB flash drive
- Sector in the file system is sized too large

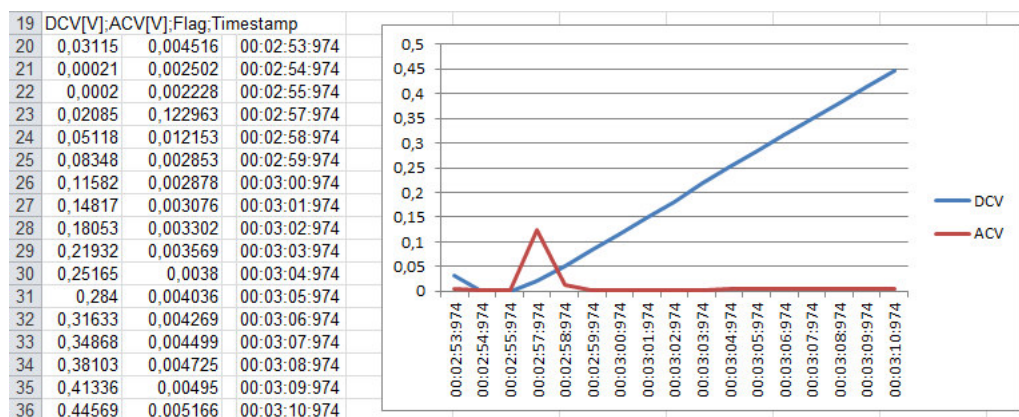


Figure 5-10: Graphical log file analysis in excel

Data formatting in excel

If a CSV log file is opened with Excel, the measurement data is displayed correctly. However, Rohde and Schwarz recommend you to change the formatting of the time stamp ("Timestamp") manually. After opening the CSV file, you can adjust the formatting of the time stamp by selecting the time stamp values and then clicking the right mouse button for "Format Cells". The formatting can then be configured manually using the "User Defined" function with the keyboard in the "type" section.

To adjust the formatting of the time stamp:

1. Select the time stamp values.
2. Right-click the "Format Cells".
3. In the "type" section, use the "User Defined" function with the keyboard to configure the formatting as follows.
`hh:mm:ss,000`
4. Click "OK".

The user-defined custom formatting is saved and the time stamp values are displayed in the selected format. By doing this, even the smallest millisecond values can be read easily.

It is also possible to use the Import Wizard in Excel. After starting Excel, first select the relevant CSV file by clicking on the tab "Data" --> "From Text". After selecting the file and confirming with the "Import" button, the Import Wizard is started. This Text Import Wizard can also be used to format the CSV file as needed. For example, the "Start

import on line" function can be configured in a way that only the readings are imported without the header.

hh:mm:ss,000

It is also possible to use the "Import" wizard to format the CSV file. To do it:

1. Open the Excel file.
2. Select "Data" > "From Text/CSV".
3. Select the relevant CSV file.
4. Click "Open".

The "Import" wizard starts. This "Import" wizard can also be used to format the CSV file as needed. For example, the "Start import on line" function can be configured in a way that only the readings are imported without the header.

Settings

LOGGING.....	59
TIME.....	59
INTERVAL.....	59
COUNT.....	59
MODE.....	60

LOGGING

Enables or disables the data logging function on selected channel.

"On" Data logging is enabled.

"Off" Data logging is disabled.

Remote command:

[DATA:] LOG[:STATe] on page 146

TIME

Duration of the measurement values capture.

See also "MODE" on page 60.

Remote command:

[DATA:] LOG:TIME on page 148

INTERVAL

Sets measurement interval for data logging. The measurement interval describes the time between the recorded measurements. For example, if the function Interval is set to 2, all 2s are included in the measurements.

Note: This setting is available only if **MODE** is set to *T*.

Remote command:

[DATA:] LOG:INTERval on page 147

COUNT

Number of measurement values to be captured.

See also **"MODE"** on page 60.

Note: This setting is available only if **MODE** is set to *N*.

Remote command:

[DATA:] LOG:COUNT on page 147

MODE

Sets data capturing mode.

- "U" Performs an infinite data capture. The limiting factor in this context is the size of the internal storage (maximum of 50,000 measurement points) or of the connected USB flash drive (4 Gbyte maximum, FAT/FAT32 formatted).
- "N" Number of measurement values to be captured. For example, if you set an "INTERVAL" of 2s and a "COUNT" of 5, 5 measurement values are captured in intervals of 2s. See **"COUNT"** on page 59.
- "T" Duration of the measurement values capture. See **"TIME"** on page 59.

Note: Depending on the settings for the time interval and the number of measurement values to be captured specified in the "Logging" soft menu, these settings are synchronized with the "Trigger" menu.

Remote command:

[DATA:] LOG:MODE on page 147

5.4.4 Measuring AC+DC

The R&S UDS allows you to view the true RMS value ("True RMS") below the main measurement value (Main) on the display using "AC + DC" softkey.

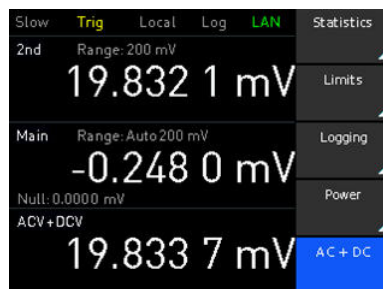


Figure 5-11: AC + DC softkey

The option to display three measurement values simultaneously allows you to conveniently measure DC voltages with overlapping AC voltage or direct currents with overlapping alternating currents. This function is useful for the development of LED lighting, for instance, which is typically controlled with PWM-regulated signals. This function is only available if the measurement of AC voltage or AC current is activated. Otherwise, the function is grayed out.

5.4.5 Power display

The "Power" softkey activates the power display. The "Power" function is only available if the measurement of DC/AC current is activated. For example, if you select the "DC V" function as the main measurement value (Main) and "DC I" as secondary measurement value ("2nd Function") or vice versa, the power is shown in the lower display section after confirming your selection using "Power" softkey. If the power display is activated, the "POWER" softkey is marked in yellow. To deactivate the power display, press the "Power" softkey again.

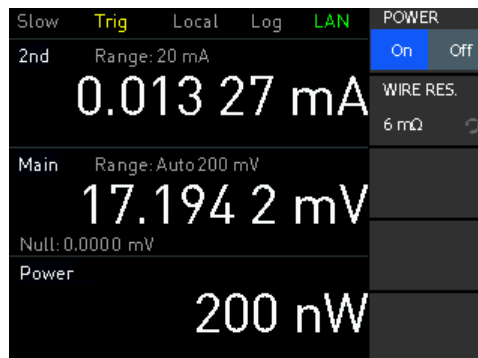


Figure 5-12: Power Menu

Settings

Power.....	61
WIRE RES.....	61

Power

Activates or deactivates the power measurement.

"On" Activates the power measurement.

"Off" Deactivates the power measurement.

Remote command:

n.a.

WIRE RES.

Sets the resistance value of all used wires (= sum of all wire resistances). The resistance value can be measured via the current path. The resistance value depends on the used cable length. The longer the cable, the higher the resistance value. If the resistance value is entered using "WIRE RES." softkey, the wire voltage drop is deducted automatically and the power at the load is measured.

Note: The wire resistance value ("WIRE RES.") can only be set using the instrument front panel. The wire resistance value cannot be set using a remote command.

Remote command:

n.a.

6 File and data management

The R&S UDS enables you to save instrument configurations, settings and screenshots of the current screen. Depending on the type of data, you can use the internal memory, or save data to an external USB memory device.

Type of data files

Data files include measurement configurations and records, screenshots and instrument settings.

Depending on the content, user data is roughly categorized in the following data types:

- *Settings*: instrument settings of a measurement configuration saved and recalled for later reuse, see [Section 6.2, "Save and recall"](#), on page 63.
- *Measurement readings*: recorded measurement results saved for evaluation, see [Section 5.4, "Mathematical functions"](#), on page 51.
- *Screenshots*: screen captures of settings or measurement mode windows, see [Section 6.3, "Screenshots"](#), on page 66.

File memory location

The R&S UDS saves user files on the internal memory or, if connected, on a USB flash drive, but screenshots only on an external USB. With the "File Manager" functions, you can exchange files between the internal and an external memory, provided you have connected a USB flash drive.

The memory locations on the internal memory are predefined, on an external USB stick, you can create, define or delete directories as known from common file explorers.

6.1 Accessing, retrieving and handling data

Depending on the origin and content, this description distinguishes between the following data types:

- Operational data
- Non-operational data

Operational data (data for intended use)

Your handheld cable and antenna analyzer uses and creates this data because of its intended use and according to the settings and configuration you have made. Thus, this data makes up most of the data that the R&S UDS creates, such as user files that contain user-defined configurations or data, like instrument settings or measurement data.

You can access, retrieve and delete user files, see [Section 6, "File and data management"](#), on page 62.

Non-operational data (usage data)

The R&S UDS generates this data during and through its use. Such data is collected e.g. for troubleshooting and to help our customer support center find solutions quickly.

The R&S UDS generates this data continuously and in real-time; this data is saved on the product. The product is not capable of storing this data on a remote server.

This data is stored in the configuration file, see [Section 6.2, "Save and recall"](#), on page 63.

The R&S UDS generates the following data:

- Environmental conditions
- Hardware component metadata

The R&S UDS displays this data on the screen, see [Device information](#).

For additional information on the different memory types of your product and on how to protect sensitive data, see the "Instrument security procedures" document.

6.2 Save and recall

With the "Save/Recall" functions, you can save a certain instrument configuration in a file and reload it for later reuse.

Access:

- Press [Save Recall] > "Device Settings" to save and load previously saved instrument settings.

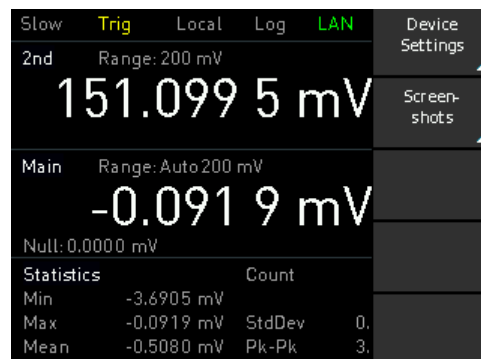


Figure 6-1: Save recall softkey menu

To save device settings

1. Press the "SAVE" softkey.
The "Save" menu appears.
2. Use the "STORAGE" softkey to select a possible location ("Internal" or "Front") to save the instrument settings.

3. Press the "ACCEPT" softkey to confirm the selection.
4. You can change the "FILE NAME" to the corresponding setting ("SET0001" is the default label).
5. Use the "COMMENT" softkey to add a comment that appears for the selected file in the "File Manager" footer.
6. Press the "SAVE" option.

Device settings are stored in HDS format (binary). The format cannot be changed.

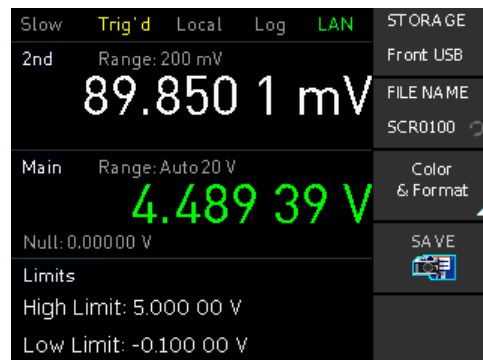


Figure 6-2: Saving/Loading device settings



Device settings from an old firmware version cannot be loaded with a new firmware version.

To load instrument settings

To upload files containing saved settings:

1. Press the corresponding softkey to open the "LOAD" soft menu.
The "File Manager" appears.
2. Use the knob to select the storage location and the respective settings file.
3. Press the "LOAD" softkey to load the file.

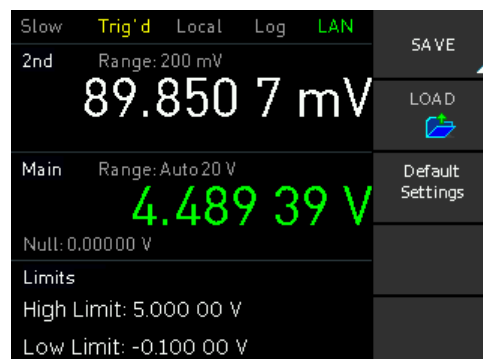


Figure 6-3: Load settings

To delete a file

To remove settings files that are no longer needed:

1. Use the rotary control knob to select the corresponding file.
2. Press the "Delete file" softkey.



If a USB flash drive is connected, you can also change or delete directories. Use the "Remove directory" softkey to delete a directory. The "Default Settings" softkey makes it possible to upload and return to the factory default setting.

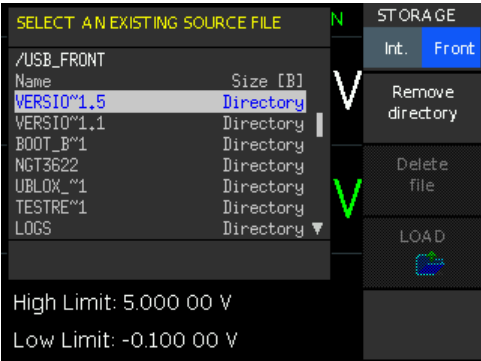


Figure 6-4: Selecting an existing file

Settings

SAVE.....65

L STORAGE..... 65

L FILENAME..... 65

L COMMENT..... 66

L SAVE..... 66

LOAD..... 66

L Remove directory..... 66

L Delete file..... 66

L LOAD..... 66

Default Settings..... 66

SAVE
Saves device settings.
Remote command:
*SAV <Storage> on page 109

STORAGE ← SAVE
Selects the memory location.

FILENAME ← SAVE
Sets filename for device settings.

Remote command:
n.a.

COMMENT ← SAVE

Sets comment on the filename for device settings.

Remote command:
n.a.

SAVE ← SAVE

Confirms save device settings.

Remote command:
n.a.

LOAD

Loads device settings.

Remote command:
[*RCL <Storage>](#) on page 109

Remove directory ← LOAD

Removes selected directory in the USB stick.

Remote command:
n.a.

Delete file ← LOAD

Deletes selected file.

LOAD ← LOAD

Loads selected file for device settings.

Remote command:
n.a.

Default Settings

Resets device settings to factory default.

Remote command:
[Section 9.2, "Common commands"](#), on page 107

6.3 Screenshots



You can only save a screenshot if a USB stick is connected to the USB connector on the front panel. See [Section 3.2, "Instrument tour"](#), on page 26.



Screenshot shortcut key

Press and hold the [Help] key to capture and save the screenshot according to the configured settings.

With the screenshot function, you can capture the image of the current screen and save it in a graphic file.

Access:

- 1. Select "Screenshots" to configure screenshots settings.
The R&S UDS displays the screenshots menu.

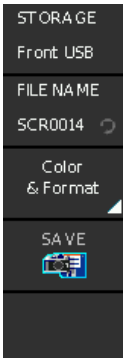


Figure 6-5: Screenshot menu

- 2. Set the desired filename, color mode and file format for the screenshot file.
- 3. Select "SAVE" to save the screenshot.
Note: The "SAVE" function is available only if you have a USB stick connected.
[HCOpy:DATA?](#) on page 150
[HCOpy:SIZE:X?](#) on page 151
[HCOpy:SIZE:Y?](#) on page 151

Settings

STORAGE.....	67
FILENAME.....	67
Color & Format.....	68
L FORMAT.....	68
L COLOR MODE.....	68
SAVE.....	68

STORAGE

Opens the file manager dialog of the USB stick location.

Remote command:
n.a.

FILENAME

Sets the screenshot filename.

For screenshots, the R&S UDS assigns the default filename SCRxxxx where "xxxx" refers to an incremental index starting from "0001".

Remote command:

n.a.

Color & Format

Sets color and format for screenshot.

FORMAT ← Color & Format

Sets format for screenshot.

"BMP" Screenshot is saved as a bitmap image file format.

"PNG" Screenshot is saved as a portable network graphic format.

Remote command:

[HCOPY:FORMat](#) on page 151

COLOR MODE ← Color & Format

Sets color mode for screenshot.

"Grayscale" Screenshot is saved in black and white color mode.

"Color" Screenshot is saved in color mode.

Remote command:

n.a.

SAVE

Saves current display in screenshot.

The function is available only if the USB stick is connected.

Remote command:

[HCOPY:DATA?](#) on page 150

7 General settings

The following chapters provide the general instrument information and utilities services in R&S UDS.

1. Press the [SETUP] key on the front panel.



Figure 7-1: Setup menu

2. In the setup softkey menu, select a softkey to access the corresponding settings dialog.

• Updates (instrument firmware)	69
• Remote control interface	71
• Miscellaneous	71
• Power up	81
• Default	82

7.1 Updates (instrument firmware)

The update functionality provides information on the currently installed firmware version, including the instrument help. Using the USB interface at the front panel, you can update the firmware.

Rohde & Schwarz recommends that you use the latest firmware version available on the product page at <http://www.rohde-schwarz.com/product/UDS>.

Required equipment

- Software:
Firmware update file RS_UDSxxx_Firmware_<version>.zip
- Hardware:
USB flash drive with enough free space to save the update file.
The USB flash drive does not need to be bootable. Several update files can reside on the flash drive simultaneously. During update procedure, the flash drive is not modified by the instrument.

1. Press the [SETUP] key on the front panel.
2. In the setup menu, select the "Update" softkey.

The "Device Firmware" dialog shows the currently installed firmware and enables you to perform a firmware update. Messages inform you about the progress of the update.

To update the instrument firmware

1. Download the latest version of the R&S UDS firmware from the Rohde & Schwarz website.

The compressed firmware *.zip file unpacks during download automatically.

2. Save the file in the root directory of the USB flash drive.

Note: Consider not to change the file name of the firmware, as the firmware update only works when the file name is UDSxxx.HFU. If you have several update files on the stick in parallel, copying the file does not replace it, but rather rename the file automatically.

3. Press the [SETUP] key.
4. Press the "Update" softkey.

The R&S UDS scans the USB memory device for firmware file types. It indicates the versions of the currently installed and the latest available firmware, including date and build information.

If the installed firmware is up to date, the R&S UDS displays the device firmware information in red. Green text indicates a more recent version that can be installed.

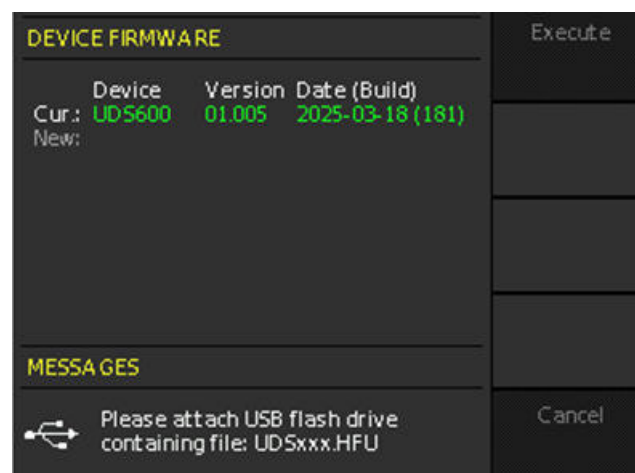


Figure 7-2: Firmware update menu

Note: If the new version is more recent than the installed version, the version information is displayed in green, for the same or older versions in red.

If the upload fails, see [Section 10.2, "Problems during firmware update"](#), on page 162.

5. **NOTICE!** Risk of potential damage to the firmware. Disconnecting the power supply while an update is in progress leads to missing or faulty firmware. Take special care not to disconnect the power supply while the update is in progress. Interrupting the power supply during the firmware update can lead to an unusable instrument which needs to be sent in for maintenance.

To update the firmware on the instrument, press the "Execute" softkey.

The firmware update starts.

7.2 Remote control interface

The R&S UDS provides several interfaces to establish a remote control connection. The "Setup" > "Interfaces" softkey menu provides the corresponding parameters for configuration.



Figure 7-3: Interface menu

Access:

1. Press the [SETUP] key on the front panel.
2. In the setup menu, select the "Interface" softkey.
3. In the interface menu, select the corresponding interface.
 - **USBTMC/USB VCP** (VCP (virtual COM port)
 - **ETHERNET** (IP address, subnet mask etc.)
 - **IEEE488** interfaces (GPIB address), instrument models UDSxxx-G
4. To configure the required access parameters, see [Section 8, "Network operation and remote control"](#), on page 83.

7.3 Miscellaneous

The miscellaneous menu provides access to instrument information and to basic instrument settings, e.g. to configure date and time, the screen display or CSV file settings. You can individually adjust the settings according to personal preferences and requirements.

Access:

1. Press the [SETUP] key on the front panel.
2. In the setup menu, press the "Misc" softkey.

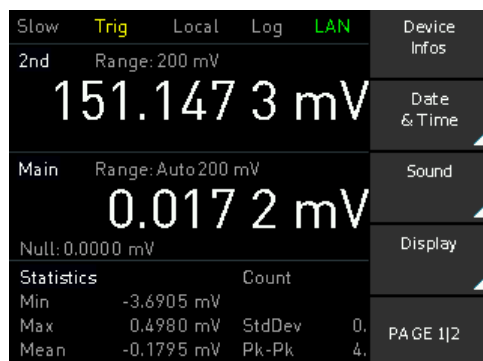


Figure 7-4: Miscellaneous softkey menu

7.3.1 Device infos

To get an overview on the configuration of your instrument, you can retrieve information on the instrument model, its hardware components and interfaces using the device information function.

Access:

1. Press the [SETUP] key on the front panel.
2. In the "SETUP" menu, press the "Misc" softkey.
3. In the "Miscellaneous" menu, select "Device Infos".

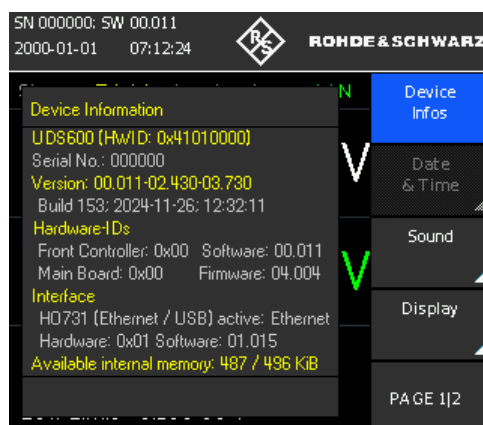


Figure 7-5: Instrument information

The "Device Information" window shows the characteristics of the instrument assemblies. It also indicates the remaining available internal memory.

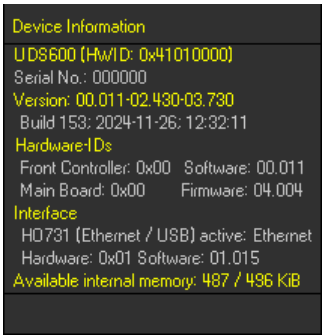


Figure 7-6: Instrument information

To return to the previous level

- ▶ Press the  key.
- In menus, the back key returns to the previous level or folds it down to a small menu (toggle function).

Settings

Device Information..... 73

Device Information

Displays the main instrument information.

- "<instrument model> (<HWID:xxx)"
Designation of the instrument and its hardware identification number.
 - "Serial No." Serial number of the instrument.
 - "Version" Currently installed firmware version.
How to: see [Section 7.1, "Updates \(instrument firmware\)"](#), on page 69
 - "Build" Version of the firmware package with time stamp.
 - "Hardware IDs" Installed hardware modules, software and firmware versions.
 - "Interface" Information on the set remote control interface, including hardware ID and software version.
 - "Available internal memory"
Available amount of memory.
 - "Device Name" Name of the instrument name. To assign a name, see [Section 7.3.5, "Device name"](#), on page 77.
 - "Temperature" Current ambient temperature and operating temperature of the shunt.
- Remote command:
- [*IDN?](#) on page 108
 - [SYSTem:VERSion?](#) on page 157

7.3.2 Date & time

Using the "Date & Time" function, you can set the date and time.

The R&S UDS records the time during operation and creates a time stamp on printed outputs or in saved data sets.

Access:

- 1. Press the [SETUP] key on the front panel.
- 2. In the "SETUP" menu, press the "Misc" softkey.
- 3. In the "Miscellaneous" menu, select "Date & Time".

The "Date & Time" entry field contains the date and time setting of the operating system. You can update of modify this setting individually.

The required remote commands are described in [Section 9.8, "SYSTem subsystem"](#), on page 151.

Settings	
Date.....	74
Time.....	74

Date

Sets the date in the format [yyyy.mm.dd].

Remote command:

[SYSTem:DATE](#) on page 154

Time

Sets the time in the format [hh.mm.ss].

Remote command:

[SYSTem:TIME](#) on page 157

7.3.3 Sound

The R&S UDS provides the option for issuing an acoustic signal if there is an error, or as a control measure.

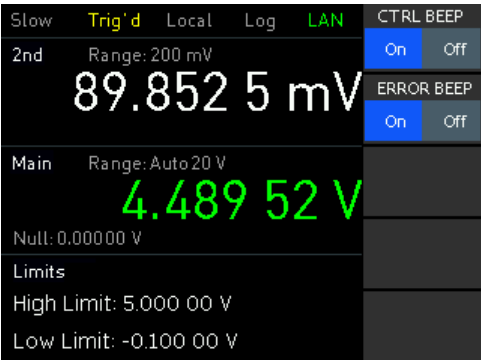


Figure 7-7: Sound menu

Access:

- 1. Press the [SETUP] key on the front panel.
- 2. In the "SETUP" menu, press the "Misc" softkey.
- 3. In the "Miscellaneous" menu, press the "Sound" softkey.
- 4. Activate the acoustic signals with "CTRL BEEP" and "ERROR BEEP" > "On" (toggle function).

The required remote commands are described in [Section 9.8, "SYSTem subsystem"](#), on page 151.

Settings

Error Beep.....	75
CTRL Beep.....	75

Error Beep

Generates an acoustic signal when an error occurs.

- "On" Beeps on error.
- "Off" No beep.

Remote command:
[SYSTem:BEEPer:STAt](#) on page 153

CTRL Beep

Beeps immediately when the instrument receives a remote control command.

- "On" Beeps on received control command.
- "Off" No beep.

Remote command:
[SYSTem:BEEPer\[:IMMediate\]](#) on page 153

7.3.4 Key brightness

The R&S UDS enables you to customize the brightness of the keys. You can also determine the fallback time. When this time has expired, the instrument accepts a changed value and exits the setting dialog automatically.

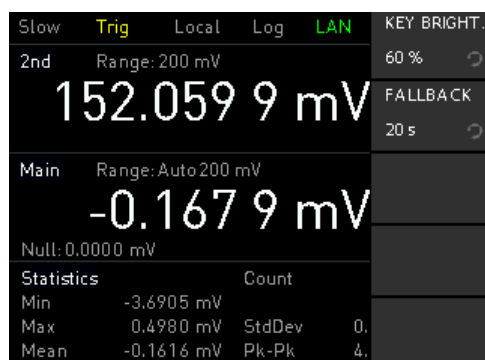


Figure 7-8: Key menu

Access:

1. Press the [SETUP] key on the front panel.
2. In the "SETUP" menu, press the "Misc" softkey.
3. In the "Miscellaneous" menu, press the "PAGE 1|2" softkey.
4. Proceed with [To set the key brightness](#) and [To set the fallback time](#).

To set the key brightness

Access:

1. Select [SETUP] > "Misc" > "PAGE 1/2".
2. Press the "Key" softkey.
3. Press the "KEY BRIGHT" softkey.
4. Turn the rotary knob to set the brightness in percent.
5. To confirm the setting, press the rotary knob.

To set the fallback time

1. Select [SETUP] > "Misc" > "PAGE 1/2".
2. Press the "Key" softkey.
3. Press the "FALLBACK" softkey.
4. Select the fallback time with the rotary knob or the arrow keys.
5. To confirm the settings, press the rotary knob or wait until R&S UDS closes the list automatically.

To return to the previous level

- Press the  key.

In menus, the back key returns to the previous level or folds it down to a small menu (toggle function).

Settings

Key Brightness.....	77
Key Fallback Time.....	77

Key Brightness

Sets the intensity of the key illumination in percent.

Range: 10 % to 100 %

Remote command:

n.a.

Key Fallback Time

Sets the "Key Fallback Time". This parameter determines the time period the instrument waits before it automatically assigns a changed value. If you confirm the setting manually before the fallback time expires, the setting has no effect.

"5s", "10s", "20s"

Sets the corresponding time period.

"Off"

Disables the function.

7.3.5 Device name

Access:

1. Press the SETUP key at the front panel.
2. In the "SETUP" menu, select the "Misc" softkey.
3. In the "Miscellaneous" menu, press the "PAGE 1|2" softkey.

- Press "Device name" softkey.

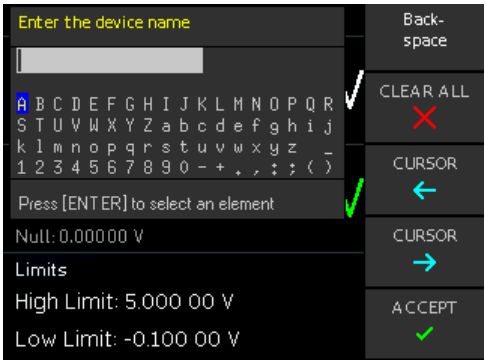


Figure 7-9: Entering the instrument name

The R&S UDS opens a keypad to assign a name to the instrument.

To assign a name to the instrument

Access:

- Select [SETUP] > "Misc" > "Device name".
- In the "Enter the device name" window, select a character with the rotary knob.
- Confirm with the "Press [ENTER] to select an element" button.
- Repeat the steps until you complete the name.
- For navigation, use the "CURSOR" softkeys.
- For corrections, use the "Backspace" and "CLEAR ALL" softkeys.
- Complete the entry with the "ACCEPT" softkey.

The device name is assigned. The R&S UDS indicates the assigned device name in the window.

Settings

Device name..... 78

Device name

Sets device name.
Remote command:
n.a.

7.3.6 CSV

The "CSV" softkey provides access to the standard "CSV" softkey menu, see [Section 7.3.6.2, "CSV settings"](#), on page 79. In this menu, you can define the table separators and decimal floating point for the data, saved in standard CSV or TXT file format.

7.3.6.1 About CSV

The R&S UDS enables you to record measurement readings and save the data in a file for subsequent evaluation and validation. Recorded data consists of character strings that list general metadata as, e.g., date, device name, etc., the parameter names and the acquired measurement values.

The standard file formats `*.csv` or `*.txt` the R&S UDS saves the data, allow you to use a spreadsheet application program for analysis and evaluation. A spreadsheet program displays the data either as numerals and text, or in graphical form.

Consideration on data content depending on the application used

During a measurement, gaps can occur due to high process load, measurement speed or exceeding file size. It can also occur that a measured parameter was not displayed caused by configuration or exceeded ranges. The gaps result in empty cells designated as "nan" (not a number).

Consider that not all spreadsheet applications can evaluate "nan" as a 0, which leads to erroneous results, shown in the example.

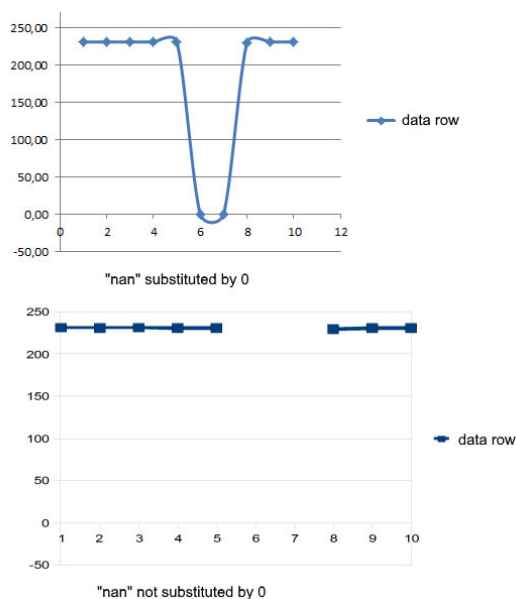


Figure 7-10: "nan"- with correct and erroneous empty cell evaluation

Therefore, the R&S UDS provides a correction function that fills empty cells with 0. Consider the capability of the application you use, and set the function correction correspondingly, see ["ERROR VAL."](#) on page 80.

7.3.6.2 CSV settings

Access:

1. Press the [SETUP] key on the front panel.

2. In the "SETUP" menu, press the "Misc" softkey.
3. In the "Miscellaneous" menu, press the "PAGE 1|2" softkey.
4. Press the "CSV" softkey.

The instrument opens a softkey menu for configuring the data separators in the *.CSV file.

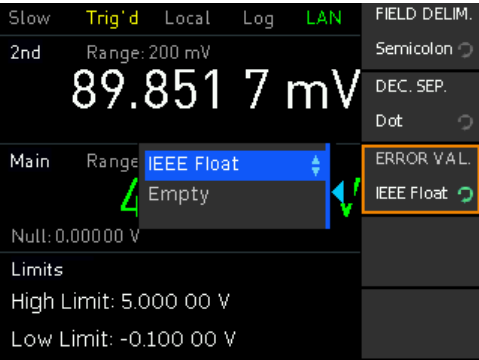


Figure 7-11: CSV structure

Settings

CSV	80
FIELD DELIM.	80
DEC. SEP.	80
ERROR VAL.	80

CSV

Opens the "CSV" softkey menu for setting the data separators.

FIELD DELIM.

Selects the line separator between individual parameters or values.

- "Semicolon" Separates the data entries by a semicolon.
- "Comma" Uses a comma.

Remote command:
n.a.

DEC. SEP.

Selects the decimal separator for values.

- "Dot" Sets a decimal point.
- "Comma" Uses a comma.

Remote command:
n.a.

ERROR VAL.

Selects whether an empty cell is filled with 0.

- "IEE Float" Fills empty cells with 0.

"Empty" Leaves empty cells.

Remote command:
n.a.

7.4 Power up

The power up function enables you to select the start up behaviour of the instrument in the event of a power failure.

Access:

- 1. Press the [SETUP] key on the front panel.
- 2. In the setup menu, select "Misc" > "Page 1/2".
- 3. Select "Power up".

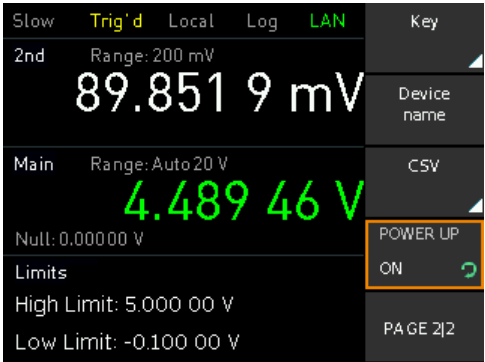


Figure 7-12: Power up menu

The R&S UDS opens a selection list for setting the power up behavior of the instrument.

Settings

Power up.....	81
---------------	----

Power up

Sets the power up mode after accidental loss of AC power.

Last state Default setting. When the AC power supply is restored, the R&S UDS restarts when it was switched on before the AC power loss. Otherwise, it switches to standby mode.

On The R&S UDS restarts when AC power is supplied.

Off The R&S UDS switches to standby mode when AC power is supplied.

Remote command:
n.a.

7.5 Default

The R&S UDS resets all the miscellaneous settings to default settings except for [Date & time](#) and [Device name](#) settings.

Access:

1. Press the [SETUP] key on the front panel.

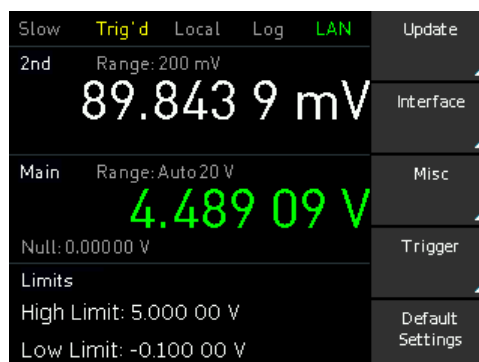


Figure 7-13: Setup menu

2. In the setup softkey menu, select "Default Settings".

The R&S UDS resets all miscellaneous settings except for the date, time and device name settings.

Default settings

Resets the miscellaneous settings to default except [Date & time](#) and [Device name](#).

Remote command:

*[RST](#) on page 109

8 Network operation and remote control

As an alternative to interactive operation directly at the instrument, the R&S UDS can also be operated remotely, for example a controller PC.

The interfaces of the R&S UDS provide flexible access to the instrument. [Figure 8-1](#) illustrates the physical interface configurations available.



The following descriptions provide information required for operating the R&S UDS remotely. The information applies to all applications and operating modes supported by the instrument. Definitions specified in the SCPI standard are not provided.

For basic knowledge on remote control operation and additional information, see the following documents available from the Rohde & Schwarz website:

- [Remote control via SCPI](#)
- [1MA171: How to use Rohde & Schwarz Instruments in MATLAB](#)
- [1SL374: How to communicate with R&S devices using VISA](#)
- [Rohde-Schwarz - Remote control examples](#)

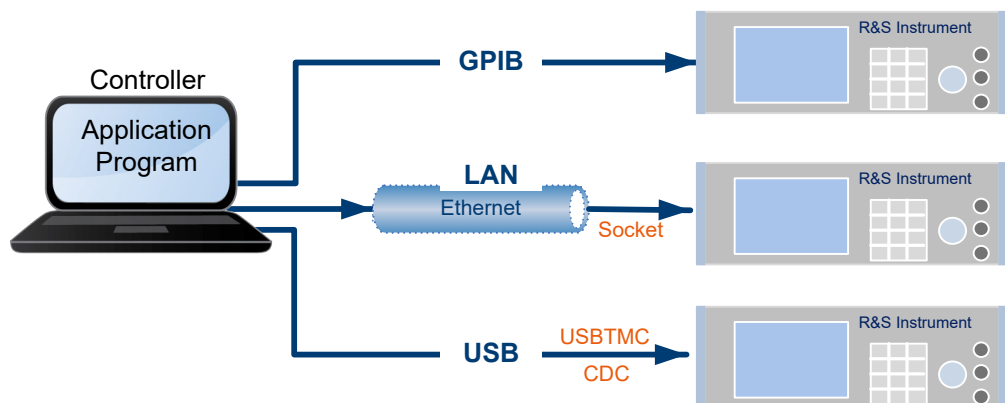


Figure 8-1: Supported remote connections

• Remote control interfaces and protocols	83
• Remote access settings	89
• Connecting the R&S UDS for remote access	94
• Adjusting the interface addresses	96
• Starting and stopping remote control	101
• Status reporting system	101

8.1 Remote control interfaces and protocols

The R&S UDS comes with the following interfaces for remote control:

- Ethernet (LAN) interface
- USB standard interface

- IEE-488 bus interface (GPIB) (instrument models UDSxxx-G)

You need a connection between the R&S UDS and the controller PC. An application that supports communication over the used interfaces must be installed on the controller PC.

Table 8-1 gives an overview on the connectivity.

Table 8-1: Remote control interfaces and protocols

Interface	Protocols, VISA ^{*)} address string and library	Remarks
Local area network (LAN)	• Socket communication (Raw Ethernet, simple Telnet) TCP/IP::host address[:: LAN device name]::<port>::SOCKET VISA or socket controller	The LAN connector at the Rear panel of the instrument. The interface is based on TCP/IP, see Section 8.1.1, "LAN interface", on page 85.
USB	• USBTCM USB::<vendor ID>::<product ID>:: <serial number>[:INSTR] VISA • CDC (communications device class, corresponds to VCP (virtual COM port))	The USB B connector is at the Front panel. For a description of the interface, refer to Section 8.1, "Remote control interfaces and protocols", on page 83
GPIB (IEC/IEEE Bus Interface) (instrument model R&S UDS-G)	– GPIB::<address>[:INSTR] (no secondary address) VISA (optional)	The GPIB bus interface according to standard IEC 625.1/IEEE 488.1 is at the Rear panel. For a description of the interface, see Section 8.2, "Remote access settings", on page 89.

^{*)} VISA (Virtual Instrument Software Architecture) is a standardized software interface library providing input and output functions to communicate with instruments. A VISA installation on the controller is a prerequisite for remote control over LAN and USB interface. For remote control over socket communication VISA installation is optional. When using socket communication or the GPIB interface, VISA installation is optional. For basic information, see [Remote control via SCPI](#).



Rohde & Schwarz provides the standardized I/O software library R&S VISA for download at the Rohde & Schwarz website <http://www.rohde-schwarz.com/rsvisa>.

There are various ways how the R&S UDS can be remotely accessed and controlled.

Access:

- Select [Setup] > "Device" > "Interfaces" to configure the required interface.
The R&S UDS displays the "Interfaces" dialog.



Figure 8-2: Interfaces dialog

- LAN interface..... 85
- USB interface.....86
- GPIB interface (IEC/IEEE bus interface).....87
- SCPI.....88
- VISA.....88

8.1.1 LAN interface

For remote control via a network, the PC and the instrument must be connected over the LAN interfaces to a common network with TCP/IP network protocol. The instruments are connected with a commercial RJ-45 cable (shielded or unshielded twisted-pair CAT 6+),

The TCP/IP network protocol and the associated network services are preconfigured on the instrument. Software for instrument control and (for specified protocols only) the VISA program library must be installed on the controller.

Identifying instruments in a network

If several instruments are connected to the network, each instrument has its own IP address and associated resource string. The controller identifies these instruments by the resource string.

8.1.1.1 VISA resource strings

The VISA resource string is required to establish a communication session between the controller and the instrument in a LAN. The resource string is a unique identifier, composed of the specific IP address of the instrument and some network and VISA-specific keywords.

```
TCPIP::<host address>[:<LAN device name>][:INSTR]
```

TCPIP = designates the network protocol
 host address = designates the IP address or hostname of the instrument
 [::LAN device name] = defines the protocol and the instance number of a subinstrument
 [::INSTR] = indicates the instrument resource class (optional)

The **IP address** (host address/computer name) is used by the programs to identify and control the instrument. It is automatically assigned by the DHCP server the first time the device is registered on the network.

The R&S UDS indicates the IP address in the "Ethernet Settings" dialog, see [Section 8.4.1, "How to configure the Ethernet settings"](#), on page 96, which also provides to adjust the IP address manually.

Socket communication

TCPIP::<host address>::<port>::SOCKET

TCPIP = designates the network protocol
 host address = designates the IP address or hostname of the instrument
 port = determines the used port number
 SOCKET = indicates the raw network socket resource class

Socket communication requires the specification of the port (commonly referred to as port number) and of "SOCKET" to complete the VISA resource string with the associated protocol used.

The registered port for socket communication is port 5025.

Example:

TCPIP::192.1.2.3::5025::SOCKET

To assign the address, see [Section 8.4.1, "How to configure the Ethernet settings"](#), on page 96.

8.1.2 USB interface

For remote control over the USB connection, the PC and the instrument must be connected over the USB B interface.

The USB B connector is at the [Front panel](#) of the instrument.

On the controller, you need to install any application for instrument control, for example the GPIB Explorer, and if available, a VISA program library. VISA detects and configures the Rohde & Schwarz instrument automatically when the USB connection is established.

You can communicate with the instrument over the USB TMC class or the CDC class protocols:

- **USBTMC**
(USB Test & Measurement Class Specification) is a protocol that is built on top of USB for communication with USB devices, like GPIB. It defines class code information of the instrument that identifies its functionality to load the respective device

driver. Using the VISA library, it supports service requests, triggers, and other specific operations, similar to GPIB.

For control, you can use the SCPI terminal function of the GPIB Explorer software. This software also provides logging of measurement values, or graphical display.

- **CDC**

(Communications Device Class, also known as VCP virtual COM port) is a protocol used for emulating serial ports over USB. Using the CDC protocol, you have to install the USB VCP driver and activate it in the PC device explorer. The driver is available for download on the Rohde & Schwarz product site at <http://www.rohde-schwarz.com/product/uds>.

To select the USB class, see [Section 8.2, "Remote access settings"](#), on page 89.

USB resource string

The resource string represents an addressing scheme that is used to establish a communication session with the instrument. It is based on the instrument address and some instrument- and vendor-specific information.

The USB resource string syntax is as follows:

USB::<vendor ID>::<product ID>::<serial number>[::INSTR]

USB	= denotes the used interface
<vendor ID>	= is the manufacturer ID for Rohde & Schwarz
<product ID>	= is the product identification of the instrument
<serial number>	= is the individual serial number on the rear of the instrument
[::INSTR]	= indicates the instrument resource class (optional)

Example:

USB::0x0AAD::0x01DD::100001

0x0AAD is the vendor ID for Rohde & Schwarz.

0x01DD is the product ID for the R&S UDS.

100001 is the serial number of the particular instrument.

See [Section 8.4, "Adjusting the interface addresses"](#), on page 96.

8.1.3 GPIB interface (IEC/IEEE bus interface)

R&S UDS-G models are equipped with a GPIB interface. The GPIB interface is at the [Rear panel](#).

To control the instrument over the GPIB bus interface, the instrument and the controller must be connected with a GPIB bus cable. A GPIB bus card, the card drivers and the program libraries for the programming language used must be provided in the controller.



See [Remote control via SCPI](#) for additional information on the characteristics, control commands and messages of the GPIB interface.

GPIO address

The controller addresses the instrument within the GPIO bus channel. GPIO provides channel addresses from 0 to 30. The GPIO address is preset to 20 (factory-set), but you can adjust it according to your network environment, see [Section 8.2, "Remote access settings"](#), on page 89. An instrument preset does not affect the GPIO address.

`GPIO:://<channel>[:INSTR]`

GPIO = denotes the used interface
 <channel address> = the used channel
 [:INSTR] = indicates the instrument resource class (optional)



If the VISA implementation supports the GPIO interface, you can optionally define the VISA Instrument Control Resource (INSTR). It is used to define the basic operations and attributes for a device, such as reading, writing, or triggering.

Example:

`GPIO : 28`

28 is the selected GPIO bus channel.

To change the GPIO address, see [Section 8.4, "Adjusting the interface addresses"](#), on page 96.

8.1.4 SCPI

SCPI (Standard Commands for Programmable Instruments) commands - messages - are used for remote control. Commands that are not taken from the SCPI standard follow the SCPI syntax rules. The instrument supports the SCPI version 1999. The SCPI standard is based on standard IEEE 488.2 and aims at the standardization of device-specific commands, error handling and the status registers. The tutorial "Automatic Measurement Control" - A tutorial on SCPI and IEEE 488.2" from John M. Pieper (R&S order number 0002.3536.00) offers detailed information on concepts and definitions of SCPI.

The requirements that the SCPI standard places on command syntax, error handling and configuration of the status registers are explained in detail in the following sections. For more information, see [Section 9, "Remote control commands"](#), on page 106.

8.1.5 VISA

VISA is a standardized software interface library providing input and output functions to communicate with instruments. The I/O channel (LAN or USB) is selected at initialization time by means of a channel-specific resource string. For more information about VISA, refer to its user documentation.

8.2 Remote access settings

The "Interface" softkey menu provides access to the settings that address the instrument, including its specific identification parameters and parameters required for the corresponding interfaces.

Access:

- Select [SETUP] > "Interface".
See [Section 7.2, "Remote control interface"](#), on page 71.

The "Interface" softkey menu enables you to access the setting parameters of the interfaces the instrument is equipped with.

8.2.1 Ethernet settings

1. Select [SETUP] > "Interface".
2. In the "interface" softkey menu, select the "Ethernet" softkey.
3. Select the "Parameter" softkey to access the "Ethernet Settings" dialog.

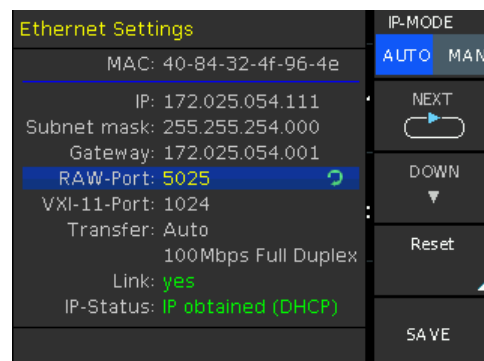


Figure 8-3: Ethernet settings dialog

In this dialog, you can configure the settings of the general network environment and specific identification parameters of the instrument in the network. The R&S UDS displays the VISA resource strings and additional parameters for information on the LAN interface, and the status of the connection.

The remote commands required to configure the network remotely are described in [SYSTem subsystem](#).

By default, the R&S UDS is configured to use dynamic TCP/IP configuration and to obtain the whole address information automatically. If the network does not support DHCP, you can assign the IP address manually.

How To: ["To assign the IP address manually on the controller PC"](#) on page 98.

ETHERNET.....	90
IP Mode.....	90
MAC.....	90
IP.....	90
Subnet mask.....	90
Gateway.....	91
RAW-Port.....	91
Transfer.....	91
Link.....	91
IP-Status.....	91
Reset.....	91
Save.....	91

ETHERNET

Selects the LAN interface for controlling the R&S UDS remotely.

Remote command:

[SYSTem:INTerface](#) on page 155

IP Mode

Selects the mode for assigning the IP address.

How to: see [Section 8.4, "Adjusting the interface addresses"](#), on page 96.

"Auto (DHCP)"

Assigns the IP address automatically, provided the network supports [DHCP](#).

"MAN"

Enables you to assign the IP address manually.

Remote command:

n.a.

MAC

Indicates the MAC (Media Access Control) address, a unique identifier of the network adapter in the R&S UDS.

Remote command:

n.a.

IP

Displays the IP address of the instrument in the network.

To assign the IP address manually, select [IP Mode > MAN](#).

Remote command:

n.a.

Subnet mask

Displays the bit group of the subnet in the host identifier.

To assign the subnet mask manually, select [IP Mode > MAN](#).

Remote command:

n.a.

Gateway

Displays the gateway address.

This address identifies the router on the same network as the instrument that is used to forward traffic to destinations beyond the local network.

To assign the "Gateway" manually, select [IP Mode > MAN](#).

Remote command:

n.a.

RAW-Port

Displays the visa resource string for remote control over LAN, using TCP/IP socket protocol.

To assign the socket port manually, select [IP Mode > MAN](#).

Remote command:

n.a.

Transfer

Selects the mode to determine the parameters of the communication channel.

Auto Determines the parameters automatically.

"Manual 10/100Mbps Half Duplex"

Sets 10/100Mbps data transfer in one direction on the communication channel.

"Manual 10/100Mbps Full Duplex"

Sets 10/100 Mbps data transfer in both directions on the communication channel.

Remote command:

n.a.

Link

Displays the status of the LAN connection. "Yes" in green letters denotes that the over LAN is active.

Remote command:

n.a.

IP-Status

Indicates whether the LAN connection is active (green color), and displays the setting of the IP mode.

Remote command:

n.a.

Reset

Restores the LAN settings to factory default.

"Confirm" Confirm the factory default settings.

"Abort" Aborts the factory default settings.

Save

Saves the static IP settings.

8.2.2 GPIB settings

Only R&S UDS-G models are equipped with an integrated GPIB IEEE488 bus interface.

Access:

1. Select [SETUP] > "Interface".
2. In the interface menu, select "IEEE488".
3. Select "Parameter" to access the "IEEE488" softkey menu.
4. Select the "Address" softkey.
5. Enter the address.
6. Confirm with "Save".

The controller must address the instrument with the GPIB bus address.

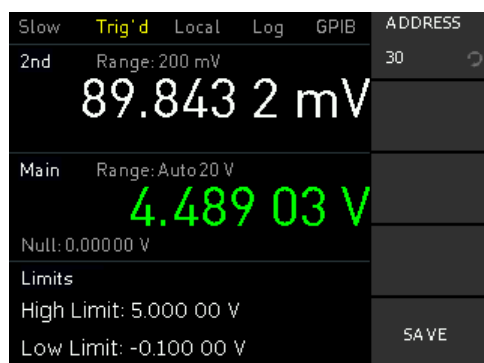


Figure 8-4: GPIB selection

See also: [Section 8.4, "Adjusting the interface addresses"](#), on page 96.

To return to the previous level

- Press the  key.

In menus, the back key returns to the previous level or folds it down to a small menu (toggle function).

IEEE488

GPIB interface.

Parameter

Selects the GPIB interface parameter.

Address

Sets the GPIB address.

Save

Confirms the setting.

Remote command:

[SYSTEM:INTERface](#) on page 155

8.2.3 USB settings

For remote control over USB, you can address the R&S UDS over the USB TMC class, or the virtual COM port CDC (VCP).

1. Select [SETUP] > "Interface".
2. In the "Interface" softkey menu, select either "USB VCP" or "USB TMC".

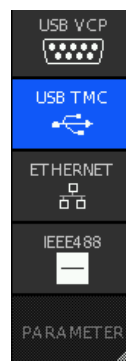


Figure 8-5: USB TMC selection

The R&S UDS activates the connection and indicates the selected USB interface port on top of the display.



Figure 8-6: USB TMC display on the screen

Note: If you have established the USB connection to the controller PC, and the required VCP driver or the VISA interface library is missing, the PC operating system displays the "Found New Hardware Wizard" notification.

If a connection between the PC and the instrument has been established and no R&S UDS USB-VCP driver is installed, the PC operating system displays a "Found New Hardware" wizard. In this case, the R&S UDS USB-VCP driver must be installed.

See also: [Section 8.1.2, "USB interface"](#), on page 86.

See also: [Section 8.4, "Adjusting the interface addresses"](#), on page 96

USB VCP

Selects the CDC protocol for controlling the R&S UDS remotely over the USB interface.

USB TMC

Selects the USBTMC connection for remote control over USB.

Remote command:

[SYSTem:INTerface](#) on page 155

8.3 Connecting the R&S UDS for remote access

8.3.1 Connecting to LAN

The R&S UDS provides Ethernet (LAN) connectivity. If you have assigned the corresponding rights, you can use this interface for remote control and data transfer from a controller PC. Make sure that you have connected the controller PC in the same network.

Consult your network administrator before performing the following tasks to avoid a network failure:

- Connecting the instrument to the network
- Configuring the network
- Changing IP addresses

The LAN connector is at the [rear panel](#).

To operate the instrument securely

1. **NOTICE!** The R&S UDS is designed to operate at local workplaces or in secured networks (LAN).
When connected to the LAN, the R&S UDS can potentially be accessed from the internet, which constitutes a security risk. For example, attackers can misuse or damage your device.
Use secured connections for internet or remote access, if applicable.
2. 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.
3. Always install the latest firmware.

To connect to LAN

The LAN connector is at the [rear panel](#).

1. Ensure that all products are grounded by connecting them to the AC power.

2. Connect the LAN socket using an RJ-45 cable to the LAN.

By default, the R&S UDS is configured to use DHCP that assigns the IP address automatically.

If the R&S UDS cannot obtain an IP address automatically, it returns a time-out message after about three minutes and clears the parameters 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.

3. If the time-out message is displayed, proceed as follows:
 - a) Check the LAN connection of both, the R&S UDS and the controller PC.
 - b) Consult your network administrator to request support and an IP address, if necessary.
 - c) If necessary, assign the IP address manually as described in ["To assign the IP addresses for the LAN interface manually"](#) on page 96

If connected and switched on, the R&S UDS indicates the address information and LAN parameters in the "Ethernet Settings" dialog.

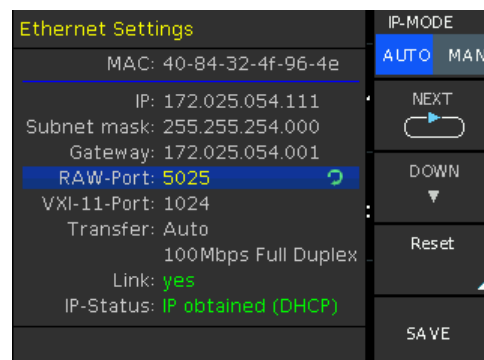


Figure 8-7: Ethernet settings dialog

See [Section 8.5, "Starting and stopping remote control"](#), on page 101.

8.3.2 Connecting the R&S UDS to the USB interface

You can use the USB B interface for remote control and data transfer from a controller PC. Remote control over USB requires the VISA library.

The USB B connector is located at the [Rear panel](#).

To connect the R&S UDS to the USB B interface:

- ▶ Connect the USB B connector using a double-shielded USB cable to the controller PC.

VISA detects and configures the instrument automatically when the USB connection is established. You do not have to enter an address string or install a separate driver.

8.3.3 Connecting the R&S UDS to the IEC 625/IEEE 488 interface

Instrument models UDS-G provide the GPIB bus interface that you can use for controlling the instrument remotely.

The IEC 625/IEEE 488 connector is located at the [Rear panel](#).

To connect the R&S UDS to the controller PC:

1. Connect the IEC 625/IEEE 488 connector of the R&S UDS to the controller PC with a double-shielded GPIB bus interface cable.
2. Activate the remote control connection as described in [Section 8.2, "Remote access settings"](#), on page 89.

The controller must address the instrument with the GPIB bus address, see [Section 8.1, "Remote control interfaces and protocols"](#), on page 83.

8.4 Adjusting the interface addresses

8.4.1 How to configure the Ethernet settings

Depending on the network capabilities, the TCP/IP address information for the instrument can be obtained in different ways.

- If the network supports DHCP (dynamic host configuration protocol), this protocol assigns the IP address automatically (default setting). DHCP mode enables you to establish a physical connection to the LAN without any additional instrument configuration.
- If the network does not support DHCP or if the instrument is set to use an alternate TCP/IP configuration, you must set the addresses manually.

To assign the IP addresses for the LAN interface manually

The following instruction leads you through the steps to be taken for setting the IP address manually.

Access:

1. Select [SETUP] > "Interface" > "Ethernet" softkey.

In this dialog, you can configure the settings of the general network environment and specific identification parameters of the instrument in the network. The R&S UDS displays the VISA resource strings and additional parameters for information on the LAN interface, and the status of the connection.

2. Select the "Parameter" softkey.

The "Ethernet Settings" dialog appears.

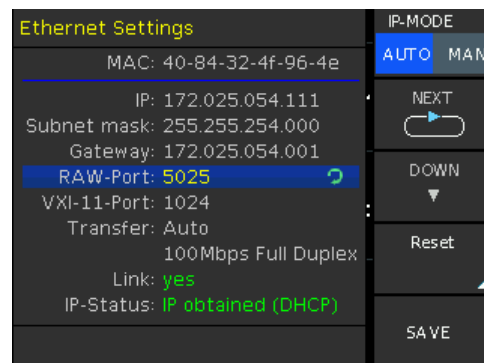


Figure 8-8: Ethernet settings dialog

3. **NOTICE!** Risk of network failure. Connecting to the network can cause network failure. Errors can affect the entire network.

Consult your network administrator before performing the following tasks:

- Connecting the instrument to the network
- Configuring the network
- Changing IP addresses

4. Select "IP-MODE" > "MAN" to enable edit mode.

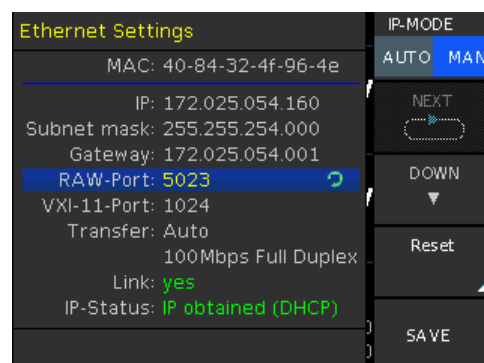


Figure 8-9: Ethernet Settings dialog

The MAC address is assigned statically and cannot be modified.

5. Turn the rotary knob to select the "IP" address.
The IP address consists of four blocks separated by dots. Every block contains 3 numbers at a maximum.
 - a) Set the first number of the address.
 - b) Select "NEXT" to move to the following block.

- c) Set the number.
 - d) Repeat the steps to complete the address.
6. Select "DOWN" to continue with the next setting.
 7. Set the "Subnet mask" and "Gateway" in the same way as described in the before.
 8. Select the "RAW Port" entry field to set the port number for SCPI socket communication.
 9. Select the "Transfer" mode.
"Auto" assigns the transfer parameters automatically, or you can set the baud rate and duplex mode ("HALF" / "FULL") manually.
 10. Select "SAVE" to save the settings.

The "Link" and "IP-Status" information at the bottom of the dialog indicates whether a LAN connection is established successfully.

To assign the IP address manually on the controller PC

- Obtain the necessary information from your network administrator. If you use more than one LAN connector, you need separate address information for each connector.

For information on how to configure the LAN settings, refer to the documentation of the operating system the PC uses.

To check the LAN connection

You have several possibilities to validate if the LAN connection is established and working properly:

1. Check the LAN connection using `ping <IP address>`.
2. If the PC can access the instrument, enter the IP address of the address line of the Internet browser on your computer: `http//:xxx.yyy.zzz.xxx`

The "Device Information" page appears. It provides information on the instrument and the LAN connection.


[Website](#) | [Support](#)

[Device](#)
[Settings](#)
[Security](#)
[Terminal](#)

Device Information	
Device Model	UDS600
Manufacturer	Rohde&Schwarz
Serial Number	000000000
Description	Rohde&Schwarz UDS600 - 000000000
LXI Extended Functions	---
LXI Version	---
Hostname	R-UDS600-000000.local.
MAC Address	
TCP/IP Address	
Firmwareversion	01.005
Device Address String	TCPIP0: :5025::SOCKET
Device identification	Enable

Figure 8-10: Device information page

8.4.2 How to change the GPIB address

The controller addresses the instrument within the GPIB bus channel, providing addresses from 0 to 30. The R&S UDS has the factory-set address of 20, which you can adjust it according to your environment manually.

To assign the GPIB (IEEE488) address manually

Access:

1. Press the [Menu] key at the front panel.
2. In the general settings dialog, select the "Interface" softkey.
3. Select "Interface" > "IEEE488".
4. Return with the left arrow key.
5. Select "Settings" > "IEEE488 Address".
6. Set the "IEEE488 Address" using the rotary knob.

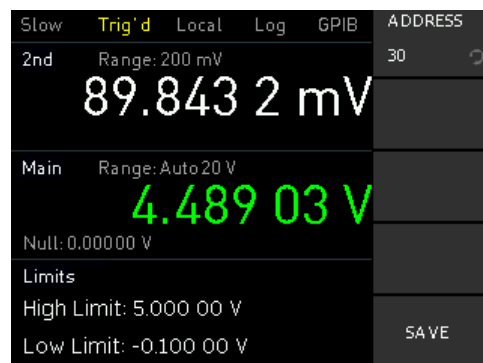


Figure 8-11: GPIB selection

To assign the IEEE488 address manually on the controller PC

- Obtain the necessary information from your network administrator. If you use more than one LAN connector, you need separate address information for each connector.
- For information on how to configure the LAN settings, refer to the documentation of the operating system installed on the PC.

8.4.3 How to configure the USB connection

To select the USB communication port

Access:

1. Select [SETUP] > "Interface".
2. Select the "USB" port, e.g. "USB TMC".

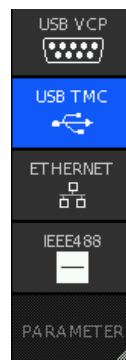


Figure 8-12: USB TMC selection

3. Return with the  arrow key.

For remote control over the USB connection, the controller PC and the instrument must be connected via the USB type B interface. Depending on the used USB port, the connection requires the VISA library or a USB VCP driver to be installed. You do not have to enter an address string or install a separate driver.

8.5 Starting and stopping remote control

When you switch on the instrument, it is always in manual operation state (local state). You can operate it using the controls on the front panel. To switch to remote control operation, proceed as described as follows.

See also, [Section 9.8, "SYSTEM subsystem"](#), on page 151 for more details on system commands.

To start a remote control session

- Send a remote control command from the controller.

The instrument switches to remote control and executes the command.

On the screen, a status symbol indicates that remote control is active. The display remains on and you can still operate it manually with the front panel controls.

To lock manual control

To prevent unauthorized access, you can explicitly block the front panel controls.

1. Send the message `>r`.
2. Send the message `>l`.

You can control the instrument remotely only.

3. To release the controls again, send the message `>l`.

To return to manual control

The instrument switches back to manual operation when the remote connection is closed. But you can return to manual operation either manually or remotely.

1. Select "Local" softkey.
2. Send the message `>L`.

The instrument switches to manual control.

8.6 Status reporting system

The status reporting system stores all information on the current operating state of the instrument and errors which have occurred. This information is stored in the status reg-

isters and in the error queue. You can query both via RS-232, USB, GPIB or LAN interface (STATus... commands).

8.6.1 Structure of a SCPI status register

Each standard SCPI register consists of 2 or 3 parts (Event, Condition and Enable register). Each part has a width of 16 bits and has different functions. The individual bits are independent of each other, i.e. each hardware status is assigned a bit number which is valid for all 2 or 3 parts. Bit 15 (the most significant bit) is set to zero for all parts. Thus the controller can process contents of the register parts as positive integers.

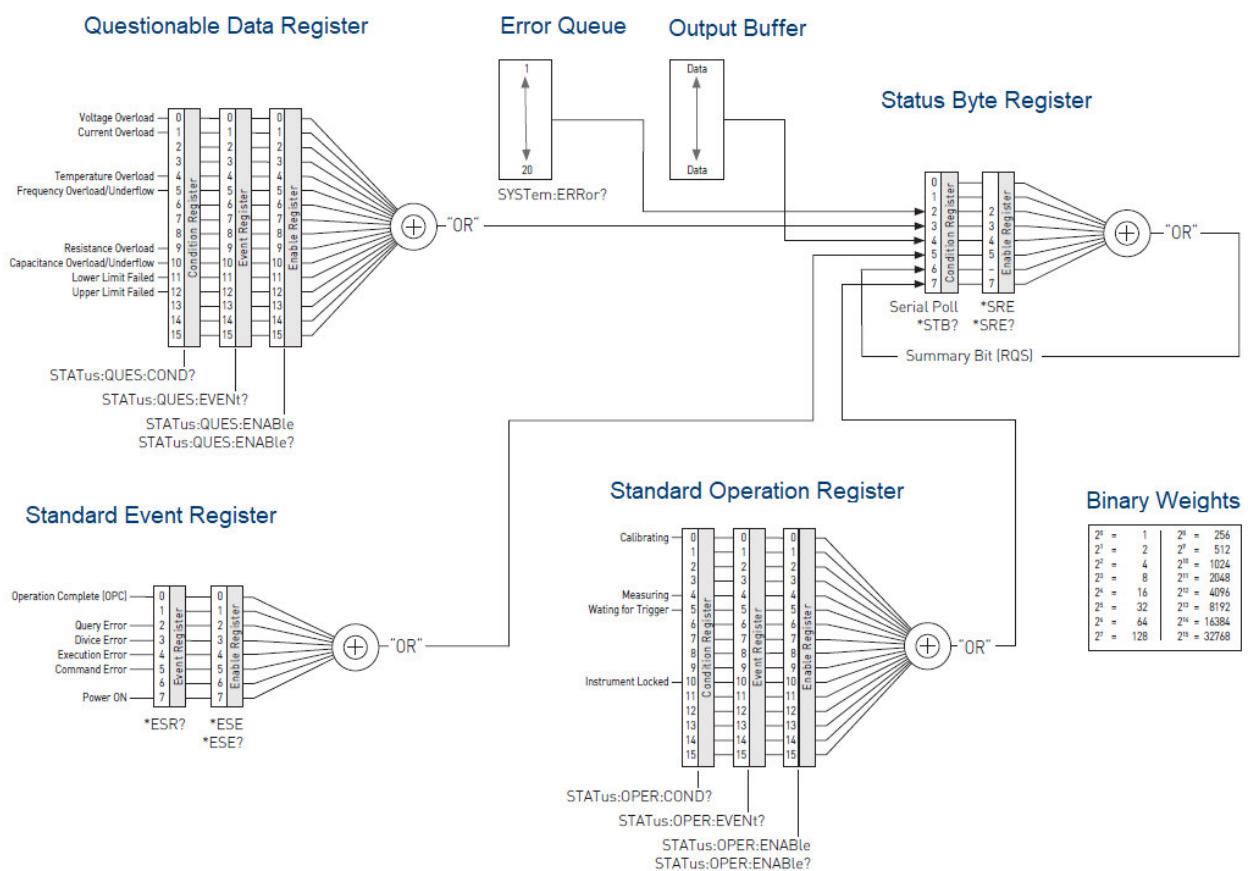


Figure 8-13: Structure of the status registers

Any part of a status register system can be read by query commands. A decimal value is returned and represents the bit pattern of the requested register. Each SCPI register is 16 bits wide and has various functions. The individual bits are independent, i.e. each hardware status is assigned to a bit number.

Bits 9 to 12 are still "free" resp. unused (always return a "0"). Certain areas of the registers are not used. The SCPI standard defines only the "basic functions". Some devices offer an advanced functionality.

Description of the status register parts

The SCPI standard provides two different status registers:

CONDition

- The CONDition register queries the actual state of the instrument.

EVENT

- The EVENT status register is set (1) until it is queried. After reading (query), the EVENT status register is set to zero.
- **PTRansition / NTRansition**
The two transition register parts define which state transition of the CONDition part (none, 0 to 1, 1 to 0 or both) is saved in the EVENT part. Both parts are readable and writeable.

The **Positive-TRansition** part acts as a transition filter. When a bit of the CONDition part changes from 0 to 1, the corresponding PTR bit sets the EVENT bit to 1 according to the following conditions:

- PTR bit =1: sets EVENT bit = 1.
- PTR bit =0: EVENT bit = 0 (not set).

The **Negative-TRansition** part also acts as a transition filter. When a bit of the CONDition part changes from 1 to 0, the corresponding NTR bit sets the EVENT bit to 1 according to the following conditions:

- NTR bit =1: sets EVENT bit = 1.
- NTR bit =0: EVENT bit =0 (not set).

- **ENABLE**

The ENABLE part determines whether the associated EVENT bit contributes to the sum bit (see below). Each bit of the EVENT part is "ANDed" with the associated ENABLE bit (symbol '&'). The results of all logical operations of this part are passed on to the sum bit via an "OR" function (symbol '+').

ENABLE bit = 0: the associated EVENT bit does not contribute to the sum bit

ENABLE bit = 1: if the associated EVENT bit is "1", the sum bit is set to "1" as well.

This part can be written into and read by the user as required. Its contents are not affected by reading.



The description of registers is only used for general explanation. Due to the complexity, we recommend the general accessible SCPI standard document for more detailed information.

For further description of the status register, see [Section 9.9, "STATus subsystem"](#), on page 157 .

8.6.2 Contents of the status registers

8.6.2.1 Event status register (ESR) and event status enable register (ESE)

The ESR is defined in IEEE 488.2. It can be compared with the `EVENTt` part of a SCPI register. The event status register can be read out using the command `*ESR?`. The ESE corresponds to the `ENABLEe` part of a SCPI register. If a bit is set in the ESE and the associated bit in the ESR changes from 0 to 1, the ESB bit in the STB is set. The ESE register can be set using the command `*ESE` and read using the command `*ESE?`.

8.6.2.2 STATus:QUEStionable register

This register contains information about different states which can occur. It can be read using the commands `STATus:QUEStionable:CONDition?` and `STATus:QUEStionable[:EVENTt]?`. See [Figure 8-13](#).

Table 8-2: Bits of the STATus:QUEStionable register

Bit No.	Meaning
0	Voltage overrange This bit is set when voltage overrange occurs.
1	Current overrange This bit is set when current overrange occurs.
2 to 3	Not used
4	TEMPerature overrange This bit is set when the temperature is exceeded.
5	Frequency overload/underflow This bit is set when frequency overrange occurs.
6 to 8	Not used
9	Resistance overrange This bit is set if a resistance range overload occurs.
10	Capacitance overload/underflow This bit is set if a capacitance range overload / underflow occurs.
11	Lower limit failed This bit is set if a lower limit value is violated.
12	Upper limit failed This bit is set if an upper limit value is violated.
13 to 15	Not used

See the schematic representation [Figure 8-13](#).

8.6.2.3 Application of the status reporting system

The purpose of the status reporting system is to monitor the status of one or several instruments in a test system. In particular, it monitors continuous measurements to detect errors in the signal. The controller must receive and evaluate the information of all devices.

The following standard methods are used:

- Query of a specific register by commands
- Query of the error queue

These methods are described in the following sections.

Query of an instrument status

Each part of any status register can be read using queries.

There are two types of commands:

- The common commands `*ESR?`, `*IDN?`, `*STB?` query the higher-level registers.
- The commands of the `STATus` system query the SCPI registers (`STATus:QUEStionable`)

The returned value is always a decimal number that represents the bit pattern of the queried register. This number is evaluated by the controller program.

Decimal representation of a bit pattern (binary weights)

The STB and ESR registers contain 8 bits, the status registers 16 bits. The contents of a status register are specified and transferred as a single decimal number. To make this possible, each bit is assigned a weighted value. The decimal number is calculated as the sum of the weighted values of all bits in the register that are set to 1.

Bits	0	1	2	3	4	5	6	7	...
Weight	1	2	4	8	16	32	64	128	...

Figure 8-14: Decimal representation of a bit pattern

8.6.3 Error queue

Each error state in the instrument leads to an entry in the error queue. The entries of the error queue are detailed plain text error messages. You can look them up in the error log or via remote control using `SYSTem:ERRor[:NEXT]?`. Each call of `SYSTem:ERRor[:NEXT]?` provides one entry from the error queue. If no error messages are stored, the instrument responds with 0, "No error".

For further description of the error queue and the device error codes, please refer to [Section 9.2, "Common commands"](#), on page 107.

9 Remote control commands

In the following, all remote control commands are presented in detail with their parameters and the ranges of numerical values.

For an introduction to remote control and the status registers, see:

- [Section 8, "Network operation and remote control"](#), on page 83
- [Section 9.9, "STATus subsystem"](#), on page 157

See also the list of commands in alphabetical order at the end of this user manual.



The channel suffix is irrelevant for all measurement commands and is therefore not mentioned in the following commands.

9.1 Conventions used in SCPI command descriptions

Note the following conventions used in the remote command descriptions:

- **Command usage**
Unless otherwise specified, you can set and query a parameter with a command. If you can only set or query a parameter with a command, or if a command triggers an event, the use is explicitly specified.
- **Parameter usage**
Unless otherwise specified, you can set and query a value of a parameter. Parameters that only set a value are indicated as **Setting parameters**. Parameters that refine a value are indicated as **Query parameters**. Parameters that are only returned as the result of a query are indicated as **Return values**.
- **Conformity**
Commands that are taken from the SCPI standard are indicated as **SCPI confirmed**. All commands used by the R&S UDS follow the SCPI syntax rules.
- **Asynchronous commands**
A command which does not automatically finish executing before the next command starts executing (overlapping command), is indicated as an **Asynchronous command**.
- **Reset values (*RST)**
Default parameter values that are used directly after resetting the instrument (*RST command) are indicated as ***RST** values, if available.
- **Default unit**
The default unit is used for numeric values if no other unit is provided with the parameter.
- **Manual operation**
If the result of a remote command can also be achieved in manual operation, a link to the description is inserted.

9.2 Common commands

Common commands are described in the IEEE 488.2 (IEC 625-2) standard. These commands have the same effect and are employed in the same way on different devices. The headers of these commands consist of "*" followed by three letters. Many common commands are related to the Status Reporting System.



Rohde & Schwarz recommend to start a program by *RST (see *RST on page 109) in order to set the instrument to a defined status prior to starting a program.

The R&S UDS does not support parallel processing of remote commands. If the query *OPC? (see *OPC on page 108) returns a „1“, the device is able to process new commands.

Available common commands:

*CLS.....	107
*ESE.....	107
*ESR?.....	108
*IDN?.....	108
*LRN?.....	108
*OPC.....	108
*PSC.....	108
*RCL <Storage>.....	109
*RST.....	109
*SAV <Storage>.....	109
*SRE.....	109
*STB?.....	109
*TRG.....	110
*TST?.....	110
*WAI.....	110

*CLS

Clear status

Sets the status byte (STB), the standard event register (ESR) and the `EVENT` part of the `QUESTIONABLE` and the `OPERATION` registers to zero. The command does not alter the mask and transition parts of the registers. It clears the output buffer.

Usage: Setting only

*ESE <Value>

Event status enable

Sets the event status enable register to the specified value. The query returns the contents of the event status enable register in decimal form.

Parameters:

<Value> Range: 0 to 255

***ESR?**

Event status read

Returns the contents of the event status register in decimal form and then sets the register to zero.

Return values:

<Contents> Range: 0 to 255

Usage: Query only

***IDN?**

Returns the instrument identification.

Return values:

<ID>	ROHDE&SCHWARZ,<device type>,<serial number>,<hardware>,<firmwareversion>
------	--

Example: Rohde&Schwarz,UDS500,00000000,HW42000000,SW01.000

Usage: Query only

Manual operation: See "Device Information" on page 73

***LRN?**

Returns the current instrument state in a block of binary settings.

Usage: Query only

***OPC**

Operation complete

Sets bit 0 in the event status register when all preceding commands have been executed. This bit can be used to initiate a service request. The query writes a "1" into the output buffer when all preceding commands have been executed, which is useful for command synchronization.

***PSC** <Action>

Power on status clear

Determines whether the contents of the `ENABLE` registers are preserved or reset when the instrument is switched on. Thus a service request can be triggered when the instrument is switched on, if the status registers ESE and SRE are suitably configured. The query reads out the contents of the "power-on-status-clear" flag.

Parameters:

<Action>	0 1
----------	-------

0

The contents of the status registers are preserved.

1

Resets the status registers.

***RCL <Storage>**

Recalls the current instrument state from the specified memory location.

Parameters:

<Storage> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

Manual operation: See "[LOAD](#)" on page 66

***RST**

Reset

Sets the instrument to a defined default status. The default settings are indicated in the description of commands.

Usage: Setting only**Manual operation:** See "[Default settings](#)" on page 82

***SAV <Storage>**

Saves the current instrument state in the specified memory location. The command overwrites any previously saved state in the same memory location without error notification.

Parameters:

<Storage> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

Manual operation: See "[SAVE](#)" on page 65

***SRE <Contents>**

Service request enable

Sets the service request enable register to the indicated value. This command determines under which conditions a service request is triggered.

Parameters:<Contents> Contents of the service request enable register in decimal form.
Bit 6 (MSS mask bit) is always 0.

Range: 0 to 255

***STB?**

Status byte query

Reads the contents of the status byte in decimal form.

Usage: Query only

***TRG**

Trigger

Triggers all actions waiting for a trigger event. In particular, *TRG generates a manual trigger signal. This common command complements the commands of the TRIGger subsystem.

*TRG corresponds to the INITiate:IMMediate command.

Usage: Event

***TST?**

Self-test query

Initiates self-tests of the instrument and returns an error code.

Return values:

<ErrorCode>	integer > 0 (in decimal format)
	An error occurred.
	0
	No errors occurred.

Usage: Query only

***WAI**

Wait to continue

Prevents servicing of the subsequent commands until all preceding commands have been executed and all signals have settled (see also command synchronization and *OPC).

Usage: Event

9.3 Configuration subsystem

The Configuration subsystem contains the commands for setting the voltage, current, resistance, frequency and capacitance values for the instrument.

- [Voltage configuration subsystem](#)..... 111
- [Current configuration subsystem](#)..... 116
- [Frequency configuration subsystem](#)..... 120
- [Resistance configuration subsystem](#)..... 123
- [Capacitance configuration subsystem](#)..... 127
- [Diode configuration subsystem](#)..... 129

- Temperature configuration subsystem..... 130
- Continuity configuration subsystem..... 132
- Miscellaneous..... 133

9.3.1 Voltage configuration subsystem

The **VOLTage** configuration subsystem contains the commands for setting the AC V/DC V values for the instrument.

CONFigure[:VOLTage]:AC.....	111
[SENSe:]VOLTage:AC:BANDwidth.....	112
[SENSe:]VOLTage:AC:NULL[:STATe].....	112
[SENSe:]VOLTage:AC:NULL:VALue.....	112
[SENSe:]VOLTage:AC:RANGe:AUTO.....	113
[SENSe:]VOLTage:AC:RANGe[:UPPer].....	113
CONFigure[:VOLTage][:DC].....	113
[SENSe:]VOLTage[:DC]:NULL[:STATe].....	114
[SENSe:]VOLTage[:DC]:NULL:VALue.....	114
[SENSe:]VOLTage[:DC]:RANGe:AUTO.....	115
[SENSe:]VOLTage[:DC]:RANGe[:UPPer].....	115
[SENSe:]VOLTage[:DC]:ZERO:AUTO.....	115

CONFigure[:VOLTage]:AC [{<Range> | AUTO | MIN | MAX | DEF}]

Configures the instrument for AC V measurements, but does not initiate a measurement. Using this command, you can change to the AC V function and configure the range setting according to your needs. Use the **READ?** command to query the AC V measurement value with specified range or the **CONF?** command to query the AC V function configuration. Use the **<Range>** parameter to set the measurement range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> 200 mV, 2 V, 20 V, 200 V, 750 V
Configures the instrument for AC V measurements with the specified range.

AUTO

Auto range selection

MIN

200 mV range selection

MAX

750 V range selection

DEF

200 mV range selection

Example:

CONF:VOLT:AC 20

The device switches to the AC V measurement function and sets the range to 20 V.

Usage: Setting only

[SENSe:]VOLTage:AC:BANDwidth {<Threshold>| MIN | MAX | DEF}
[SENSe:]VOLTage:AC:BANDwidth?

Sets or queries the AC filter of the AC V measurement function. In this case, the instrument does not switch into AC V mode. For activating the AC V measurement function, use the "FUNC" command.

Parameters:

<Threshold> 10: 10 Hz filter (Slow)
 50: 50 Hz filter (Medium)
 400: 400 Hz filter (Fast)
MIN
 Slow
MAX
 Fast
DEF
 Slow
 *RST: 5.00000000E+01

[SENSe:]VOLTage:AC:NULL[:STATe] {OFF | ON | 0 | 1}
[SENSe:]VOLTage:AC:NULL[:STATe]?

Turns the null function for AC V measurements on or off.

The query command returns the current state of the null function for AC V measurements.

Parameters:

<State> **ON | 1**
 Activates the Null function of AC V measurements.
OFF | 0
 Deactivates the Null function of AC V measurements.
 *RST: OFF | 0

[SENSe:]VOLTage:AC:NULL:VALue {<Value>| MIN | MAX}
[SENSe:]VOLTage:AC:NULL:VALue?

Sets or queries the null value of the AC V measurement function. The null value is subtracted from each sample if the null state is turned on.

Parameters:

<Value> 0 V to 750 V (adjustable in 1 nV steps)
MIN
 0.0E+00
MAX
 7.500000E+02

*RST: 0.0E+00

[SENSe:]VOLTage:AC:RANGe:AUTO <Mode>

[SENSe:]VOLTage:AC:RANGe:AUTO?

Activates or deactivates the auto range mode of the AC V measurement function.

The query command returns the current state of the auto range mode of the AC V measurement function.

Parameters:

<Mode>

ON | 1

Activates the auto range mode of the AC V measurement function.

OFF | 0

Deactivates the auto range mode of the AC V measurement function.

*RST: ON | 1

[SENSe:]VOLTage:AC:RANGe[:UPPer] {<Range>| MIN | MAX | DEF}

[SENSe:]VOLTage:AC:RANGe[:UPPer]?

Sets or queries the AC V measurement function range. Use the <Range> parameter to set the measurement range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range>

200 mV, 2V, 20 V, 200 V, 750 V

Configures the instrument for AC V measurements with the specified range.

MIN

200 mV range selection

MAX

750 V range selection

DEF

200 mV range selection

CONFigure[:VOLTage][:DC] [{<Range>| AUTO | MIN | MAX | DEF}]

Configures the instrument for DC V measurements, but does not initiate a measurement. Using this command, you can change to the DC V function and configure the range setting according to your needs. Use the **READ?** command to query the DC V measurement value with specified range or the **CONF?** command to query the DC V function configuration. Use the <Range> parameter to set the measurement range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> 200 mV, 2 V, 20 V, 200 V, 1000 V
Configures the instrument for DC V measurements with the specified range.

AUTO

Auto range selection

MIN

200 mV range selection

MAX

1000 V range selection

DEF

200 mV range selection

Example:

CONF:VOLT:DC 20

The device switches to the DC V measurement function and sets the range to 20 V.

Usage:

Setting only

[SENSe:]VOLTage[:DC]:NULL[:STATe] {OFF | ON | 0 | 1}

[SENSe:]VOLTage[:DC]:NULL[:STATe]?

Turns the null function for DC V measurements on or off.

The query command returns the current state of the null function for DC V measurements.

Parameters:

<State> **ON | 1**
Activates the Null function of DC V measurements.
OFF | 0
Deactivates the Null function of DC V measurements.
*RST: OFF | 0

[SENSe:]VOLTage[:DC]:NULL:VALue {<Value>| MIN | MAX}

[SENSe:]VOLTage[:DC]:NULL:VALue?

Sets or queries the null value of the DC V measurement function. The null value is subtracted from each sample if the null state is turned on.

Parameters:

<Value> -1000 V to 1000 V (adjustable in 1 nV steps)
MIN
-1000 V
MAX
1000 V
*RST: 0

```
[SENSe:]VOLTage[:DC]:RANGe:AUTO <Mode>
[SENSe:]VOLTage[:DC]:RANGe:AUTO?
```

Activates or deactivates the auto range mode of the DC V measurement function.

The query command returns the current state of the auto range mode of the DC V measurement function.

Parameters:

<Mode>

ON | 1

Activates the auto range mode of the DC V measurement function.

OFF | 0

Deactivates the auto range mode of the DC V measurement function.

*RST: ON | 1

```
[SENSe:]VOLTage[:DC]:RANGe[:UPPer] {<Range>| MIN | MAX | DEF}
[SENSe:]VOLTage[:DC]:RANGe[:UPPer]?
```

Sets or queries the DC V measurement function range. Use the <Range> parameter to set the measurement range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range>

200 mV, 2 V, 20 V, 200 V, 1000 V

Configures the instrument for DC V measurements with the specified range.

MIN

200 mV range selection

MAX

1000 V range selection

DEF

200 mV range selection

```
[SENSe:]VOLTage[:DC]:ZERO:AUTO <Mode>
[SENSe:]VOLTage[:DC]:ZERO:AUTO?
```

Activates or deactivates the auto zero mode of the DC V measurement function.

The query command returns the current state of the auto zero mode of the DC V measurement function.

Parameters:

<Mode>

ON | 1

Activates the auto zero mode of the DC V measurement function.

OFF | 0

Deactivates the auto zero mode of the DC V measurement function.

9.3.2 Current configuration subsystem

The `CURRent` configuration subsystem contains the commands for setting the AC I/DC I values for the instrument.

<code>CONFigure:CURRent:AC</code>	116
<code>[SENSe:]CURRent:AC:BANDwidth</code>	117
<code>[SENSe:]CURRent:AC:NULL[:STATe]</code>	117
<code>[SENSe:]CURRent:AC:NULL:VALue</code>	117
<code>[SENSe:]CURRent:AC:RANGe[:UPPer]</code>	118
<code>CONFigure:CURRent[:DC]</code>	118
<code>[SENSe:]CURRent[:DC]:NULL[:STATe]</code>	119
<code>[SENSe:]CURRent[:DC]:NULL:VALue</code>	119
<code>[SENSe:]CURRent[:DC]:RANGe:AUTO</code>	119
<code>[SENSe:]CURRent[:DC]:RANGe[:UPPer]</code>	120

CONFigure:CURRent:AC [{<Range>| AUTO | MIN | MAX | DEF}]

Configures the instrument for AC I measurements, but does not initiate a measurement. Using this command, you can change to the AC I function and configure the range setting according to your needs. Use the `READ?` command to query the AC I measurement value with specified range or the `CONF?` command to query the AC I function configuration. Use the `<Range>` parameter to set the measurement range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

`<Range>` 20 mA, 200 mA, 2 A, 10 A
Configures the instrument for AC I measurements with the specified range.

AUTO

Auto range selection

MIN

20 mA range selection

MAX

10 A range selection

DEF

20 mA range selection

Example:

`CONF:CURR:AC 10`

The device switches to the AC I measurement function and sets the range to 10 A.

Usage:

Setting only

[SENSe:]CURREnt:AC:BANDwidth {<Threshold>| MIN | MAX | DEF}
[SENSe:]CURREnt:AC:BANDwidth?

Sets or queries the AC filter of the AC I measurement function.

Parameters:

<Threshold> 10: 10 Hz filter (Slow)
 50: 50 Hz filter (Medium)
 400: 400 Hz filter (Fast)

MIN
 Slow

MAX
 Fast

DEF
 Slow

*RST: 5.00000000E+01

[SENSe:]CURREnt:AC:NULL[:STATe] {OFF | ON | 0 | 1}
[SENSe:]CURREnt:AC:NULL[:STATe]?

Turns the null function for AC I measurements on or off. In this case, the instrument does not switch to the AC I mode. For activating the AC I measurement function, use the **FUNC** command.

The query command returns the current state of the null function for AC I measurements.

Parameters:

<State> **ON | 1**
 Activates the Null function of AC I measurements.

OFF | 0
 Deactivates the Null function of AC I measurements.

*RST: OFF | 0

[SENSe:]CURREnt:AC:NULL:VALue {<Value>| MIN | MAX}
[SENSe:]CURREnt:AC:NULL:VALue?

Sets or queries the null value of the AC I measurement function. The null value is subtracted from each sample if the null state is turned on.

Parameters:

<Value> -10 A to 10 A (adjustable in 10 pA steps)

MIN
 -1.000000E+01

MAX
 1.000000E+01

*RST: 0.0E+00

[SENSe:]CURRent:AC:RANGe[:UPPer] {<Range>| MIN | MAX | DEF}
[SENSe:]CURRent:AC:RANGe[:UPPer]?

Sets or queries the AC I measurement function range. Use the <Range> parameter to set the measurement range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> 20 mA, 200 mA, 2 A, 10 A
 Configures the instrument for AC I measurements with the specified range.

MIN

20 mA range selection

MAX

10 A range selection

DEF

20 mA range selection

CONFigure:CURRent[:DC] [{<Range>| AUTO | MIN | MAX | DEF}]

Configures the instrument for DC I measurements, but does not initiate a measurement. Using this command, you can change to the DC I function and configure the range setting according to your needs. Use the READ? command to query the DC I measurement value with specified range or the CONF? command to query the DC I function configuration. Use the <Range> parameter to set the measurement range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> 20 mA, 200 mA, 2 A, 10 A
 Configures the instrument for AC I measurements with the specified range.

AUTO

Auto range selection

MIN

20 mA range selection

MAX

10 A range selection

DEF

20 mA range selection

Example:

CONF:CURR:DC 10

The device switches to the DC I measurement function and sets the range to 10 A.

Usage:

Setting only

```
[SENSe:]CURREnt[:DC]:NULL[:STATe] {OFF | ON | 0 | 1}
[SENSe:]CURREnt[:DC]:NULL[:STATe]?
```

Turns the null function for DC I measurements on or off. In this case, the instrument does not switch to the DC I mode. For activating the DC I measurement function, use the `FUNC` command.

The query command returns the current state of the null function for AC I measurements.

Parameters:

<State> **ON | 1**
 Activates the Null function of DC I measurements.

OFF | 0
 Deactivates the Null function of DC I measurements.

*RST: OFF | 0

```
[SENSe:]CURREnt[:DC]:NULL:VALue {<Value>| MIN | MAX}
[SENSe:]CURREnt[:DC]:NULL:VALue?
```

Sets or queries the null value of the DC I measurement function. The null value is subtracted from each sample if the null state is turned on.

Parameters:

<Value> -10 A to 10 A (adjustable in 10 pA steps)

MIN
 -1.000000E+01

MAX
 1.000000E+01

*RST: 0.0E+00

```
[SENSe:]CURREnt[:DC]:RANGe:AUTO <Mode>
[SENSe:]CURREnt[:DC]:RANGe:AUTO?
```

Activates or deactivates the auto range mode of the DC I measurement function.

The query command returns the current state of the auto range mode of the DC I measurement function.

Parameters:

<Mode> **ON | 1**
 Activates the auto range mode of the DC I measurement function.

OFF | 0
 Deactivates the auto range mode of the DC I measurement function.

*RST: ON | 1

[SENSe:]CURRent[:DC]:RANGe[:UPPer] {<Range>| MIN | MAX | DEF}
[SENSe:]CURRent[:DC]:RANGe[:UPPer]?

Sets or queries the DC I measurement function range. Use the <Range> parameter to set the measurement range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range>	20 mA, 200 mA, 2 A, 10 A Configures the instrument for DC I measurements with the specified range.
MIN	20 mA range selection
MAX	10 A range selection
DEF	20 mA range selection

9.3.3 Frequency configuration subsystem

The FREQuency configuration subsystem contains the commands for setting the frequency values for the instrument.

CONFigure:FREQuency[:VOLTAGE].....	120
CONFigure:FREQuency:CURRent.....	121
[SENSe:]FREQuency:APERture.....	121
[SENSe:]FREQuency:CURRent:RANGe:AUTO.....	121
[SENSe:]FREQuency:CURRent:RANGe[:UPPer].....	122
[SENSe:]FREQuency:VOLTag:e:RANGe:AUTO.....	122
[SENSe:]FREQuency:VOLTag:e:RANGe[:UPPer].....	122

CONFigure:FREQuency[:VOLTAGE]

Configures the instrument for frequency measurements, but does not initiate a measurement. Using this command, you can change to the Frequency function and configure the range setting according to your needs. Use the READ? command to query the frequency measurement value or the CONF? command to query the frequency function configuration in AC V mode.

Usage: Setting only

CONFigure:FREQuency:CURRent

Configures the instrument for frequency measurements, but does not initiate a measurement. Using this command, you can change to the Frequency function and configure the range setting according to your needs. Use the `READ?` command to query the frequency measurement value or the `CONF?` command to query the frequency function configuration in AC I mode.

Usage: Setting only

[SENSe:]FREQuency:APERture {<Seconds>|MIN|MAX|DEF}

[SENSe:]FREQuency:APERture?

Sets or queries the gate time of the frequency measurement function in AC V / AC I mode.

Parameters:

<Seconds> 10 ms, 100 ms, 1 s

MIN

10 ms

MAX

1 s

DEF

1 s

[SENSe:]FREQuency:CURRent:RANGe:AUTO <Mode>

[SENSe:]FREQuency:CURRent:RANGe:AUTO?

Activates or deactivates the auto range mode of the AC I measurement function for frequency measurements.

The query command returns the current state of the auto range mode of the AC I measurement function.

Parameters:

<Mode>

ON | 1

Activates the auto range mode of the AC I measurement function.

OFF | 0

Deactivates the auto range mode of the AC I measurement function.

*RST: ON | 1

**[SENSe:]FREQuency:CURRent:RANGe[:UPPer] {<Current_Range>|MIN|MAX|DEF}
[SENSe:]FREQuency:CURRent:RANGe[:UPPer]?**

Sets or queries the current range of the AC I measurement function for frequency measurements.

Parameters:

<Current_Range> 20 mA, 200 mA, 2 A, 10 A

MIN
20 mA

MAX
10 A

DEF
20 mA

**[SENSe:]FREQuency:VOLTage:RANGe:AUTO <Mode>
[SENSe:]FREQuency:VOLTage:RANGe:AUTO?**

Activates or deactivates the auto range mode of the AC V measurement function..

The query command returns the current state of the auto range mode of the AC V measurement function.

Parameters:

<Mode> **ON | 1**
Activates the auto range mode of the AC V measurement function.

OFF | 0
Deactivates the auto range mode of the AC V measurement function.

*RST: ON | 1

**[SENSe:]FREQuency:VOLTage:RANGe[:UPPer] {<Voltage_Range>|MIN|MAX|DEF}
[SENSe:]FREQuency:VOLTage:RANGe[:UPPer]?**

Sets or queries the voltage range of the AC V measurement function for frequency measurements.

Parameters:

<Voltage_Range> 200 mV, 2V, 20 V, 200 V, 750 V

MIN
200 mV

MAX
750 V

DEF
200 mV

9.3.4 Resistance configuration subsystem

The `RESistance` configuration subsystem contains the commands for setting the resistance values for the instrument.

<code>CONFigure:FRESistance</code>	123
<code>[SENSe:]FRESistance:NULL[:STATe]</code>	123
<code>[SENSe:]FRESistance:NULL:VALue</code>	124
<code>[SENSe:]FRESistance:RANGe:AUTO</code>	124
<code>[SENSe:]FRESistance:RANGe[:UPPer]</code>	124
<code>CONFigure:RESistance</code>	125
<code>[SENSe:]RESistance:NULL[:STATe]</code>	125
<code>[SENSe:]RESistance:NULL:VALue</code>	126
<code>[SENSe:]RESistance:RANGe:AUTO</code>	126
<code>[SENSe:]RESistance:RANGe[:UPPer]</code>	126

CONFigure:FRESistance [{<Range> | AUTO | MIN | MAX | DEF}]

Configures the instrument for 4-wire resistance measurements, but does not initiate a measurement. Using this command, you can change to the 4-wire resistance function and configure the range setting according to your needs. Use the `READ?` command to query the 4-wire resistance measurement value with specified range or the `CONF?` command to query the 4-wire resistance function configuration.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range>	200 Ω , 2 k Ω , 20 k Ω
AUTO	Auto range selection
MIN	200 Ω
MAX	20 k Ω
DEF	200 Ω

Example: `CONF:FRES 200`
The device switches to the 4-wire resistance measurement function and sets the range to 200 Ω .

Usage: Setting only

[SENSe:]FRESistance:NULL[:STATe] {OFF | ON | 0 | 1} **[SENSe:]FRESistance:NULL[:STATe]?**

Turns the null function for 4-wire (4w) resistance measurement function on or off. In this case, the instrument does not switch to the resistance mode. For activating the Ω measurement function, use the `FUNC` command.

The query command returns the current state of the null function state of the 4-wire (4w) resistance measurement function.

Parameters:

<State> **ON | 1**
 Activates the Null function of 4w resistance measurement function.

OFF | 0
 Deactivates the Null function of 4w resistance measurement function.

*RST: OFF | 0

[SENSe:]FRESistance:NULL:VALue {<Value>| MIN | MAX}
[SENSe:]FRESistance:NULL:VALue?

Sets or queries the null value of the 4-wire (4w) resistance measurement function.

Parameters:

<Value> 0 Ω to 20 k Ω (adjustable in 1 Ω steps)

MIN
 0 Ω

MAX
 20 k Ω

*RST: 0 Ω

[SENSe:]FRESistance:RANGe:AUTO <Mode>
[SENSe:]FRESistance:RANGe:AUTO?

Activates or deactivates the auto range mode of the 4-wire (4w) resistance measurement function.

The query command returns the current state of the auto range mode of the 4-wire (4w) resistance measurement function.

Parameters:

<Mode> **ON | 1**
 Activates the auto range mode of the 4-wire (4w) resistance measurement function.

OFF | 0
 Deactivates the auto range mode of the 4-wire (4w) resistance measurement function.

*RST: ON | 1

[SENSe:]FRESistance:RANGe[:UPPer] {<Range>| MIN | MAX | DEF}
[SENSe:]FRESistance:RANGe[:UPPer]?

Sets or queries the 4-wire (4w) resistance measurement function range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> 200 Ω, 2 kΩ, 20 kΩ
Configures the instrument for 4-wire (4w) resistance measurement function with the specified range.

MIN
200 Ω (4.00000000E+02)

MAX
20 kΩ (4.00000000E+06)

DEF
200 Ω (4.00000000E+02)

CONFigure:RESistance [{<Range>| AUTO | MIN | MAX | DEF}]

Configures the instrument for 2-wire resistance measurements, but does not initiate a measurement. Using this command, you can change to the 2-wire resistance function and configure the range setting according to your needs. Use the `READ?` command to query the 2-wire resistance measurement value with specified range or the `CONF?` command to query the 2-wire resistance function configuration.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> 200 Ω, 2kΩ, 20 kΩ, 200 kΩ, 2 MΩ

AUTO
Auto range selection

MIN
200 Ω

MAX
250 MΩ

DEF
200 Ω

Example:

CONF:RES 200

The device switches to the 2-wire resistance measurement function and sets the range to 200 Ω.

Usage:

Setting only

[SENSe:]RESistance:NULL[:STATe] {OFF | ON | 0 | 1}
[SENSe:]RESistance:NULL[:STATe]?

Turns the null function for 2-wire (2w) resistance measurement function on or off. In this case, the instrument does not switch to the resistance mode. For activating the Ω measurement function, use the `FUNC` command.

The query command returns the current state of the null function state of the 2-wire (2w) resistance measurement function.

Parameters:

<State> **ON | 1**
 Activates the Null function of 2w resistance measurement function.

OFF | 0
 Deactivates the Null function of 2w resistance measurement function.

*RST: OFF | 0

[SENSe:]RESistance:NULL:VALue {<Value>| MIN | MAX}

[SENSe:]RESistance:NULL:VALue?

Sets or queries the null value of the 2-wire (2w) resistance measurement function.

Parameters:

<Value> 0 Ω to 250 M Ω (adjustable in 1 Ω steps)

MIN
 0 Ω (0.0E+00)

MAX
 250 M Ω (2.500000E+08)

*RST: 0 Ω (0.0E+00)

[SENSe:]RESistance:RANGe:AUTO <Mode>

[SENSe:]RESistance:RANGe:AUTO?

Activates or deactivates the auto range mode of the 2-wire (2w) resistance measurement function.

The query command returns the current state of the auto range mode of the 2-wire (2w) resistance measurement function.

Parameters:

<Mode> **ON | 1**
 Activates the auto range mode of the 2-wire (2w) resistance measurement function.

OFF | 0
 Deactivates the auto range mode of the 2-wire (2w) resistance measurement function.

*RST: ON | 1

[SENSe:]RESistance:RANGe:UPPer] {<Range>| MIN | MAX | DEF}

[SENSe:]RESistance:RANGe:UPPer]?

Sets or queries the 2-wire (2w) resistance measurement function range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> 200 Ω , 2 k Ω , 20 k Ω , 200 k Ω , 2 M Ω , 20 M Ω
 Configures the instrument for 2-wire (2w) resistance measurement function with the specified range.

MIN
 200 Ω (4.00000000E+02)

MAX
 250 M Ω (2.50000000E+08)

DEF
 200 Ω (4.00000000E+02)

9.3.5 Capacitance configuration subsystem

The CAPacitance configuration subsystem contains the commands for setting the capacitance values for the instrument.

CONFigure:CAPacitance.....	127
[SENSe:]CAPacitance:NULL[:STATe].....	128
[SENSe:]CAPacitance:NULL:VALue.....	128
[SENSe:]CAPacitance:RANGe:AUTO.....	128
[SENSe:]CAPacitance:RANGe[:UPPer].....	129

CONFigure:CAPacitance [{<Range>| AUTO | MIN | MAX | DEF}]

Configures the instrument for capacitance measurements, but does not initiate a measurement. Using this command, you can change to the Capacitance function and configure the range setting according to your needs. Use the READ? command to query the capacitance measurement value with specified range or the CONF? command to query the capacitance function configuration. Use the <Range> parameter to set the measurement range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> 5 nF, 50 nF, 500 nF, 5 μ F, 50 μ F, 500 μ F
 Configures the instrument for capacitance measurements with the specified range.

AUTO
 Auto range selection

MIN
 5 nF range selection

MAX
 500 μ F range selection

DEF
 5 nF range selection

Example: CONF:CAP 5.0E-6
The device switches to the Capacitance measurement function and sets the range to 5 μ F.

Usage: Setting only

[SENSe:]CAPacitance:NULL[:STATe] {OFF | ON | 0 | 1}
[SENSe:]CAPacitance:NULL[:STATe]?

Turns the null function for capacitance measurements on or off. In this case, the instrument does not switch to the capacitance mode. For activating the capacitance measurement function, use the FUNC command.

The query command returns the current state of the null function for capacitance measurements.

Parameters:

<State> **ON | 1**
Activates the null function of the capacitance measurement function.

OFF | 0
Deactivates the null function of the capacitance measurement function.

*RST: OFF | 0

[SENSe:]CAPacitance:NULL:VALue {<Value>| MIN | MAX}
[SENSe:]CAPacitance:NULL:VALue?

Sets or queries the null value of the capacitance measurement function. The null value is subtracted from each sample if the null state is turned on.

Parameters:

<Value> 0 to 500 μ F (adjustable in 1 F steps)

MIN
0.0E+00

MAX
5.000000E-04

*RST: 0.0E+00

[SENSe:]CAPacitance:RANGe:AUTO <Mode>
[SENSe:]CAPacitance:RANGe:AUTO?

Activates or deactivates the auto range mode of the capacitance measurement function.

The query command returns the current state of the auto range mode of the capacitance measurement function.

Parameters:

<Mode>

ON | 1

Activates the auto range mode of the capacitance measurement function.

OFF | 0

Deactivates the auto range mode of the capacitance measurement function.

*RST: ON | 1

[SENSe:]CAPacitance:RANGe[:UPPer] {<Range>| MIN | MAX | DEF}
[SENSe:]CAPacitance:RANGe[:UPPer]?

Sets or queries the capacitance measurement function range.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range>

5 nF, 50 nF, 500 nF, 5 μ F, 50 μ F, 500 μ F

Configures the instrument for capacitance measurements with the specified range.

MIN

5 nF range selection

MAX

500 μ F range selection

DEF

5 nF range selection

9.3.6 Diode configuration subsystem

The DIODE configuration subsystem contains the commands for setting instrument for diode measurements.

CONFigure:DIODE?	129
[SENSe:]DIODE:THReshold	130
[SENSe:]DIODE:BEEPer[:STATe]	130

CONFigure:DIODE?

Configures the instrument for diode measurements, but does not initiate a measurement. Use the READ? command to query the diode measurement value or the CONF? command to query the general function configuration.

Usage: Query only

[SENSe:]DIODE:THReshold {<Threshold>|MIN|MAX|DEF}
[SENSe:]DIODE:THReshold?

Sets or queries the threshold of the diode measurement function. In this case, the instrument does not switch into continuity mode. For activating the diode measurement function, use the **FUNC** command.

Parameters:

<Threshold> 0 V to 2.4 V (adjustable in 1 µV steps)

MIN
 0 V

MAX
 2.4 V

DEF
 700 mV

*RST: 700 mV

[SENSe:]DIODE:BEEPer[:STATe] {OFF | ON | 0 | 1}
[SENSe:]DIODE:BEEPer[:STATe]?

Activates or deactivates the beeper function for diode measurements.

The query command returns the current state of the beeper function for the diode measurements.

Parameters:

<State> **ON | 1**
 Activates the the beeper of the diode measurement function.

OFF | 0
 Deactivates the beeper of the diode measurement function.

*RST: OFF | 0

9.3.7 Temperature configuration subsystem

The **TEMPerature** configuration subsystem contains the commands for setting instrument for temperature measurements.

CONFigure:TEMPerature	131
[SENSe:]TEMPerature:NULL[:STATe]	131
[SENSe:]FRESistance:NULL:VALue	131
[SENSe:]TEMPerature:TRANsducer:RTD:TYPE	132
[SENSe:]TEMPerature:TRANsducer:TYPE	132
UNIT:TEMPerature	132

CONFigure:TEMPerature [{<Probe_Type>| DEF},{<Type>| DEF}]

Configures the instrument for 2-wire/4-wire temperature measurements, but does not initiate a measurement. Use the **READ?** command to query the 2-wire/4-wire temperature measurement value with specified range or the **CONF?** command to query the 2-wire resistance function configuration.

Parameters:

<Probe_Type>	FRTD
	4-wire temperature value (4 W)
	RTD
	2-wire temperature value (2 W)
	DEF
	RTD (2W)
<Type>	PT100
	PT500
	PT1000

[SENSe:]TEMPerature:NULL[:STATe] {OFF | ON | 0 | 1}**[SENSe:]TEMPerature:NULL[:STATe]?**

Turns the null function for temperature measurement function on or off. In this case, the instrument does not switch into temperature mode (SENSOR). For activating the SENSOR measurement function, use the **FUNC** command.

The query command returns the current state of the null function for AC V measurements.

Parameters:

<State>	ON 1
	Activates the Null function of temperature measurement function.
	OFF 0
	Deactivates the Null function of temperature measurement function.
	*RST: OFF 0

[SENSe:]FRESistance:NULL:VALue {<Value>| MIN | MAX}**[SENSe:]FRESistance:NULL:VALue?**

Sets or queries the null value of the temperature measurement function.

Parameters:

<Value>	-273.1°C to 999.9°C (adjustable in 1µ°C steps)
	MIN
	-273.1°C
	MAX
	999.9°C

*RST: 0°C

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE {PT100 | PT500 | PT1000}

[SENSe:]TEMPerature:TRANsducer:RTD:TYPE?

Sets or queries the RTD type (PT type) of the temperature measurement function.

Parameters:

<Type> **PT100**
 PT500
 PT1000
 *RST: PT100

[SENSe:]TEMPerature:TRANsducer:TYPE {FRTD | RTD}

[SENSe:]TEMPerature:TRANsducer:TYPE?

Sets or queries the probe type of the temperature measurement function.

Parameters:

<Probe_Type> **FRTD**
 4-wire temperature probe type (4 W)
 RTD
 2-wire temperature probe type (2 W)
 *RST: RTD

UNIT:TEMPerature {C | K | F}

UNIT:TEMPerature?

Sets or queries the unit of the temperature measurement function.

Parameters:

<Unit> **C**
 Activates Celcius temperature unit.
 K
 Activates Kelvin unit.
 F
 Activates Fahrenheit unit.

9.3.8 Continuity configuration subsystem

The CONTInuity configuration subsystem contains the commands for setting instrument for continuity measurements.

CONFigure:CONTInuity?.....133
 [SENSe:]CONTInuity:THReshold.....133
 [SENSe:]CONTInuity:BEEPer[:STATe].....133

CONFigure:CONTInuity?

Configures the instrument for continuity measurements, but does not initiate a measurement. Use the `READ?` command to query the continuity measurement value or the `CONF?` command to query the general function configuration.

Usage: Query only

[SENSe:]CONTInuity:THReshold {<Threshold>| MIN | MAX | DEF}
[SENSe:]CONTInuity:THReshold?

Sets or queries the threshold of the continuity measurement function. In this case, the instrument does not switch into continuity mode. For activating the continuity measurement function, use the `FUNC` command.

Parameters:

<Threshold>	MIN
	0.00000000E+00
	MAX
	1.00000000E+06
	DEF
	2.00000000E+02

[SENSe:]CONTInuity:BEEPer[:STATe] {OFF | ON | 0 | 1}
[SENSe:]CONTInuity:BEEPer[:STATe]?

Activates or deactivates the beeper of the continuity measurement function.

The query command returns the current state of the beeper of the continuity measurement function.

Parameters:

<State>	ON 1
	Activates the the beeper of the continuity measurement function.
	OFF 0
	Deactivates the beeper of the continuity measurement function.
*RST:	OFF 0

9.3.9 Miscellaneous

This section contains the other miscellaneous commands of the instrument.

[SENSe:]ADCRate.....	134
CONFigure?.....	134
[SENSe:]FUNCtion[:ON].....	134

[SENSe:]ADCRate {SLOW | MEDium | FAST}

[SENSe:]ADCRate?

Sets or queries the ADC rate for the activated measurement function. The reading rate per second of the ADC rate function depends on the activated measurement function.

Parameters:

SLOW MEDium	Slow
FAST	MEDium
	FAST
*RST:	Slow

CONFigure?

Returns the actual instrument configuration.

Example: CONF?-->TEMP, PT100, RTD
In the above example, the CONF? command returns "TEMP, PT100, RTD" for sensor measurements.

Usage: Query only

[SENSe:]FUNCTION[:ON] <Function>

[SENSe:]FUNCTION[:ON]?

Selects the measurement function.

Parameters:

<Function>	VOLTage[:DC] DC V measurement function
	VOLTage:AC AC V measurement function
	CURRent[:DC] DC I measurement function
	CURRent:AC AC I measurement function
	RESistance 2-wire resistance measurement function
	FRESistance 4-wire resistance measurement function
	FREQuency[:VOLTage] Frequency measurement function in AC V mode
	FREQuency:CURRent Frequency measurement function in AC I mode
	CONTinuity Continuity measurement function
	DIODe Diode measurement function

SENSor

Sensor measurement function

CAPacity

Capacity measurement function

*RST: VOLT[:DC]

Example: FUNC VOLT: AC

9.4 Measurement subsystem

The MEASure subsystem provides commands to query the voltage, current, resistance and capacitance values for the instrument.

MEASure[:VOLTage]:AC?	135
MEASure[:VOLTage]:DC?	136
MEASure:CURREnt:AC?	136
MEASure:CURREnt:DC?	137
MEASure:RESistance?	137
MEASure:FRESistance?	138
MEASure:FREQuency[:VOLTAGE]?	139
MEASure:FREQuency:CURREnt?	139
MEASure:CAPacitance?	140
MEASure:CONTinuity?	140
MEASure:DIODE?	141
MEASure:TEMPerature?	141

MEASure[:VOLTage]:AC? [{<Range>| AUTO | MIN | MAX | DEF}]

Sets and queries the instrument for AC V measurements. The displayed values (including statistic values) are reset and the instrument immediately triggers a measurement. Use the <Range> parameter to specify the expected value of the input signal.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> <numeric value> | AUTO | MIN | MAX | DEF

<numeric value>

200 mV, 2 V, 20 V, 200 V, 750 V

Make a AC V measurement with the specified range. The command returns a single reading.

AUTO

Auto range selection

MIN

200 mV range selection

MAX

750 V range selection

DEF

200 mV range selection

Example: MEAS:VOLT:AC?**Usage:** Query only**MEASure[:VOLTage]:DC?** [{<Range> | AUTO | MIN | MAX | DEF}]

Sets and queries the instrument for DC V measurements. The displayed values (including statistic values) are reset and the instrument immediately triggers a measurement. Use the <Range> parameter to specify the expected value of the input signal.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> <numeric value> | AUTO | MIN | MAX | DEF

<numeric value>

200 mV, 2 V, 20 V, 200 V, 1000 V

Make a AC V measurement with the specified range. The command returns a single reading.

AUTO

Auto range selection

MIN

200 mV range selection

MAX

1000 V range selection

DEF

200 mV range selection

Example: MEAS:VOLT:DC?**Usage:** Query only**MEASure:CURRent:AC?** [{<Range> | AUTO | MIN | MAX | DEF}]

Sets and queries the instrument for AC I measurements. The displayed values (including statistic values) are reset and the instrument immediately triggers a measurement. Use the <Range> parameter to specify the expected value of the input signal.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> <numeric value> | AUTO | MIN | MAX | DEF

<numeric value>

20 mA, 200 mA, 2 A, 10 A

Make a AC I measurement with the specified range. The command returns a single reading.

AUTO

Auto range selection

MIN

20 mA range selection

MAX

10 A range selection

DEF

20 mA range selection

Example:`MEAS:CURR:AC? 2`**Usage:**

Query only

MEASure:CURRent:DC? [{<Range>| AUTO | MIN | MAX | DEF}]

Sets and queries the instrument for DC I measurements. The displayed values (including statistic values) are reset and the instrument immediately triggers a measurement. Use the <Range> parameter to specify the expected value of the input signal.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range>

<numeric value> | AUTO | MIN | MAX | DEF

<numeric value>

20 mA, 200 mA, 2 A, 10 A

Make a AC I measurement with the specified range. The command returns a single reading.

AUTO

Auto range selection

MIN

20 mA range selection

MAX

10 A range selection

DEF

20 mA range selection

Example:`MEAS:CURR:DC?`**Usage:**

Query only

MEASure:RESistance? [{<Range>| AUTO | MIN | MAX | DEF}]

Sets and queries the instrument for 2-wire resistance measurements. The displayed values (including statistic values) are reset and the instrument immediately triggers a measurement. Use the <Range> parameter to specify the expected value of the input signal.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> <numeric value> | AUTO | MIN | MAX | DEF

<numeric value>
 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ, 20 MΩ, 250 MΩ
 Make a 2-wire resistance measurement with the specified range.
 The command returns a single reading.

AUTO
 Auto range selection

MIN
 200 Ω range selection

MAX
 250 MΩ range selection

DEF
 200 Ω range selection

Example: MEAS:RES?

Usage: Query only

MEASure:FRESistance? [{<Range>| AUTO | MIN | MAX | DEF}]

Sets and queries the instrument for 4-wire resistance measurements. The displayed values (including statistic values) are reset and the instrument immediately triggers a measurement. Use the <Range> parameter to specify the expected value of the input signal.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> <numeric value> | AUTO | MIN | MAX | DEF

<numeric value>
 200 Ω, 2 kΩ, 20 kΩ
 Make a 4-wire resistance measurement with the specified range.
 The command returns a single reading.

AUTO
 Auto range selection

MIN
 200 Ω

MAX
 20 kΩ

DEF
 200 Ω

Example: MEAS:RES?

Usage: Query only

MEASure:FREQuency[:VOLTAGE]? [{<Range>| AUTO | MIN | MAX | DEF}]

Sets and queries the instrument for frequency measurements with main function "AC V". The displayed values (including statistic values) are reset and the instrument immediately triggers a measurement. Display of frequency is only available as 2nd function for the main functions "AC V" and "AC I". Use the <Range> parameter to specify the expected value of the input signal.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> <numeric value> | AUTO | MIN | MAX | DEF

<numeric value>

AC voltage: 200 mV, 2 V, 20 V, 200 V, 750 V (5 Hz to 700 kHz)

Make a frequency measurement with the specified range. The command returns a single reading.

AUTO

Auto range selection

MIN

200 mV range selection

MAX

750 V range selection

DEF

200 mV range selection

Example: MEAS:FREQ?

Usage: Query only

MEASure:FREQuency:CURREnt? [{<Range>| AUTO | MIN | MAX | DEF}]

Sets and queries the instrument for frequency measurements with main function "AC I". The displayed values (including statistic values) will be reset and the instrument immediately triggers a measurement. Display of frequency is only available as 2nd function for the main functions "AC V" and "AC I". Use the <Range> parameter to specify the expected value of the input signal.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> <numeric value> | AUTO | MIN | MAX | DEF

<numeric value>

20 mA, 200 mA (5 Hz to 10 kHz)

2 A, 10 A (5 Hz to 5 kHz)

Make a frequency measurement with the specified range. The command returns a single reading.

AUTO

Auto range selection

MIN

20 mA range selection

MAX

10 A range selection

DEF

20 mA range selection

Example: MEAS:FREQ:CURR?**Usage:** Query only**MEASure:CAPacitance? [{<Range>| AUTO | MIN | MAX | DEF}]**

Sets and queries the instrument for capacitance measurements. The displayed values (including statistic values) are reset and the instrument immediately triggers a measurement. Use the <Range> parameter to specify the expected value of the input signal.

Note: If the input signal is outside the limits of the selected range (manual ranging), the instrument returns 9.90000000E+37.

Parameters:

<Range> <numeric value> | AUTO | MIN | MAX | DEF

<numeric value>

5 nF, 50 nF, 500 nF, 5 µF, 50 µF, 500 µF

Make a capacitance measurement with the specified range. The command returns a single reading.

AUTO

Auto range selection

MIN

5 nF range selection

MAX

500 µF range selection

DEF

5 nF range selection

Example: MEAS:CAP?**Usage:** Query only**MEASure:CONTinuity?**

Sets and queries the instrument for continuity measurements. The displayed value is reset and the instrument immediately triggers a measurement.

The command returns a single reading. The range is fixed (2000 Ω).

Example: MEAS:CONT?**Usage:** Query only

MEASure:DIODe?

Sets and queries the instrument for diode tests. The displayed value is reset and the instrument immediately triggers a measurement.

The command returns a single reading. The range is fixed (2.4 V).

Example: `MEAS:DIOD?`

Usage: Query only

MEASure:TEMPerature? [{<Probe_Type>| DEF},{<Type>| DEF}]

Sets and queries the instrument for temperature measurements. The displayed values (including statistic values) are reset and the instrument immediately triggers a measurement.

Parameters:

<Probe_Type>	FRTD
	Make a 4-wire temperature measurement.
	RTD
	Make a 2-wire temperature measurement.
	DEF
	RTD (2W)
<Type>	PT100
	PT500
	PT1000

Example: `MEAS:TEMP? FRTD, PT500`

Usage: Query only

9.5 Mathematical functions

This section contains the commands for setting the mathematical functions that can be used with different measurement functions.

CALCulate:FUNCTION {NULL | DB | DBM | AVERage | LIMit | POWer}**CALCulate:FUNCTION?**

Sets the calculation function, but does not activate the function. Use the `CALC ON` command to activate the calculation function.

The following table shows the possible math/measurement function combinations.

Table 9-1: Measurement functions with possible math options

Measure- ment function	Stats	Limits	Hold	Null	dB	dBm	Power
DC V	Yes	Yes	Yes	Yes	Yes	Yes	Yes (only with 2nd function DC I)
AC V	Yes	Yes	Yes	Yes	Yes	Yes	
DC I	Yes	Yes	Yes	Yes	Yes	Yes	Yes (only with 2nd function DC I)
AC I	Yes	Yes	Yes	Yes	Yes	Yes	
Ω	Yes	Yes	Yes	Yes			
CAP	Yes	Yes	Yes	Yes			
SENSOR	Yes		Yes	Yes			
							

Parameters:

{NULL | DB | DBM |
AVERage | LIMit |
POWER}

NULL

Null function

DB

dB function

DBM

dBm function

AVERage

Statistic measurements

LIMit

Limit lines

POWER

Power display

CALCulate[:STATe] {OFF | ON | 0 | 1}

CALCulate[:STATe]?

Turns the selected calculation function on or off. For activating the calculation function, use the **FUNC** command.

The query command returns the current state of the null function for AC V measurements.

Parameters:

<State>

ON | 1

Activates the selected calculation function.

OFF | 0

Deactivates the selected calculation function.

*RST: OFF | 0

CALCulate:POWer?

Returns the DC power value. To activate the power display function, use the `CALC:FUNC POW` command with the `CALC ON` command.

If the instrument is not configured in DC I/DC V or DC V/DC I mode, -1 is returned.

Usage: Query only

**CALCulate:LIMit:LOWer {<Value> | MINimum | MAXimum}
CALCulate:LIMit:LOWer?**

Sets or queries the low limit value of the limit line function. The possible maximum and minimum low limit value depends on the activated measurement function. To activate the limit lines, use the `CALC:FUNC LIM` command with the `CALC ON` command.

Parameters:

<Value> Depends on the activated measurement function

**CALCulate:LIMit:UPPer {<Value> | MINimum | MAXimum}
CALCulate:LIMit:UPPer?**

Sets or queries the high limit value of the limit line function. The possible maximum and minimum high limit value depends on the activated measurement function. To activate the limit lines, use the `CALC:FUNC LIM` command with the `CALC ON` command.

Parameters:

<Value> Depends on the activated measurement function

**CALCulate:DB:REFeRence {<Value> | MINimum | MAXimum}
CALCulate:DB:REFeRence?**

Stores a relative value used for the dB function. The possible dB reference value depends on the activated measurement function. To activate the dB function, use the `CALC:FUNC DB` command with the `CALC ON` command.

The query command returns the value used for the dB function.

Parameters:

<Value> Depends on the activated measurement function

CALCulate:DBM:REFerence {<Value> | MINimum | MAXimum}
CALCulate:DBM:REFerence?

Sets or queries the user defined dBm reference resistance value. To activate the dBm function, use the `CALC:FUNC DBM` command with the `CALC ON` command.

Parameters:

<Value> 1 Ω to 65,5 k Ω (adjustable in 1 Ω steps)
 MIN
 1.0E+00
 MAX
 6.55350E+04

CALCulate:NULL:OFFSet {<Value> | MINimum | MAXimum}
CALCulate:NULL:OFFSet?

Sets or queries the maximum null value depending on the activated measurement function.

Parameters:

<Value> Depends on the activated measurement function

CALCulate:AVERage:AVERage?

Returns the mean value of the statistic function depending on the activated measurement function. To activate the statistic function, use the `CALC:FUNC AVER` command with the `CALC ON` command.

Usage: Query only

CALCulate:AVERage:CLEar

Resets all statistic function values.

Usage: Setting only

CALCulate:AVERage:COUNT?

Returns the number of statistic measurement counts. You can read the statistical values at any time.

Usage: Query only

CALCulate:AVERage:MAXimum?

Returns the maximum value (Max) of the statistic function depending on the activated measurement function. To activate the statistic function use the `CALC:FUNC AVER` command with the `CALC ON` command.

Usage: Query only

CALCulate:AVERage:MINimum?

Returns the minimum value (Min) of the statistic function depending on the activated measurement function. To activate the statistic function, use the `CALC:FUNC AVER` command with the `CALC ON` command.

Usage: Query only

CALCulate:AVERage:PTPeak?

Returns the peak to peak value (Pk to Pk) of the statistic function depending on the activated measurement function. To activate the statistic function, use the `CALC:FUNC AVER` command with the `CALC ON` command.

Usage: Query only

CALCulate:AVERage:SDEViation?

Returns the standard deviation value (StdDev) of the statistic function depending on the activated measurement function. To activate the statistic function, use the `CALC:FUNC AVER` command with the `CALC ON` command.

Usage: Query only

9.6 DISPlay subsystem

The DISPlay subsystem contains the commands for configuring the .

Example: DISPlay settings

The example represents the remote control commands for configuring .

```
// *****
// Display a text message box on the front display.
// Clear the text message box on the front display.
// Turn on the screen backlight
// *****
DISPlay:TEXT 'UDS500'
// Response: 'UDS500' shown on the front display
DISPlay:TEXT:CLEAr
DISPlay:STATE 1
```

DISPlay[::STATe].....	145
DISPlay:TEXT:CLEAr.....	146
DISPlay:TEXT[:DATA].....	146

DISPlay[::STATe] <String>

Activates the backlight of the screen.

Parameters:

<State> 1 | 0 | ON | OFF

Example:See [Example "DISPlay settings"](#) on page 145.**DISPlay:TEXT:CLEAr**

Clears the text message box on the front display.

Example:See [Section 9.6, "DISPlay subsystem"](#), on page 145.**Usage:**

Setting only

DISPlay:TEXT[:DATA] <String>

Displays a text message box on the front display.

Example:See [Section 9.6, "DISPlay subsystem"](#), on page 145.

9.7 Data and file management commands

The **DATA** and **HCOPY** subsystem contains commands for managing the files in the instrument and external USB flash memory.

[DATA:]LOG[:STATe]	146
[DATA:]LOG:INTerval	147
[DATA:]LOG:COUNT	147
[DATA:]LOG:MODE	147
[DATA:]LOG:FORMat	148
[DATA:]LOG:FNAME	148
[DATA:]LOG:TIME	148
DATA:DATA?	149
DATA:DELeTe	149
DATA:LIST?	150
DATA:POINts?	150
HCOPY:DATA?	150
HCOPY:FORMat	151
HCOPY:SIZE:X?	151
HCOPY:SIZE:Y?	151

[DATA:]LOG[:STATe] {OFF | ON | 0 | 1}**[DATA:]LOG[:STATe]?**

Sets or queries the data logging function on or off.

Parameters:

ON | OFF | 0 | 1

ON | 1

Data logging function is activated.

OFF | 0

Data logging function is deactivated.

*RST: OFF | 0

Manual operation: See ["LOGGING"](#) on page 59

[DATA:]LOG:INTERval <Interval in seconds>

[DATA:]LOG:INTERval?

Sets or queries the logging measurement interval. The measurement interval describes the time between the recorded measurements.

Parameters:

<Interval in seconds> 0 s to 3600 s.

Example: LOG:INT? -> e.g. 1.0E+00

Manual operation: See ["INTERVAL"](#) on page 59

[DATA:]LOG:COUNT <No of samples>

[DATA:]LOG:COUNT?

Sets or queries the number of measurement values to be captured. To set the file name and path for the storing the data, see [\[DATA:\]LOG:FNAME](#).

Parameters:

<No of samples> Number of measurement values to be captured.

Range: 0 (Internal/External) to 180000000 (Internal: 50000h), Depends on the capacity of the USB flash memory (External)

Example: LOG:COUN? -> e.g. 1.00E+01

Manual operation: See ["COUNT"](#) on page 59

[DATA:]LOG:MODE {UNLimited | COUNT | TIME}

[DATA:]LOG:MODE?

Sets or queries the data logging mode.

Parameters:

<Mode> UNLimited | COUNT | TIME

UNLimited

Infinite data capture.

COUNT

Number of measurement values to be captured.

TIME

Duration of the measurement values capture.

*RST: UNL

Example: See [Section 9.7, "Data and file management commands"](#), on page 146.

Manual operation: See ["MODE"](#) on page 60

[DATA:]LOG:FORMat {CSV | TXT}

[DATA:]LOG:FORMat?

Sets or queries the data logging file format.

Parameters:

CSV | TXT

CSV

Comma separated values.

TXT

Text file.

*RST: CSV

Example:

See [Section 9.7, "Data and file management commands"](#), on page 146.

[DATA:]LOG:FNAME {<filename>},{[INT | EXT | DEF]}

[DATA:]LOG:FNAME?

Sets or queries the file name and storage location for the logging function.

Parameters:

<filename>

e.g. "Test01.CSV",INT

INT

Internal memory

EXT

USB flash memory

DEF

Internal memory

*RST: OFF | 0

Example:

LOG:FNAME? -> "/INT/DATA/Test01.CSV"

[DATA:]LOG:TIME <Time in seconds>

[DATA:]LOG:TIME?

Sets or queries the data logging time. To set the file name and path for the storing the data, see [\[DATA:\]LOG:FNAME](#).

Parameters:

<Time in seconds>

Depending on instrument settings.

Range: 0 (Internal/External) to 180000000 (Internal: 50000h), Depends on the capacity of the USB flash memory (External)

Example:

LOG:MODE? -> e.g. 5.00000E+04

Manual operation:

See ["TIME"](#) on page 59

DATA:DATA? {<Filename>},{[INT | EXT | DEF]}

Returns the logging file data values of the selected storage location and file name. If no logging file is found, the message "No Logging Files found" is displayed. If no storage location is selected, the instrument queries the internal memory. Please notice that the logging function has to be activated, if you want to use the manual trigger mode (trigger via [Trig] button). Without activating the logging function in manual trigger mode, the instrument is not able to save a logging file internally or on the USB flash memory.

Parameters:

<Filename> e.g. "LOG0029.CSV"

INT

Internal memory

EXT

USB flash memory

DEF

Internal memory

Example:

External logging file (USB flash memory), count = 5
 External logging file (USB flash memory) of
 single trigger, count = 6
 DATA:DATA? 'LOG0001.CSV',EXT -> # UDS -Log-File ; #
 Date: 2013-05-23 ; # Start Time:, 15:09:32; # Stop Time:,
 15:10:03 ; # Settings: ; #<9> ADC Rate : Fast; #<9> AC Filter :
 -----; #<9> Input Imp. : 10M; DCV[V],DCI[A],Flag; 12.891854,
 0.982340 ; 12.889381, 0.982539 ; 12.909376, 0.982238 ;
 12.875769, 0.982418 ; 12.844559, 0.982506 ; 12.863085,
 0.982463 ;

Usage:

Query only

DATA:DELeTe {<Filename>},{[INT | EXT | DEF]}

Deletes the logging file data values of the selected storage location and file name. If no storage location is selected, the instrument uses the internal memory. Take note that the logging function has to be activated, if you want to use the manual trigger mode (trigger via [Trig] button). Without activating the logging function in manual trigger mode, the instrument is not able to save a logging file internally or on the USB flash memory.

Parameters:

<Filename> e.g. "LOG0001.CSV"

INT

Internal memory.

EXT

USB flash memory.

DEF

Internal memory.

Example:

DATA:DEL "LOG0001.CSV",EXT

DATA:LIST? [{INT | EXT | DEF}]

Queries all saved logging files of the selected storage location. If no storage location is selected, the instrument queries the internal memory. Take note that the logging function has to be activated, if you want to use the manual trigger mode (trigger via TRIG button). Without activating the logging function in manual trigger mode, the instrument is not able to save a logging file internally or on the USB flash memory. If you store the logging file on the USB flash memory, the query returns all files depending on the storage format (CSV or TXT files).

Parameters:

INT EXT DEF	INT Internal memory.
	EXT USB flash memory.
	DEF Internal memory.

Example: `DATA:LIST? EXT -> "LOG0001.CSV", "LOG0002.CSV", "LOG0003.CSV"`

Usage: Query only

DATA:POINTS? {<Filename>},[{INT | EXT | DEF}]

Queries the number of measurements from the selected logging file.

If manual trigger mode (trigger via TRIG function) is used, the logging function has to be activated. Without activating the logging function in the manual trigger mode, the instrument is not able to save a logging file internally or on the USB flash memory.

Example: `DATA:DATA? 'LOG0001.CSV', EXT -> 5`
Returns 5 log files counts from "LOG0001.CSV".

Usage: Query only

HCOPY:DATA?

Returns the actual display content (screenshot). The `DATA?` query responses the screenshot data in binary format.

Usage: Query only

Manual operation: See ["SAVE"](#) on page 68

HCOPY:FORMat {BMP | PNG}**HCOPY:FORMat?**

Sets or queries the data format of the screenshot.

Parameters:

BMP | PNG

BMP

Windows Bitmap Format.

PNG

Portable Network Graphic.

*RST: BMP

Manual operation: See "[FORMAT](#)" on page 68

HCOPY:SIZE:X?

Returns the horizontal expansion of the screenshots.

Usage: Query only

HCOPY:SIZE:Y?

Returns the vertical expansion of the screenshots.

Usage: Query only

9.8 SYSTem subsystem

The SYSTem subsystem contains the commands for general functions which do not directly affect instrument operation.

Example: General instrument settings

The example represents the remote control commands for general settings.

```
// Request information on the instrument configuration.
SYSTem:DEV?
// Response: 'UDS500-G' // instrument model
SYSTem:HARDware?
// Response: #H40000000 // hardware version
SYSTem:SNUM?
// Response:
SYSTem:VERsion?
// Response: 0x3

// Enable the instrument to create a time stamp
SYSTem:DATE 2020,02,20
SYSTem:DATE?
Response: 2020,2,20
SYSTem:TIME 10,08,41
SYSTem:TIME?
Response: 10,8,41

// Set the sound functionality of the beeper.
//Enable the sound to beep when an error occurs
SYST:BEEP:STAT On
SYST:BEEP:STATe?
Response: 1

// Disable the sound to beep when the instrument receives a remote control command.
SYST:BEEP Off
SYST:BEEP?
Response: 0
```

FETCH?	153
READ?	153
SYSTem:BEEPer:STATe	153
SYSTem:BEEPer[:IMMediate]	153
SYSTem:DATE	154
SYSTem:DEVIce?	154
SYSTem:ERRor?	154
SYSTem:ERRor:ALL?	154
SYSTem:ERRor[:NEXT]?	155
SYSTem:HARDware?	155
SYSTem:INTErface	155
SYSTem:LOCal	156
SYSTem:NAME	156
SYSTem:REMOte	156
SYSTem:RWLock	156
SYSTem:SNUMber?	156
SYSTem:SOFTware?	156

SYSTem:TIME.....	157
SYSTem:TREE?.....	157
SYSTem:VERsion?.....	157

FETCH?

Queries the actual measurement value on the display in auto trigger, single trigger or manual trigger mode. In contrast to the READ? command, the FETCH? command does not initialize a trigger. By sending the *TRG command before the FETCH? command you get the actual triggered measurement value.

Example: See [Section 9.8, "SYSTem subsystem"](#), on page 151.

Usage: Query only

READ?

Queries the actual measurement value in auto trigger mode. In the single trigger mode, the READ? command initializes a trigger with the settings for trigger count or interval. In the trigger manual mode, the READ? command initializes a trigger. By sending the READ? command again, the trigger mode stops.

Note: The READ? command only queries the first measurement value of the trigger system.

Example: See [Section 9.8, "SYSTem subsystem"](#), on page 151.

Usage: Query only

SYSTem:BEEPer:STATe <Mode>

Switches the front panel control beeper on or off. For example, if the control beeper is disabled, you don't get a control beep during the manual or single trigger.

The query returns the current state.

Parameters:

<boolean> 1 | 0 | ON | OFF
 *RST: ON | 1

Example: See [Section 9.8, "SYSTem subsystem"](#), on page 151.

Manual operation: See ["Error Beep"](#) on page 75

SYSTem:BEEPer[:IMMediate]

Activates the beeper to return a single beep immediately.

Usage: Setting only

Manual operation: See ["CTRL Beep"](#) on page 75

SYSTem:DATE <arg0>, <arg1>, <arg2>

SYSTem:DATE?

Sets or queries the system date.

Parameters:

<year> Sets year of the date.

<month> Sets month of the date.

<day> Sets day of the date.

Example: SYSTem:DATE 2018, 10, 15

SYSTem:DATE? -> 2018, 10, 15

Returns the system date.

Example: See [Section 9.8, "SYSTem subsystem"](#), on page 151

Manual operation: See ["Date"](#) on page 74

SYSTem:DEvice?

Queries the instrument model.

Example: See [Section 9.8, "SYSTem subsystem"](#), on page 151.

Usage: Query only

SYSTem:ERRor?

Queries the eThis command reads the oldest error from the list of errors stored in the error queue of the instrument.

See also [SYSTem:ERRor:ALL?](#).

Usage: Query only

SYSTem:ERRor:ALL?

Queries the error/event queue for all unread items and removes them from the queue. The response is a comma separated list of error number and a short description of the error in FIFO order. Positive error numbers are instrument-dependent. Negative error numbers are reserved by the SCPI standard.

Return values:

<ERRor> List of:
 Error/event_number,"Error/event_description"[;Devicedepend-
 ent info]"
 If the queue is empty, the response is 0,"No error"

Usage: Query only
 SCPI confirmed

SYSTem:ERRor[:NEXT]?

Queries an error and removes it from the queue. Positive error numbers are instrument-dependent. Negative error numbers are reserved by the SCPI standard. If the queue is empty, the response is 0, "No error".

Return values:

<ERRor>	0, "No error"
	-100, "Command error"
	-102, "Syntax error"
	-104, "Data type error"
	-350, "Queue overflow"

Usage: Query only

SYSTem:HARDware?

Queries the instrument hardware version.

Example: See [Section 9.8, "SYSTem subsystem"](#), on page 151.

Usage: Query only

SYSTem:INTERface <interface>

Selects the interface for remote control.

Parameters:

<Interface> LAN | GPIB | USB CDC | USB TMC

LAN

Selects the Ethernet (LAN) interface for remote control.

GPIB

Selects the IEEE488 interface for remote control.

USB CDC

Selects the USB interface for remote control over the VCP port with CDC protocol (requires USB-VCP driver).

USB TMC

Selects the USB interface for remote control with TMC protocol (requires VISA library).

Example: See [Section 7, "General settings"](#), on page 69

Usage: SCPI confirmed

Manual operation: See ["ETHERNET"](#) on page 90
 See ["Save"](#) on page 92
 See ["USB TMC"](#) on page 94

SYSTem:LOCa1

Sets the system to front panel control. The front panel control is unlocked. If the front panel control was locked with [SYSTem:RWLock](#), the message box of the locked front panel on the display is closed.

Usage: Setting only

SYSTem:NAME <Name>

Defines or queries the instrument name.

Parameters:

<Name> String with max. 20 characters.

Example: `SYSTem:NAME 'TEST UNIT'`
`SYSTem:NAME?`
`<-- TEST UNIT`

SYSTem:REMOte

Sets the system to remote state. The front panel control is locked.

Usage: Setting only

SYSTem:RWLock

Sets the system to remote state. The front panel control is locked and a message box is shown on the instrument display.

To unlock the front panel control, use [SYSTem:LOCa1](#).

Usage: Setting only

SYSTem:SNUMber?

Queries the instrument serial number.

Example: See [Section 9.8, "SYSTem subsystem"](#), on page 151.

Usage: Query only

SYSTem:SOFTware?

Queries the instrument firmware version.

Example: See [Section 9.8, "SYSTem subsystem"](#), on page 151.

Usage: Query only

SYSTem:TIME <arg0>, <arg1>, <arg2>

SYSTem:TIME?

Sets or queries the system time.

Parameters:

<hh> Sets the hours of the system time.

Range: 0 to 23

<mm> Sets the minutes of the system time.

Range: 0 to 59

<ss> Sets the seconds of the system time.

Range: 0 to 59

Example: SYSTem:TIME 12, 30, 59

SYSTem:TIME? -> 12, 30, 59

Returns system time.

Example: See [Section 9.8, "SYSTem subsystem"](#), on page 151

Manual operation: See ["Time"](#) on page 74

SYSTem:TREE?

Returns a list of implemented remote commands.

Usage: Query only

SYSTem:VERSion?

Returns the firmware version and the version of the SCPI standard.

Usage: Query only

Manual operation: See ["Device Information"](#) on page 73

9.9 STATus subsystem

This system contains the commands for the status reporting system. See also [Section 8.6, "Status reporting system"](#), on page 101 for detailed information. *RST has no effect on the status registers.

9.9.1 Status operation register

This system contains the commands for controlling the STATus:OPERation register of the status reporting system.

The configuration commands set the corresponding register. They determine which status changes of the R&S UDS cause changes in the status registers.

Value range: Decimal values in the range 0 to 32767 ($=2^{15}-1$)

STATus:PRESet.....	158
STATus:OPERation:CONDition?.....	158
STATus:OPERation:ENABLE.....	158
STATus:OPERation:ENABLE?.....	158
STATus:OPERation:NTRansition.....	159
STATus:OPERation:PTRansition.....	159
STATus:OPERation[:EVENT]?.....	159

STATus:PRESet <Preset>

Resets the status registers. All PTRansition parts are set to FFFFh (32767), i.e. all transitions from 0 to 1 are detected. All NTRansition parts are set to 0, i.e. a transition from 1 to 0 in a CONDition bit is not detected. The ENABLE parts of STATus:OPERation and STATus:QUESTionable are set to 0, i.e. all events in these registers are not passed on.

Parameters:

<Preset> string

Example:

STATus:PRESet
resets the status registers.

Usage: Setting only

STATus:OPERation:CONDition?

Queries the CONDition part of the operational status register.

Return values:

<CONDition> Condition bits in decimal representation.
Range: 1 to 65535

Usage: Query only

STATus:OPERation:ENABLE <Enable_value>

Enables the bits in the enable register for the Standard Operation Register group.

Parameters:

<Enable_Value> Range: 1 to 65535

STATus:OPERation:ENABLE?

Queries the bits in the enable register for the Standard Operation Register group.

Usage: Query only

STATus:OPERation:NTRansition <Value>

Sets or queries the negative transition filter. If a bit is set, a 1 to 0 transition in the corresponding bit of the condition register causes a 1 to be written in the corresponding bit of the status register.

Parameters:

<Value> Range: 1 to 65535

STATus:OPERation:PTRansition <Value>

Sets or queries the positive transition filter. If a bit is set, a 0 to 1 transition in the corresponding bit of the condition register causes a 1 to be written in the corresponding bit of the status register.

Parameters:

<Value> Range: 1 to 65535

STATus:OPERation[:EVENT]?

Queries the actions the instrument has executed since the last reading.

Return values:

<OPERation> Range: 1 to 65535

Usage: Query only

9.9.2 Status questionable register

This system contains the commands for controlling the STATus:QUEStionable register of the status reporting system.

Queries return the current value of the corresponding register, which permits a check of the device status.

STATus:QUEStionable:CONDition?	159
STATus:QUEStionable:ENABLE	160
STATus:QUEStionable:ENABLE?	160
STATus:QUEStionable:NTRansition	160
STATus:QUEStionable:PTRansition	160
STATus:QUEStionable[:EVENT]?	160

STATus:QUEStionable:CONDition?

Returns the contents of the CONDition part of the status register to check for questionable instrument or measurement states. Reading the CONDition registers does not delete the contents.

Return values:

<Condition> Condition bits in decimal representation
Range: 1 to 65535

Usage: Query only

STATus:QUESTIONable:ENABLE <Enable_value>

Sets the enable mask that allows true conditions in the EVENT part to be reported in the summary bit. If a bit in the enable part is set to 1 and its associated event bit transitions to true, a positive transition occurs in the summary bit and is reported to the next higher level.

Parameters:

<Enable_value> Bit mask in decimal representation
Range: 1 to 65535

STATus:QUESTIONable:ENABLE?

Queries the enable register and returns a decimal value which corresponds to the binary-weighted sum.

Usage: Query only

STATus:QUESTIONable:NTRansition <Value>

Sets or queries the negative transition filter. If a bit is set, a 1 to 0 transition in the corresponding bit of the condition register causes a 1 to be written in the corresponding bit of the event register.

Parameters:

<Value> Bit mask in decimal representation
Range: 1 to 65535

STATus:QUESTIONable:PTRansition <Value>

Sets or queries the positive transition filter. If a bit is set, a 0 to 1 transition in the corresponding bit of the condition register causes a 1 to be written in the corresponding bit of the event register.

Parameters:

<Value> Bit mask in decimal representation
Range: 1 to 65535

STATus:QUESTIONable[:EVENT]?

Queries the contents of the EVENT part of the status register to check whether an event has occurred since the last reading. Reading an EVENT register deletes its contents.

Return values:

<QUESTIONable> Event bits in decimal representation
Range: 1 to 65535

Usage: Query only

10 Troubleshooting and notifications

- [Displaying status information and notifications](#)..... 162
- [Problems during firmware update](#)..... 162
- [Problems with remote control over LAN](#)..... 163
- [Contacting customer support](#)..... 163

10.1 Displaying status information and notifications

The R&S UDS displays notifications to inform you on current settings and states. It distinguishes between status, information and error notifications and warnings.

Some information and notifications are entered in the error/event queue of the status reporting system, see [Section 8.6, "Status reporting system"](#), on page 101.

10.2 Problems during firmware update

The firmware update is described in [Section 7.1, "Updates \(instrument firmware\)"](#), on page 69 .

Solutions for potential problems that can occur during firmware update are described in the following sections.

Firmware update was interrupted

If for example, a power cut happened during the firmware update, problems can occur.

1. Perform the firmware update again. Sometimes, a further update fixes the problems.
2. If you nevertheless cannot update the R&S UDS, contact the local service representative, see [Section 10.4, "Contacting customer support"](#), on page 163.

Firmware update was aborted

If there is not enough free memory space, the firmware update aborts. The instrument displays an error message.

- Start the firmware update again.

10.3 Problems with remote control over LAN

10.3.1 Cannot establish a LAN connection

If you have problems to establish a LAN connection as described in [Section 8.3.1, "Connecting to LAN"](#), on page 94:

1. Check if the TCP/IP address information is valid.
2. Assign the IP address manually, e.g. if the network does not support DHCP configuration, see [Section 8.4, "Adjusting the interface addresses"](#), on page 96.

10.3.2 Cannot communicate over LAN

If you have problems to establish the LAN communication:

1. Refer to the application note [1SL374: How to communicate with R&S devices using VISA](#), that provides comprehensive information on configuring the interfaces, required drivers, and testing the communication.
2. If you still have problems, contact the customer support.

10.4 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, or follow this QR code:



Figure 10-1: QR code to the Rohde & Schwarz support page

11 Transporting

Lifting and carrying

For safety information, see:

- ["Lifting and carrying the product"](#) on page 10
- .

Packing

Use the original packaging material. It consists of antistatic wrap for electrostatic protection and packing material designed for the product.

If you do not have the original packaging, use similar materials that provide the same level of protection. You can also contact your local Rohde & Schwarz service center for advice.

Securing

When moving the product in a vehicle or using transporting equipment, make sure that the product is properly secured. Only use items intended for securing objects.

Transport altitude

Unless otherwise specified in the data sheet, the maximum transport altitude without pressure compensation is 4500 m above sea level.

12 Maintenance, storage and disposal

We advise to check the nominal data from time to time.

12.1 Cleaning

How to clean the product is described in "[Cleaning the product](#)" on page 13.

Do not use any liquids for cleaning. Cleaning agents, solvents, acids and bases can damage the front panel labeling, plastic parts and display.

12.2 Changing fuses

If the R&S UDS does not start, it is possible that a blown fuse is the cause. Proceed as described in [Preparing for use >To change the fuse](#).

12.3 Storage

Protect the product against dust. Ensure that the environmental conditions, e.g. temperature range and climatic load, meet the values specified in the specifications document.

12.4 Disposal

Rohde & Schwarz is committed to making careful, ecologically sound use of natural resources and minimizing the environmental footprint of our products. Help us by disposing of waste in a way that causes minimum environmental impact.

Disposing of electrical and electronic equipment

A product that is labeled as follows cannot be disposed of in normal household waste after it has come to the end of its life. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.



Figure 12-1: Labeling in line with EU directive WEEE

Rohde & Schwarz has developed a disposal concept for the eco-friendly disposal or recycling of waste material. As a manufacturer, Rohde & Schwarz completely fulfills its

obligation to take back and dispose of electrical and electronic waste. Contact your local service representative to dispose of the product.

12.5 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, or follow this QR code:



Figure 12-2: QR code to the Rohde & Schwarz support page

Glossary: List of often used terms and abbreviations

C

CDC: Communications device class: protocol used for emulating serial ports over USB.

Computer name: An unambiguous indication of the instrument a LAN that uses a [DNS](#) server.

The default computer name follows the syntax `<instrument>-<serial number>`.

Synonym: [Hostname](#)

See [Serial number](#).

D

DHCP: Dynamic host configuration protocol

DNS: Domain name system server

E

e.g.: For example

F

FFT: "Fast Fourier Transformation"

A mathematical algorithm to convert a signal, e.g. from the time domain to the frequency domain and vice versa. You can use this method to represent the time-dependent behavior of the signal power.

G

Glossary: List of the often used terms and abbreviations

GPIB: General purpose interface bus: digital interface system, used to control an instrument remotely or transfer data between two or more instruments.

GUI: Graphical user interface

H

Hostname: [Computer name](#)

I

i.e.: That is

IEC 625/IEEE 488: [GPIB](#)

L

Line voltage: AC voltage of the network.
Synonyms: Mains voltage

O

OSA: Open source acknowledgment documentation embedded in the instrument firmware.

P

PC: Personal computer

product page: A designation of the R&S UDS product page.

R

Remote control: The operation of the R&S UDS by remote control commands or programs to perform automated tests.
The instrument is connected to a system controller via LAN, GPIB or USB using [VISA](#).
The instrument is controlled directly or supported by instrument drivers.

Remote device: External device controls the R&S UDS in remote operation mode, see Remote operation.
Synonyms: External controller, client device

S

SCPI: Standard commands for programmable instruments.

Serial number: Unique instrument identification, provided on the rear panel of the instrument and required to build the [Computer name](#).
The serial number are the last 6 digits in the string `<stock no.>-<serial number>`.

T

TCP/IP: Transmission control protocol / Internet protocol for communication of devices in a network (Internet or private network).

U

URL: Uniform resource locator: address string for unique identification of a device connected to a network.

USB: Universal bus interface

USBTMC: USB test & measurement class specification: a protocol that is built on top of USB for communication with USB devices.

V

VCP: Virtual COM port

Synonym: [CDC](#)

VISA: Virtual instrument software architecture for communication over various interfaces, e.g. Ethernet, LAN or USB.

VISA library: Standardized I/O software interface library for communication of devices over TCP/IP protocols.

List of commands

[DATA:]LOG:COUNT.....	147
[DATA:]LOG:FNAME.....	148
[DATA:]LOG:FORMAT.....	148
[DATA:]LOG:INTERVAL.....	147
[DATA:]LOG:MODE.....	147
[DATA:]LOG:TIME.....	148
[DATA:]LOG[:STATE].....	146
[SENSe:]ADCRate.....	134
[SENSe:]CAPacitance:NULL:VALue.....	128
[SENSe:]CAPacitance:NULL[:STATE].....	128
[SENSe:]CAPacitance:RANGe:AUTO.....	128
[SENSe:]CAPacitance:RANGe[:UPPer].....	129
[SENSe:]CONTInuity:BEEPer[:STATE].....	133
[SENSe:]CONTInuity:THReshold.....	133
[SENSe:]CURRent:AC:BANDwidth.....	117
[SENSe:]CURRent:AC:NULL:VALue.....	117
[SENSe:]CURRent:AC:NULL[:STATE].....	117
[SENSe:]CURRent:AC:RANGe[:UPPer].....	118
[SENSe:]CURRent[:DC]:NULL:VALue.....	119
[SENSe:]CURRent[:DC]:NULL[:STATE].....	119
[SENSe:]CURRent[:DC]:RANGe:AUTO.....	119
[SENSe:]CURRent[:DC]:RANGe[:UPPer].....	120
[SENSe:]DIODE:BEEPer[:STATE].....	130
[SENSe:]DIODE:THReshold.....	130
[SENSe:]FREQuency:APERture.....	121
[SENSe:]FREQuency:CURRent:RANGe:AUTO.....	121
[SENSe:]FREQuency:CURRent:RANGe[:UPPer].....	122
[SENSe:]FREQuency:VOLTagE:RANGe:AUTO.....	122
[SENSe:]FREQuency:VOLTagE:RANGe[:UPPer].....	122
[SENSe:]FREStance:NULL:VALue.....	124
[SENSe:]FREStance:NULL:VALue.....	131
[SENSe:]FREStance:NULL[:STATE].....	123
[SENSe:]FREStance:RANGe:AUTO.....	124
[SENSe:]FREStance:RANGe[:UPPer].....	124
[SENSe:]FUNCTION[:ON].....	134
[SENSe:]RESistance:NULL:VALue.....	126
[SENSe:]RESistance:NULL[:STATE].....	125
[SENSe:]RESistance:RANGe:AUTO.....	126
[SENSe:]RESistance:RANGe[:UPPer].....	126
[SENSe:]TEMPerature:NULL[:STATE].....	131
[SENSe:]TEMPerature:TRANSDUCER:RTD:TYPE.....	132
[SENSe:]TEMPerature:TRANSDUCER:TYPE.....	132
[SENSe:]VOLTagE:AC:BANDwidth.....	112
[SENSe:]VOLTagE:AC:NULL:VALue.....	112
[SENSe:]VOLTagE:AC:NULL[:STATE].....	112
[SENSe:]VOLTagE:AC:RANGe:AUTO.....	113
[SENSe:]VOLTagE:AC:RANGe[:UPPer].....	113

[SENSe:]VOLTage[:DC]:NULL:VALue.....	114
[SENSe:]VOLTage[:DC]:NULL[:STATe].....	114
[SENSe:]VOLTage[:DC]:RANGe:AUTO.....	115
[SENSe:]VOLTage[:DC]:RANGe[:UPPer].....	115
[SENSe:]VOLTage[:DC]:ZERO:AUTO.....	115
*CLS.....	107
*ESE.....	107
*ESR?.....	108
*IDN?.....	108
*LRN?.....	108
*OPC.....	108
*PSC.....	108
*RCL <Storage>.....	109
*RST.....	109
*SAV <Storage>.....	109
*SRE.....	109
*STB?.....	109
*TRG.....	110
*TST?.....	110
*WAI.....	110
CALCulate:AVERage:AVERage?.....	144
CALCulate:AVERage:CLEAr.....	144
CALCulate:AVERage:COUNT?.....	144
CALCulate:AVERage:MAXimum?.....	144
CALCulate:AVERage:MINimum?.....	145
CALCulate:AVERage:PTPeak?.....	145
CALCulate:AVERage:SDEVIation?.....	145
CALCulate:DB:REFerence.....	143
CALCulate:DBM:REFerence.....	144
CALCulate:FUNCTion.....	141
CALCulate:LIMit:LOWer.....	143
CALCulate:LIMit:UPPer.....	143
CALCulate:NULL:OFFSet.....	144
CALCulate:POWer?.....	143
CALCulate[:STATe].....	142
CONFigure:CAPacitance.....	127
CONFigure:CONTInuity?.....	133
CONFigure:CURRent:AC.....	116
CONFigure:CURRent[:DC].....	118
CONFigure:DIODE?.....	129
CONFigure:FREQuency:CURRent.....	121
CONFigure:FREQuency[:VOLTAGE].....	120
CONFigure:FRESistance.....	123
CONFigure:RESistance.....	125
CONFigure:TEMPerature.....	131
CONFigure?.....	134
CONFigure[:VOLTage]:AC.....	111
CONFigure[:VOLTage][:DC].....	113
DATA:DATA?.....	149
DATA:DELete.....	149

DATA:LIST?	150
DATA:POINts?	150
DISPlay:TEXT:CLEAr	146
DISPlay:TEXT[:DATA]	146
DISPlay[:STATe]	145
FETCh?	153
HCOPy:DATA?	150
HCOPy:FORMat	151
HCOPy:SIZE:X?	151
HCOPy:SIZE:Y?	151
MEASure:CAPacitance?	140
MEASure:CONTInuity?	140
MEASure:CURREnt:AC?	136
MEASure:CURREnt:DC?	137
MEASure:DIODE?	141
MEASure:FREQuency:CURREnt?	139
MEASure:FREQuency[:VOLTAGE]?	139
MEASure:FRESistance?	138
MEASure:RESistance?	137
MEASure:TEMPerature?	141
MEASure[:VOLTage]:AC?	135
MEASure[:VOLTage]:DC?	136
READ?	153
STATus:OPERation:CONDition?	158
STATus:OPERation:ENABle	158
STATus:OPERation:ENABle?	158
STATus:OPERation:NTRansition	159
STATus:OPERation:PTRansition	159
STATus:OPERation[:EVENT]?	159
STATus:PRESet	158
STATus:QUEStionable:CONDition?	159
STATus:QUEStionable:ENABle	160
STATus:QUEStionable:ENABle?	160
STATus:QUEStionable:NTRansition	160
STATus:QUEStionable:PTRansition	160
STATus:QUEStionable[:EVENT]?	160
SYSTem:BEEPer:STATe	153
SYSTem:BEEPer[:IMMediate]	153
SYSTem:DATE	154
SYSTem:DEvice?	154
SYSTem:ERRor:ALL?	154
SYSTem:ERRor?	154
SYSTem:ERRor[:NEXT]?	155
SYSTem:HARDware?	155
SYSTem:INTerface	155
SYSTem:LOCal	156
SYSTem:NAME	156
SYSTem:REMOte	156
SYSTem:RWLock	156
SYSTem:SNUMber?	156

SYSTem:SOFTware?.....	156
SYSTem:TIME.....	157
SYSTem:TREE?.....	157
SYSTem:VERsion?.....	157
UNIT:TEMPerature.....	132

Index

A

A	
Front panel	28
About	
CSV	79
AC power supply	
Rear panel	30
AC supply	
How to connect	23
Access	
CSV settings	79
Data and time settings	74
Data logging	57
Default settings	82
Device information	72
Device name settings	77
Interface	84
Key brightness settings	76
Limit settings	54
Miscellaneous	72
Power up settings	81
Save and recall	63
Screenshot	67
Sound settings	75
Statistics	52
Application cards	17
Application notes	17
Arrow keys	33
Assistance	32

B

Back key	33
Beeper	
Limits	55
Bench top, placing the R&S UDS	19
Brightness	
Keys	77

C

Cable selection	
Test setup considerations	21
Calibration certificate	17
Carrying the instrument	18
Checking the instrument	18
Cleaning	166
Clear status	
Remote	107
Com	
Front panel	28
Command sequence	
Remote	110
Commands	
Remote control	106
CONDition	103
Connect to AC supply	
How to	23
Connect to GPIB (IEC 625/IEEE 488)	
How to: connect for remote control	96
Connect to ground	
How to	23

Connect to LAN	
How to	95
Connecting	
LAN	94
Memory stick	26
Power	23
USB devices	26
Considerations	
Setting up	21
Contents of the status registers	
Application of the status reporting system	105
Event status register (ESR) and event status enable register (ESE)	104
Status operation register	104
Control beep	
Setup	75
Conventions	
SCPI	106
CSV	
About	79
General instrument settings	80
General settings	78, 79
CSV settings	
Decimal separator	80
Error value	80
Field delimiter	80
Line separator	80
Customer support	163, 167

D

Data	
Accessing	62
Handling	62
Retrieving	62
Data logging	
Access	57
How to: set	57
Date	
Setup	74
Decimal separator	
CSV settings	80
Default settings	
General settings	82
Default values	
Remote	109
Device information	
General settings	72
Setup	73
Device name	
General settings	77
DHCP	96
Display	
Characteristics	32
Front panel	27
Indicators	32
Key brightness	77
Key fallback time	77
Display information	32
DISPlay subsystem	
Remote control commands	145
Disposal	166
Documentation overview	16

E

Editor	
Instrument name	78
ENABLE	103
Enable registers	
Remote	108
Error beep	
General settings	75
Setup	75
Error value	
CSV settings	80
Ethernet	
Remote access	89
Ethernet address	
How to: adjust IP address	96
EVENT	103
Event status enable register (ESE)	
Remote	107
Event status register (ESR)	
Remote	108

F

Fall back	
How to: set brightness	76
Fallback time	32
Field delimiter	
CSV settings	80
File and data management	
Screenshot	66
Firmware update	
General settings	70
Notifications	162
Front panel	
A	28
Com	28
Display	27
Function keys	28
Fuse	28
HI sense	28
Interactive softkeys	27
LO sense	28
Navigation controls	28
Overview	27
Power key	28
USB connector	28
V	28
Function keys	
Front panel	28
Fuse	
Front panel	28
Fuses	
How to replace the line fuse	22

G

Gateway	91
General functions	
Control beep	75
Key brightness	77
Key fallback time	77
General instrument settings	
CSV	80
Power up	81

General settings	
CSV	78
CSV settings	79
Date	74
Default settings	82
Device information	72, 73
Device name	77
Error beep	75
Firmware update	70
Key brightness	76
Miscellaneous	71
Power up	81
Sound menu	74
Time	74
Getting started	16
GPIOB	
Characteristics	87
Rear panel	29
Settings	92
GPIOB address	
Adjusting	99
How to: adjust address	99
How to: adjust the address on the controller	100
Ground	
How to connect	23
Ground terminal	
Rear panel	30

H

Help	16
Screenshot shortcut key	67
HI sense	
LO	28
High	
Limit	55
How to:	
Adjust Ethernet address	96
Adjust interface addresses	96
Adjust the GPIOB bus address manually	99
Adjust the GPIOB bus address on the controller	100
Assign IP address on controller	98
Assign the IP address manually	96
Check LAN connection	98
Connect to AC supply	23
Connect to GPIOB (IEC 625/IEEE 488)	96
Connect to ground	23
Connect to LAN	25
Connect to USB B	95
Connect USB storage device	26
Connecting to LAN	95
Fall back time setting	76
Key brightness setting	76
Limit configuration	54
Replace the line fuse	22
Return to previous level or menu	73, 77, 92
Select the supplied mains voltage	23
Select USB port	100
Set data logging	57
Set statistics	52
Switch on	24

I

Identification	
Remote	108

IEC Socket	
Rear panel	30
IEC/IEEE	
Rear panel	29
Instrument	
Carrying	18
Checking	18
Lifting	18
Operating site	18
Setting up	19
Tour	26
Unpacking	18
Instrument control	
Manual operation	31
Remote control	34
Instrument name	
How to assign	78
Instrument security procedures	16
Interactive softkeys	32
Front panel	27
Interface	
Access	84
GPIB	87
LAN	85
USB	86
Interfaces	
Remote control	83
IP address	85
Adjusting	96
Dynamic	90
How to: assign address manually	96
How to: assign the address manually on the controller	98
IP address Mode	90
IP-Status	91
K	
Kensington lock	
Rear panel	30
Key brightness	
General settings	76
How to: set brightness	76
Setup	77
Key fallback time	
Setup	77
L	
Lan	
Interface	85
LAN	
Characteristics	85
Connecting	94
How to connect	95
How to: check connection	98
IP address	85
Rear panel	30
LAN communication	
Problems	163
LAN connection	
Problems	163
Lifting the instrument	18
Limits	
Beeper	55
LIMITS	
Measurement	55

Line separator	
CSV settings	80
Link	91
LO sense	
Front panel	28
Low	
Limit	55

M

Mac address	90
Mains voltage	
How to select the supplied mains voltage	23
Preparing	21
Maintenance	166
Cleaning	166
Manual operation	31
Measurement	
High Limit	55
How to: configure limits	54
LIMITS	55
Low Limit	55
Power	61
Measurement commands	
Remote control commands	
..... 110, 116, 120, 123, 127, 129, 130, 132, 133, 135	
Messages	162
Miscellaneous	
General settings	71
Mode	
IP address	90
Mounting, in a rack	20

N

Navigation controls	33
Front panel	28
Non-operational data	62
Notifications	162
NTRansition	103

O

Operating site	
Choosing	18
Operation	
Manual	31
Remote operation	34
Operation complete	
Remote	108
Operational data	62
Overview	
Front panel	27
Rear panel	29

P

Power	
Connecting the instrument	23
Measurement	61
Wire resistance	61
Power key	
Front panel	28
Power states	24
Power up	
General instrument settings	81
General settings	81

Preparing for use	18
Protocol	
SCPI	88
VISA	88
Protocols	
Remote control	83
PTRansition	103

R

Rack, mounting	20
Raw-port	91
Rear panel	
AC power supply	30
GPIO	29
Ground terminal	30
IEC Socket	30
IEC/IEEE	29
Kensington lock	30
LAN	30
Overview	29
Switch	30
USB B	30
voltage selector switch	30
Remote access	83
Ethernet settings	89
GPIO settings	92
IP address mode	90
IP-Status	91
Network gateway	91
Network IP address	90
Network Link	91
Network Mac address	90
Network raw-port	91
Network transfer mode	91
Reset	91
Saves	91
Settings	89
Subnet mask	90
USB settings	93
Remote control	34
Commands	106
GPIO interface	87
How to: adjust interface addresses	96
Interfaces	34, 83
LAN interface	85
Protocols	83
SCPI	83
Start	101
Stop	101
USB interface	86
Remote control commands	
Data and file management commands	146
DISPlay subsystem	145
Measurement commands	110, 116, 120, 123, 127, 129, 130, 132, 133, 135
Voltage configuration commands	111
Remote operation	
VNC	83
Replace the line fuse	
How to:	22
Reset	91
Reset values	
Remote	109
Resource string	
VISA	85

Return	
How to: previous level or menu	73, 77, 92
Rotary knob	33

S

Safety information	9
Safety instructions	9
Saves	91
SCPI	
Command description	106
Status register structure	104
SCPI programmers manual	
See user manual	16
Screenshot	
Access	67
Screenshot shortcut key	
Help	67
Security procedures	16
Select the supplied mains voltage	
How to:	23
Self-test	
Remote	110
Service request enable register (SRE)	
Remote	109
Setting up the instrument	
Considerations	21
Placing	19
Settings	
Remote access	89
Setup	
Control beep	75
Date	74
Device information	73
Error beep	75
Key brightness	77
Key fallback time	77
Time	74
Signal in/out	
Test setup considerations	21
Signal words	14
Socket	91
Sound menu	
General settings	74
Specifications	17
Statistics	
Access	52, 63
How to: set	52
Status byte	
Remote	107, 109
Status information	
Notifications	162
Status registers	
CONDition	103
ENABLE	103
EVENT	103
model	104
NTRansition	103
parts	104
PTRansition	103
SCPI	104
Status reporting system	101
Common commands	107
Error queue	105
Structure of a SCPI status register	102
Storage	166
Subnet mask	90

Switch	
Rear panel	30
Switching on or off	24
System and function keys	33

T

Test setup considerations	
Cable selection	21
Signal in/out	21
Time	
Setup	74
Tooltips	32
Transfer	91
Trigger	
Event (remote)	110
Troubleshooting	162
Firmware update notifications	162
LAN communication problems	163
LAN connection problems	163
Status notifications	162
Trying out the instrument	
Activating the channel output	34
Measuring DC/AC Current	34
Measuring DC/AC Voltage	34
Setting the output voltage and current limit	34
Storing/Recalling of instrument settings	34

U

Unpacking the instrument	18
Update firmware	
General settings	70
USB	
Characteristics	86
How to: select the port	100
Settings	93
USB B	
How to: connect for remote control	95
Rear panel	30
USB connector	
Front panel	28
User manual	16

V

V	
Front panel	28
VISA	84
Resource string	85
Voltage configuration commands	
Remote control commands	111
voltage selector switch	
Rear panel	30

W

Wait	
Remote	110
Warning messages	
Signal words	14
Ways of operation	30
Welcome to R&S UDS	16
Wire resistance	
Power	61