R&S®NGT3600
Power Supply Series
User Manual

5602441702
Version 01

ROHDE&SCHWARZ
Make ideas real

This manual describes the following R&S®NGT3600 models with firmware version 1.00 or higher:

- R&S®NGT3621 one-channel 80 V / 50 A, -2.5 A power supply 1800 W (5602.4000.02)
- R&S®NGT3622 two-channel 80 V / 50 A, -2.5 A power supply 3600 W (5602.4000.03)

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Contents

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 product is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments by personnel familiar with the potential risks of measuring electrical quantities.

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

Target audience

Only connect, set up and use a power supply if you are an electrically skilled person. An electrically skilled person has the relevant education and experience to identify electrical risks and take appropriate actions to prevent related hazards.

This document targets at all users, including 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.

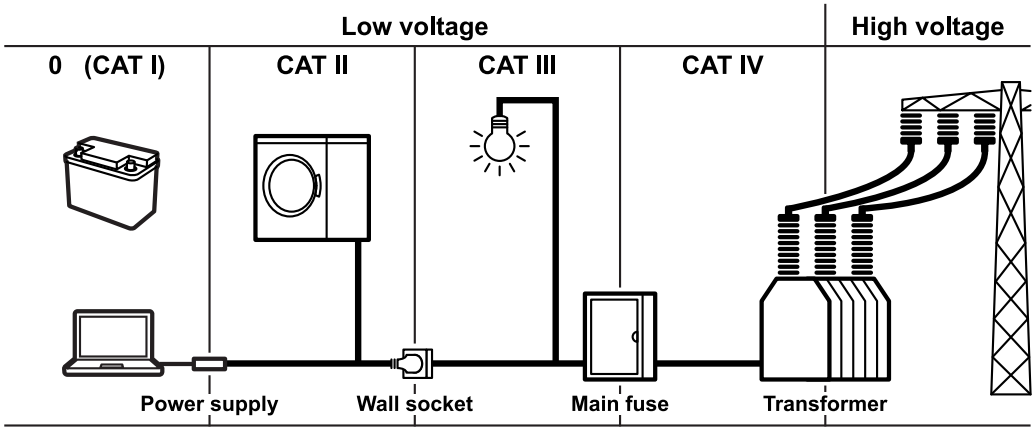
In series or parallel setups, protect yourself against electric shock before connecting access ports such as the Ethernet port or the USB port using one of the following measures:

- 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 R&S NGT3600

Labels on the casing inform about:

- Personal safety, see "Meaning of safety labels" on page 13.
- Product and environment safety, see Table 1-1.
- Device information is provided on a sticker attached to the rear panel of R&S NGT3600. The sticker contains a barcode and the device ID. The device ID is a combination of the order number and the serial number.

Table 1-1: Labels regarding R&S NGT3600 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 service life. For more information, see "Disposing of electrical and electronic equipment" on page 230.
	Grounding terminal (earth ground contact)
	ON (supply voltage)
	OFF (supply voltage)
	Chassis grounding terminal

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 NGT3600

The one or two-channel power supply series are based on a primary switched-mode regulator with power factor correction. This concept allows the instrument to achieve the highest accuracy and lowest residual ripple.

Key features

All output channels of R&S NGT3600 are galvanically isolated, floating and protected against overloading and short-circuits. Outstanding key features are:

- One or two channels with maximum 1800 W total output per channel
- Maximum output voltage of 80 V per channel
- Two-quadrant power supply with maximum output source current of 50 A and sink current of 2.5 A per channel
- Parallel or series connection to achieve higher current and voltage respectively
- Multipurpose protection functions (OVP, OCP, OPP) set separately for each channel
- Overtemperature protection function (OTP) against overheating for each channel
- Protection linking function against OVP, OCP, OPP and OTP for the two-channel model
- Arbitrary function for freely definable voltage and current sequences with a timeframe as short as 1 ms
- Ramp function to ramp up supply voltage within a defined timeframe of 10 ms to 10 s
- Digital I/O function to generate trigger events for output control and indication
- Multi-device connection setup for up to 6 single-channel or 3 two-channel power supplies to generate higher current and voltage outputs
- Various interfaces (USB, LAN) for ease of remote connection
- Various control settings (Delay, High impedance mode, Output impedance, Remote sense and Output relay lock) for each output control

For more information, see the specifications document.

2.1 Documentation overview

This section provides an overview of the R&S NGT3600 user documentation. Unless specified otherwise, you find the documents at:

www.rohde-schwarz.com/manual/ngt3600

Further documents are available at:

www.rohde-schwarz.com/product/ngt3600

2.1.1 Getting started manual

Introduces the R&S NGT3600 power supply series and describes how to set up and start working with the product. Includes basic operations, typical measurement examples, and general information, e.g. safety instructions, etc. A printed version is delivered with the instrument.

2.1.2 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.

2.1.3 Printed safety instructions

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

2.1.4 Specifications and product brochures

The specifications document, also known as the data sheet, contains the technical specifications of the R&S NGT3600. It also lists the firmware applications and their order numbers, and optional accessories.

The brochure provides an overview of the instrument and deals with the specific characteristics.

See www.rohde-schwarz.com/brochure-datasheet/ngt3600

2.1.5 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.

2.1.6 Release notes and open source acknowledgment (OSA)

The release notes list new features, improvements and known issues of the current software version, and describe the software installation.

The software uses several valuable open source software packages. An open source acknowledgment document provides verbatim license texts of the used open source software.

See www.rohde-schwarz.com/firmware/ngt3600

2.1.7 Application notes, application cards, white papers, etc.

These documents deal with special applications or background information on particular topics.

www.rohde-schwarz.com/application/ngt3600

2.1.8 Remote control driver

The instrument drivers enable remote control via the corresponding interfaces. The drivers and installation instructions are available for download on the product page at:

www.rohde-schwarz.com/driver/ngt3600

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 NGT3600 carefully.
2. Retain the original packing material. Use it when transporting or shipping the R&S NGT3600 later.
3. Using the delivery package list, check the equipment for completeness.
4. Check the equipment for damage and loose parts.

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

See also Section 11, "Transport", on page 228.

Delivery package

The delivery package contains the following items:

- R&S NGT3600 power supply
- One AC terminal block plug (PN: 3722.6613.00)
- One 8-pin plug (PN: 3639.1002.00) for digital I/O connections
- One cable cover (PN: 5602.4969.00)
- One cable gland (PN: 3859.1839.00) with M25 lock nut (5147.6108.00)
- Depending on the power supply models:
  - For one-channel model: one output terminal block plug (PN: 3692.7318.00), one share bus terminal block plug (PN: 3660.5649.00), one ferrite core (PN: 5174.1110.00) and one remote sense terminal block plug (PN: 3660.5561.00)
  - For two-channel model: two output terminal block plugs (PN: 3692.7318.00), two share bus terminal block plugs (PN: 3660.5649.00), two ferrite cores (PN: 5174.1110.00) and two remote sense terminal block plugs (PN: 3660.5561.00)
- One printed 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 NGT3600

Adequate air circulation must be ensured during operation. For continuous operation, a horizontal position is preferable.

See also:

- "Setting up the product" on page 10
- "Intended use" on page 9

3.1.4.1 Mounting the R&S NGT3600 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 may damage the product.
   The heat produced inside the instrument is guided to the exterior via a temperature and load-controlled fan. The R&S NGT3600 has multiple temperature sensors that check the heat generation and internal shunt resistor that monitor the load in the instrument to control the fan speed.
   It is necessary to ensure that there is sufficient space around the sides of the instrument for heat exchange. Ensure that fan openings and ventilation holes are unobstructed and airflow vents are unimpeded.

If the temperature inside the instrument increases more than the allowed limit, overtemperature protection is triggered and the affected outputs are switched off automatically.

To mount the R&S NGT3600 in a rack

1. Lift the R&S NGT3600 to shelf height.
2. Push the R&S NGT3600 onto the shelf until the rack brackets fit closely to the rack.
3. Tighten all screws at the rack brackets with a tightening torque of 1.2 Nm to secure the R&S NGT3600 at the rack.

To unmount the R&S NGT3600 from a rack

1. Loosen the screws at the rack brackets.
2. Remove the R&S NGT3600 from the rack.

3.1.5 Considerations for test setup

The product is built in compliance with DIN EN 61010-1 (VDC 0411 part 1), EN 61010-1 and IEC 61010-1. It is designed with the regulations of protection class 1, for supplying power-on circuits that are only indirectly connected to the low voltage mains or not connected at all.

The instrument is not intended for measurements within the measurement categories II, III or IV; the maximum potential against earth generated by the user must not exceed 600 VDC in this application.

See also "Measurement categories" on page 12.

General instrument specifications

See Table 3-1 for the general data on the instrument specifications. Refer to the specifications document for details.

Table 3-1: General data on instrument specifications

Mains nominal voltage	AC	100 VAC to 240 VAC ± 10% 50 Hz / 60 Hz 22 A to 18.3 A
Power consumption	Maximum input power (with automatic power limiting)	2200 W for R&S NGT3621 4400 W for R&S NGT3622
Mains fuses	100 VAC to 240 VAC	Internal 30 A, 500 V fast-acting The fuse is not user accessible. See "To replace the power fuse" on page 27.
Temperature	Operating temperature range	+5 °C to +40 °C
	Storage temperature range	-20 °C to +70 °C
Humidity	Non-condensing	5 % to 95 %

Display	-	TFT 4.3” 480 x 272 pixels touch-screen
Rackmount capability	-	19 " rack, 2U height
Dimensions	L x W x H	481 mm x 565 mm x 87.9 mm (18.94 in x 22.24 in x 3.46 in)
Weight	R&S NGT3621	13.5 kg (29.76 lb)
	R&S NGT3622	18.5 kg (40.79 lb)

Operating limits

The R&S NGT3600 is equipped with a protective overload feature. The protective overload feature prevents damage to the instrument and is designed to protect against possible electrical shocks. The maximum values for the instrument must not be exceeded. The protection limits are listed on the front panel of the R&S NGT3600 to ensure safe operation of the instrument.

See Table 3-2 for protection limits of the R&S NGT3600.

Table 3-2: Protection limits for R&S NGT3600

Specification		**Limits**
Maximum output voltage		80 VDC
Maximum output current		50 A
Maximum sink power		90 W
Maximum voltage against earth		600 VDC
Maximum counter voltage (same polarity)		88 VDC
Maximum reverse voltage (opposite polarity)		0.4 VDC
Maximum reverse current		50 A for 5 minutes
AC input		100 VAC to 240 VAC ± 10%, 50 Hz / 60 Hz
Maximum power output	100 VAC to 120 VAC	1800 W for R&S NGT3621 1800 W for R&S NGT3622
	200 VAC to 240 VAC	1800 W for R&S NGT3621 3600 W for R&S NGT3622

Cable selection and electromagnetic interference (EMI)

Electromagnetic interference (EMI) can affect the measurement results.

To suppress electromagnetic radiation during operation:

- Use high-quality shielded cables, for example double-shielded USB and LAN cables.
- Use at least a CAT6 LAN cable with a length ≤ 3 m and passive USB cable with a length ≤ 1 m.

- Use double-shielded data cables with a length ≤ 3 m for connectors of external devices.
- Use insulated wires for output supply/terminal connections.
- Always terminate open cable ends.
- Ensure that connected external devices comply with EMC regulations.
- Check regularly that all cables, including power cables are in perfect conditions.

Signal input and output levels

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

See also "Channel output connector (8a) (8b)" on page 37.

Cable cover and cable gland assembly

To prevent potential short hazards from exposing wiring at the mains input connector, a cable cover assembly is added to cover the AC power inlet on the rear panel, see Figure 3-1.

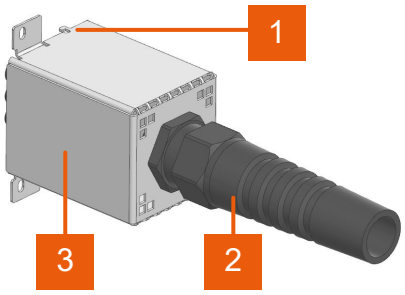


Figure 3-1: Cable cover assembly

1 = Latching point on the cable cover
2 = Cable gland assembly
3 = Cable cover

To assemble cable cover and cable gland.

1. Use only the supplied cable cover and cable gland assembly.
   The cable gland assembly comes with a lock nut, gland body and gland nut.

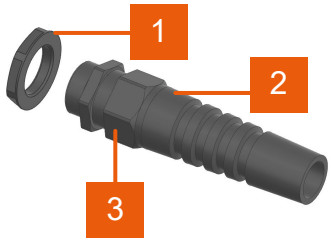


Figure 3-2: Cable gland assembly

1 = Lock nut
2 = Gland body
3 = Gland nut

2. Insert the gland body to the cable cover with the lock nut aligned inside the cover.

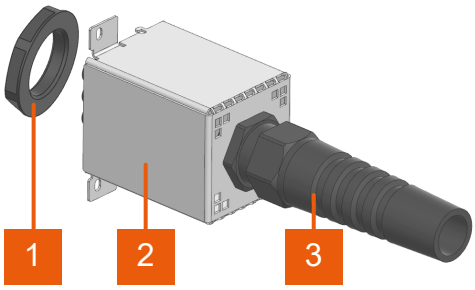


Figure 3-3: Components of cable cover assembly

1 = Lock nut
2 = Cable cover
3 = Gland body

3. Use a suitable tool, such as a hex socket with a handle, to tighten the lock nut with a tightening torque of 1.03 Nm to secure the gland body with the cable cover.
4. Do not tighten the gland nut as it is used for tightening the power cable, see Section 3.1.6, "Connecting to power", on page 23.
Note: The gland nut provides a clamping range for cable diameters from 9 mm to 17 mm.

3.1.6 Connecting to power

For safety information, see "Connecting to power" on page 11 and "Working with hazardous voltages" on page 11.

Before connecting the instrument to the mains, check that the mains voltage conforms to the range specified on the label located below the AC power connector.

The power supply module covers a wide power supply range and normally does not require adjustment. See Table 3-1 for the supported mains voltage and the corresponding fuse types and ratings. If the power supply exceeds the permissible range, contact Rohde & Schwarz customer service.

To connect to power

1. Ground the R&S NGT3600 using the ground terminal on the rear panel. See "To ground terminal" on page 27.
2. **WARNING!** Shock hazard. Do not use a power cable as a disconnect device from AC mains.

   For external protection and disconnection from AC mains, connect the R&S NGT3600 to AC mains via an external 30 A disconnect device, e.g. switch or circuit breaker compliance to UL/CSA/EN 61010-1. The switch or circuit breaker must be easily accessible in the installation.
3. Use an AC cable, 3 x AWG10 or larger diameter, UL/CSA/VDE approved, for the line connection of AC terminal block plug to the external disconnect device.
   The wiring of the connection must be made by an electrically skilled person in accordance with local electrical codes. A thicker wire gauge may be required if wires are operating at higher ambient temperature.
4. Insert the AC cable via the cable cover assembly, which is used to cover the AC power inlet on the rear panel.
   See also "Cable cover and cable gland assembly" on page 22.
5. Wire the power cable line to the AC terminal block plug, disconnect device and AC mains. See "Disconnect device for AC connection" on page 38 and Figure 3-5.

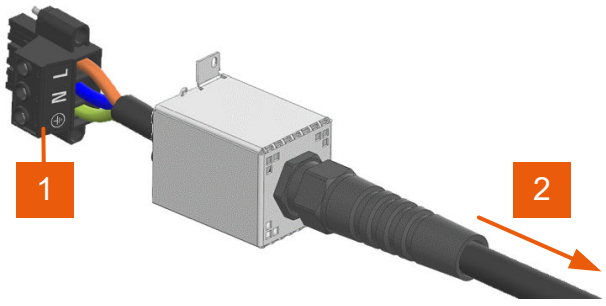


Figure 3-4: Wiring power cable line connection

1 = AC terminal block plug
2 = Direction towards disconnection device and AC mains

Use intact cables and route them carefully so that they cannot be damaged or tripped due to loose cables. Check the power cables regularly to ensure that they are undamaged.

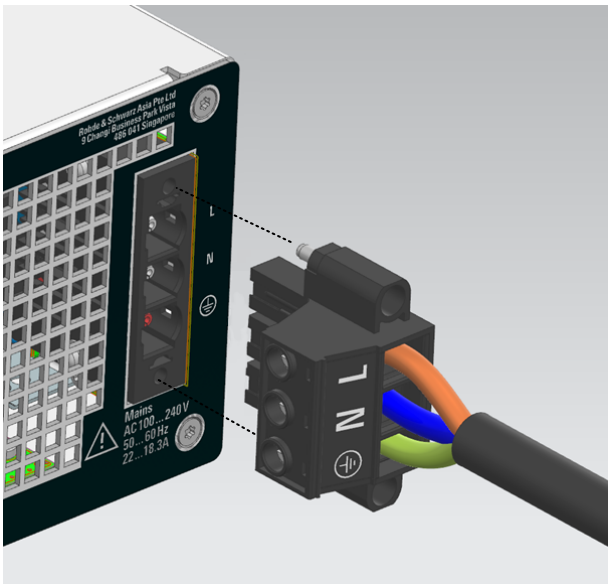


Figure 3-5: Connect AC terminal plug to R&S NGT3600

6. Connect the AC terminal block plug to the AC power supply of R&S NGT3600. Tighten the screws on the AC terminal block plug to secure the connection to R&S NGT3600. See Figure 3-5.
7. **WARNING!** Fire hazard. If the current rating of the AC power plug is exceeded, overheating may occur.
   Use an AC power plug with sufficient current rating to avoid overheating when device is operated at maximum output power. Recommended to only use industrial power plugs as according to IEC 60309-1 with a minimum current rating of 32 A.
8. Remove the two screws at the rear panel (see Figure 3-5) and align the cable cover assembly over the screw points. See Figure 3-6.
   Note: The latching point on the cover must engage with the latching hole on the R&S NGT3600. See Figure 3-1.
9. Tighten the two screws back onto the cable cover assembly with a tightening torque of 1.03 Nm.
10. Tighten the gland nut to secure the AC cable to the cable gland.
    See also Figure 3-2,

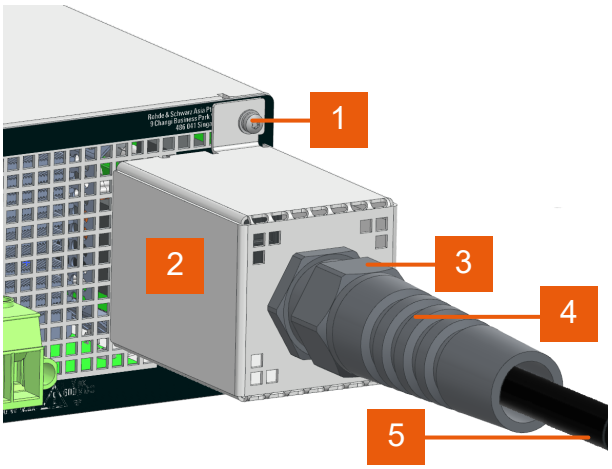


Figure 3-6: Power connection to R&S NGT3600

1 = Rear panel screw
2 = Cable cover
3 = Gland nut
4 = Cable gland
5 = AC cable

To connect a power line using a 3-phase system

WARNING

Shock hazard

Do not use a power cable as a disconnect device from AC mains. See "Shock hazard" on page 24.

If the current rating of the AC power plug is exceeded, overheating may occur. See "Fire hazard" on page 25. Use an AC cable, 3x AWG10 or larger diameter, UL/CSA/VDE approved, for the line connection of AC terminal block plug to the external disconnect device.

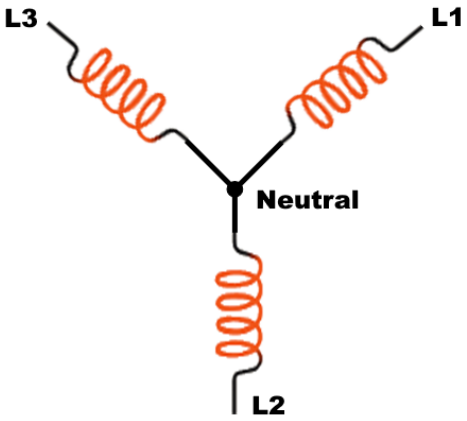
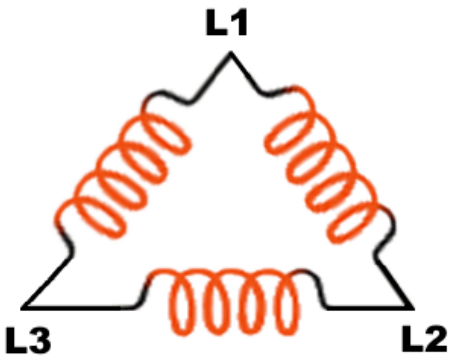
Ground the R&S NGT3600 using the Earth wire of the 3-phase power line system. See "Meaning of safety labels" on page 13.

The following illustrates the 3-phase system connection and the corresponding voltage ratings. Common input connection configurations include Wye and Delta, as shown in Table 3-4.

Table 3-3: Voltage ratings requirement

Voltage (Line to Neutral) Mains nominal voltage	3-phase system (Delta: Line to Line, Wye: Line to Neutral)	200 VAC - 240 VAC +/- 10 % 50 Hz / 60 Hz

Table 3-4: 3-phase input connection configuration

Wye connection	Delta connection
	

To replace the power fuse

► The instrument is protected by internal fuses which are not user accessible. If the instrument is not powering on, this may indicate an open fuse.

Send the instrument for servicing.

To ground terminal

If necessary, ground the instrument using the grounding connection, ⏚ located at the rear panel:

1. Unscrew the screw of the ground terminal using a cross-recess screwdriver.
2. Attach a ground cable with a ring terminal and pass the screw through it.
3. Fasten the screw with a tightening torque of 1.2 Nm.
4. Connect the cable to ground.

3.1.7 Connecting the load

For safety information, see "Connecting to power" on page 11 and "Working with hazardous voltages" on page 11.

Before connecting to the load, check that the AC power is turned off.

To connect to a load

1. **WARNING!** High floating output. Output can be floated up to 600 Vdc with respect to chassis.

   Turn off all connected equipment before making any connection changes to avoid electric shock.

2. **WARNING!** Fire hazard. High voltage over insufficient cross-sectional area of load wire can cause overheating of wire.

   Use load wires with sufficient cross-sectional area to avoid overheating when carrying the maximum short-circuit current of the power supply.
   Recommend to use AWG 8 or larger diameter to support 50 A current rating of each output at 30 °C. A thicker wire gauge may be required if load wires are operating at higher ambient temperature. See Figure 3-7.

3. **WARNING!** Shock hazard. Power supply can generate voltage above 60 V.

   Check that the load connection has no accessible live parts, and the wiring used has a rating greater than the output of the power supply. See Figure 3-7.
   Ensure that the output terminal block is plugged into the rear panel output connector before powering up the R&S NGT3600.

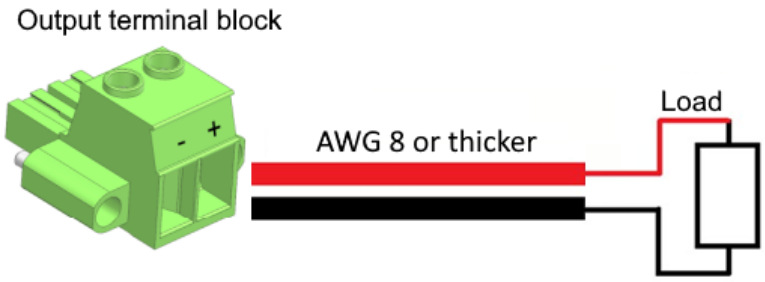


Figure 3-7: Connection to load

4. **CAUTION!** Risk of hearing damage. Extensive operation of the R&S NGT3600 at sound levels exceeding 80 dBA may lead to hearing damage.

   Recommend to use the personal protective equipment (PPE), such as earplugs, to safeguard your hearing during prolonged exposure to such conditions.

5. **NOTICE!** Overvoltage. Reverse remote sense can cause overvoltage.

   Do not disconnect or short the remote sense wires when the remote sense function is activated as it causes a brief overvoltage condition which could damage the DUT.
   Recommend to use twisted or shielded pair wire for remote sense wiring to minimize noise pickup.

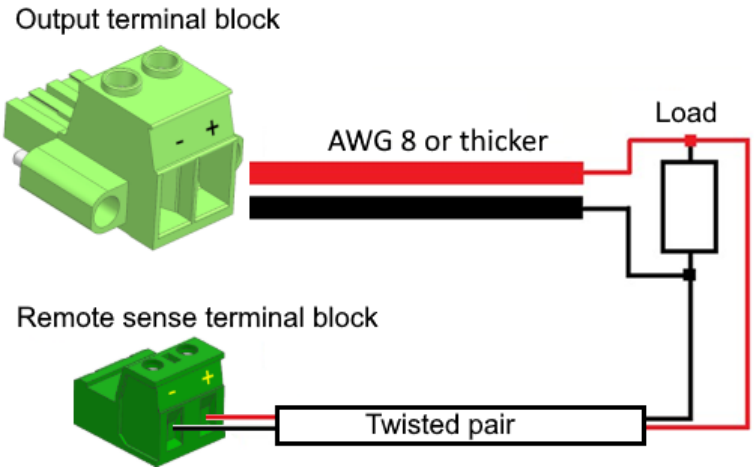


Figure 3-8: Connection to load with remote sense

6. **NOTICE!** Floating output in series connection. Connecting share bus wires during a series connection causes instrument damage.

   Do not connect share bus wires during a series connection. Share bus is disconnected by default, enable share bus function by enabling the share bus relay on the device. See connection details in Figure 3-9.

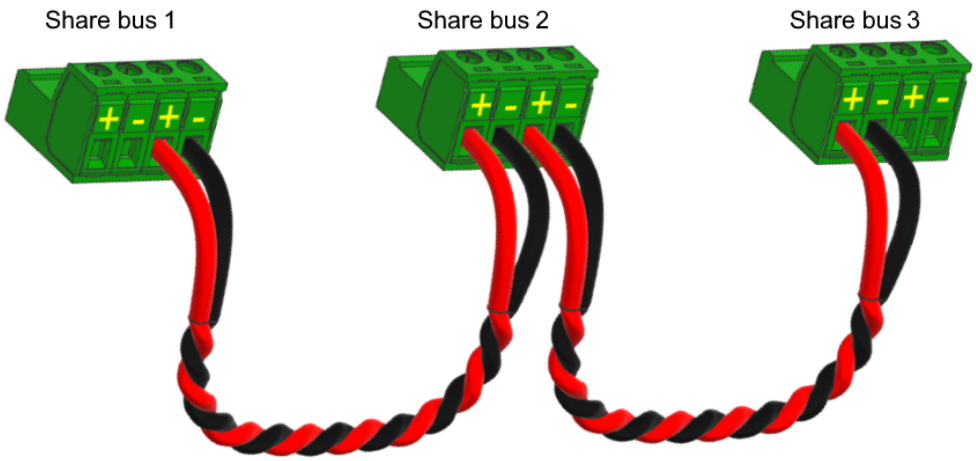


Figure 3-9: Daisy chain connection of share bus port for parallel operation

7. Add a ferrite core on the output cable to reduce the electronics noise and suppress high-frequency signals on the cable.
   Clamp the ferrite core on the cable about 25 mm to 50 mm away from the output terminal block as shown in Figure 3-10.
   Attach two cable ties on both sides of the ferrite core to secure the position on the cable.

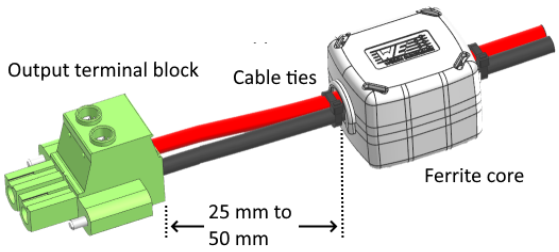


Figure 3-10: Clamp ferrite core on cable

3.1.8 Switching on or off

Specifications with tolerance data apply after a warm-up period of at least 30 minutes at a temperature of 23 °C (tolerance: -3 °C / +7 °C).

See also Section 3.1.6, "Connecting to power", on page 23.

To switch on the product

The product is off but connected to power.

► Set the switch on the power supply to position [I].
For the location of the switch, see Section 3.2.1, "Front panel", on page 32.

The instrument performs a system check, boots the operating system and starts the R&S NGT3600 firmware.
By default, the output channel is turned off when the instrument is switched on to prevent connected loads from being damaged unintentionally.
During startup, the R&S NGT3600 is loaded with the last saved instrument settings from internal memory and auto-saved parameters. See Section 6.3, "Save and recall", on page 116 in the user manual.

To shut down and disconnect R&S NGT3600 from power

For safety reasons, switch off the mains switch when the instrument is not in use.

1. Set the switch on the power supply to position [0].
   All current settings are saved and the operating system shuts down.
2. Disconnect the AC power cable from the socket outlet.

3.1.9 Connecting to LAN

To establish LAN connection

The R&S NGT3600 provides Ethernet (LAN) connectivity. Provided 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 NGT3600.

1. **NOTICE!** Recommendation on secure operation. The R&S NGT3600 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, e.g. attackers could misuse or damage your device.

   Always install the latest firmware.

   By default, the R&S NGT3600 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 NGT3600 cannot obtain an IP address automatically, or cannot establish the connection, the LAN interface icon, in the status bar turns gray. 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 NGT3600 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 Section 8.1.2, "LAN interface", on page 138.

If switched on and connected, the R&S NGT3600 indicates the address information and LAN parameters in the LAN settings dialog. See Figure 3-11.

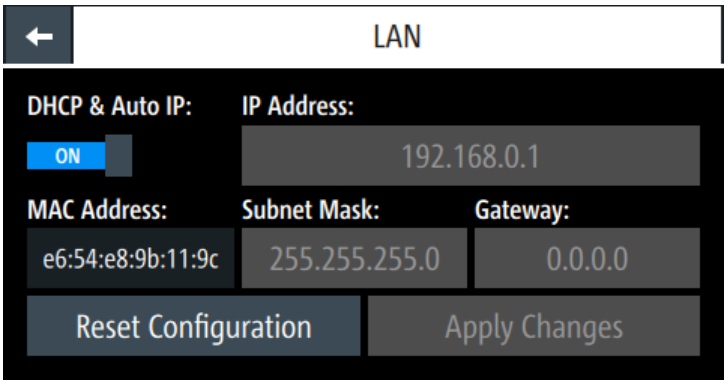


Figure 3-11: LAN settings dialog

3.1.10 Connecting USB devices

The USB Type-A interface is at the front panel. You can connect or disconnect all USB devices from the R&S NGT3600 during operation. But do not remove an external USB flash drive while the instrument is performing firmware update, data logging and storing of screen captures, since it may lead to unsuccessful updates and/or loss of data.

To connect USB storage devices

USB storage devices, such as thumb drives, allow easy data transfer from or to the R&S NGT3600. You can also use them for firmware updates.

► Connect the USB storage device to the USB Type-A interface.
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

The following sections help you to get familiar with the instrument and perform the first steps:

- Section 3.2.1, "Front panel", on page 32
- Section 3.2.2, "Rear panel", on page 34

These sections explain the controls and connections on the front and rear of the R&S NGT3600. For technical details of the connectors, see the specifications document.

The meanings of the labels on the R&S NGT3600 are described in Section 1.2, "Labels on R&S NGT3600", on page 13.

3.2.1 Front panel

Depending on the model of R&S NGT3600, the number of channels and controls on the front panel varies. The function keys and navigation controls are located on both sides of the front panel. The following front view description introduces each model individually.

Table 3-5: Power supply models

Models	Number of output terminals
R&S NGT3621 (0 V - 80 V / -2.5 A - 50 A)	1 (maximum 1800 W output / 1800 W per channel)
R&S NGT3622 (0 V - 80 V / -2.5 A - 50 A)	2 (maximum 3600 W output / 1800 W per channel)

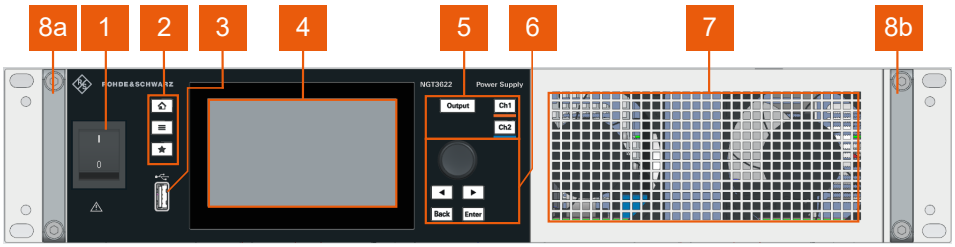


Figure 3-12: R&S NGT3600 front panel for two-channel model

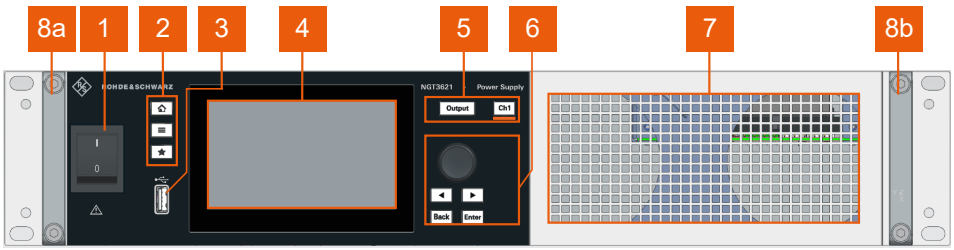


Figure 3-13: R&S NGT3600 front panel for one-channel model

1 = Power key
2 = Menu control keys
3 = USB Type-A interface
4 = Touchscreen display
5 = Output and channel keys
6 = Navigation controls
7 = Air ventilation inlet
8a, 8b = Front handle

Power key (1)

The [Power] key switches the instrument on and off, see Section 3.1.8, "Switching on or off", on page 30.

Menu control keys (2)

The menu control keys include the [Home], [Settings] and [User] keys. These keys allow you to access to the home window, instrument menu window and user-defined functions in the instrument, respectively.

For a detailed description on menu control keys, see Section 4.2.1, "Menu control keys", on page 61.

USB Type-A interface (3)

The USB Type-A interface is provided to connect a USB flash drive to perform firmware update, data logging and store screen captures.

See Section 3.1.10, "Connecting USB devices", on page 32.

Touchscreen display (4)

The display is a color TFT touchscreen. Depending on the instrument models, up to two channels are shown on the screen layout with different result fields displayed. The respective measurement readings and access to instrument settings are displayed in the individual channel display area.

There are two information status bars to display the overall instrument operating mode and channel settings of the instrument. These information status bars are located at the device level (top-right-hand corner of the display area) and channel level (on top of individual channel display area) of the instrument respectively.

For a detailed description on the screen layout, see Section 3.4.2.1, "Understanding the display information", on page 43.

Output and channel keys (5)

The R&S NGT3600 is a two-quadrant power supply. Depending on the instrument models, up to two channel keys and one output key are available to select channel(s) and enable/disable the output(s) to sink or source power.

Navigation controls (6)

The navigation controls include a rotary knob, arrow keys, [Back] key and [Enter] key. These keys are means of navigation and adjustment. When pressed or rotated, they perform tasks like navigation around the screen, adjustment of parameter values or confirmation of entries.

For a detailed description on the navigation controls, see Section 3.4.2, "Means of manual interaction", on page 42.

Air ventilation inlet (7)

Multiple air ventilation inlets are available on the chassis to ventilate the power supply from overheating. Do not obstruct these ventilation inlets.

For details on setting up the R&S NGT3600, see Section 3.1.4, "Setting up the R&S NGT3600", on page 19.

Front handle (8a) (8b)

The left and right front handles are available for easy handling.

For details on setting up the R&S NGT3600, see Section 3.1.4, "Setting up the R&S NGT3600", on page 19.

3.2.2 Rear panel

On the rear panel, the instrument models do not vary in design significantly. Therefore, the description refers to all models and points out existing differences. For technical data of the connectors, see the specifications document.

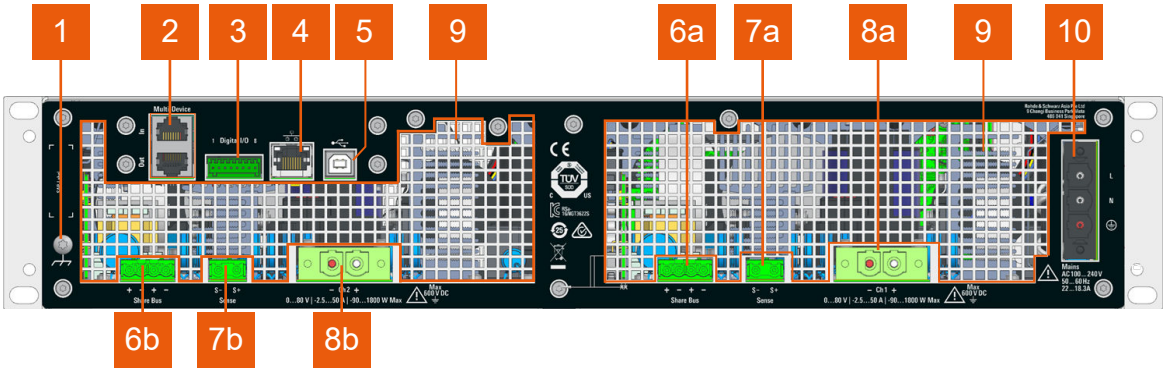


Figure 3-14: R&S NGT3600 rear panel for two-channel model

1 = Ground terminal
2 = Multi-device interface
3 = Digital I/O connector
4 = Ethernet (LAN) interface
5 = USB Type-B interface
6a, 6b = Share bus connector for channel 1 (6a) and channel 2 (6b)
7a, 7b = Remote sense connector for channel 1 (7a) and channel 2 (7b)
8a, 8b = Channel output connector for channel 1 (8a) and channel 2 (8b)
9 = Air ventilation outlet
10 = AC power supply

Ground terminal (1)

Protective ground terminal to secure the R&S NGT3600, e.g. with a ground external conductor, see Section 1.2, "Labels on R&S NGT3600", on page 13.

Multi-device interface (2)

NOTICE

Risk of instrument damage

Do not connect the multi-device interface to the LAN to prevent damage to the instrument.

Two standard RJ-45 connectors are available for connecting up to six channels in a multi-device mode configuration. In this mode, outputs of the connected devices are controlled as a single output to generate higher current (parallel connection) or higher voltage (series connection).

Digital I/O connector (3)

NOTICE

Risk of instrument damage

Do not exceed the maximum voltage rating of the digital I/O pins (0 V to 24 V max) when supplying voltages to the pins.

Do not supply more than 500mA to the digital I/O pin when it is in a device-driven low state configured as trigger output.

For more information, see the specifications document.

An 8-pin terminal block provides connection to the digital I/O connection, see Table 3-6.

Table 3-6: Pin configurations

DIO connector	Signal name	Value range	Pin number
	DIO 1	0 Vdc to 3.3 Vdc	1
	DIO 2		2
	DIO 3		3
	DIO 4		4
	DIO 5		5
	DIO 6		6
	GND	0 Vdc	7, 8

Ethernet interface (4)

The Ethernet interface is used to connect the R&S NGT3600 to a LAN (local area network) for remote control, remote operation and data transfer.

For more information on the connection setup, see Section 8.1.2, "LAN interface", on page 138.

USB Type-B interface (5)

The USB Type-B interface is used to connect a computer for remote control of the R&S NGT3600.

For more information, see Section 8.1.3, "USB interface", on page 141.

Share bus connector (6a) (6b)

The share bus connector is available to ensure equal current sharing during the operation of a parallel connection.

Connector for channel 2 is only available for the two-channel model.

For a detailed description on the share bus connection, see Section 3.1.7, "Connecting the load", on page 27.

Remote sense connector (7a) (7b)

The remote sense ("+Sense", "-Sense") allows the power supply to regulate the voltage directly at the load, compensating for any voltage drop in the cable.

Connector for channel 2 is only available for the two-channel model.

To connect rear panel connector

1. **DANGER!** Shock Hazard. Risk of electric shock if AC power is turned on when connecting wires to the rear panel connector.

   Turn off AC power when connecting wires to the rear panel connector.
2. Insert shielded wire to the pluggable terminal block.
3. Tightened all the wires with the screw on the pluggable terminal block.
4. Connect the pluggable terminal block to the output terminal.

For a detailed description on the remote sense connection, see Section 3.1.7, "Connecting the load", on page 27.

Channel output connector (8a) (8b)

The channel output provides output to source or sink supply to the load. See "Remote sense connector (7a) (7b)" on page 37 when connecting the channel output connector.

Connector for channel 2 is only available for the two-channel model.

To connect rear panel connector

1. **DANGER!** Shock Hazard. Risk of electric shock if AC power is turned on when connecting wires to the rear panel connector.

   Turn off AC power when connecting wires to the rear panel connector.
2. Insert shielded wire to the pluggable terminal block.
3. Tightened all the wires with the screw on the pluggable terminal block.
4. Connect the pluggable terminal block to the output terminal.

For a detailed description on the channel output connection, see Section 3.1.7, "Connecting the load", on page 27.

Air ventilation outlet (9)

Multiple air ventilation outlets are available on the chassis to ventilate the power supply from overheating. Do not obstruct these ventilation outlets.

For details on setting up the R&S NGT3600, see Section 3.1.4, "Setting up the R&S NGT3600", on page 19.

AC power supply (10)

Disconnect device for AC connection

For external protection and disconnection from the AC mains, the R&S NGT3600 must be connected to the AC mains via an external disconnect device rated at 30 A or higher, e.g. switch or circuit breaker compliant to UL/CSA/EN 61010-1.

The external disconnect device must be placed close to the instrument for easy accessibility and marked as a disconnect device for easy identification. Never use the product if the power cable is damaged.

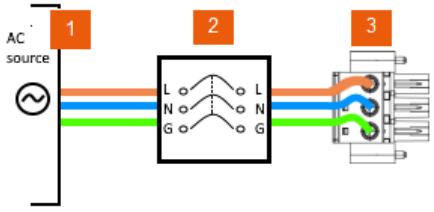


Figure 3-15: Example of a circuit breaker connection block diagram

1 = AC mains
2 = Disconnect device (e.g. circuit breaker)
3 = AC terminal block plug (3722.6613.00) connecting to AC power supply of R&S NGT3600

The AC terminal block connects the instrument to the AC power source.

For a detailed description on the AC power supply connection, see Section 3.1.6, "Connecting to power", on page 23.

3.3 Trying out the instrument

This section describes some basic functions that you can perform with the R&S NGT3600 power supply series.

Source and sink current

The R&S NGT3600 is a two-quadrant power supply which may both source and sink current. The default behavior "Source" can be configured in the output menu, see Section 5.3.3, "Output mode", on page 76.

On the display, sink mode is shown as negative current.

For more information, see Section 4.4, "Modes of operation", on page 68.

3.3.1 Selecting the channels

To select a channel, press the corresponding channel key. The selected channel key illuminates.

3.3.2 Setting the output voltage and current limit

1. Press [Home] key, .
   The R&S NGT3600 displays the home window.

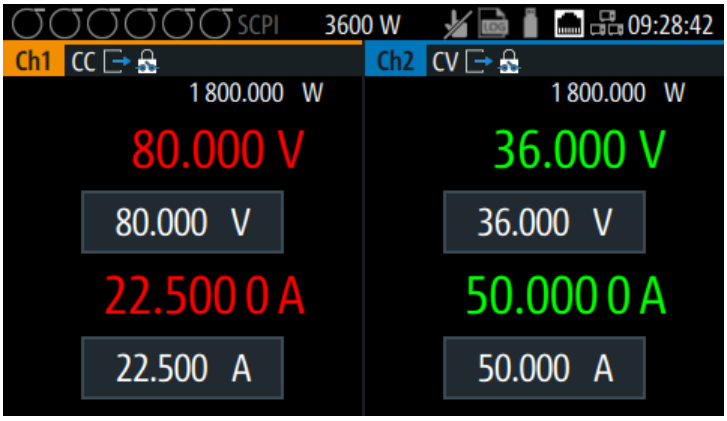


Figure 3-16: Home window of a two-channel model

2. Select the voltage or current parameter of the desired channel.
   The R&S NGT3600 displays an on-screen keyboard to set the value.

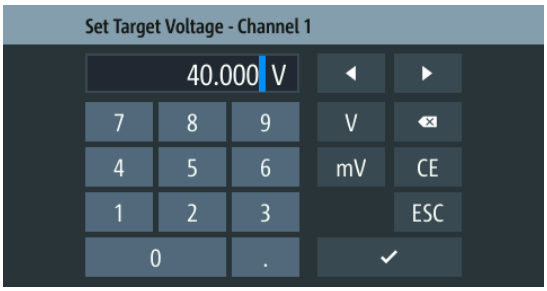


Figure 3-17: On-screen keyboard

3. Enter the required value.
   For more information on the source and sink current, see "Source and sink current" on page 38.
4. Confirm the value with either the unit softkey ("V"/"mV" or "A"/"mA").
   Alternatively, select "Enter" softkey, to confirm your value.
   The home window shows the updated voltage and current settings (see changes of voltage and current values in "Ch1").

Figure 3-18: Updated voltage and current settings

5. Repeat for another channel, if desired.

3.3.3 Activating the channel output

The output can be switched on or off regardless of the instrument's operating mode.

To activate the channel output, press [Output] key on the front panel followed by the desired channel key or vice versa.

The R&S NGT3600 power supply displays the actual voltage on the output channel and the actual current drawn by the load connected to the output. Depending on the instrument operating mode, the display font color changes to green in CV (constant voltage) mode or red in CC (constant current). The only visible indication of sink mode is the change of negative sign in the readback current.

See the highlighted areas in Figure 3-19.

By default, the output is turned off when the instrument is switched on.

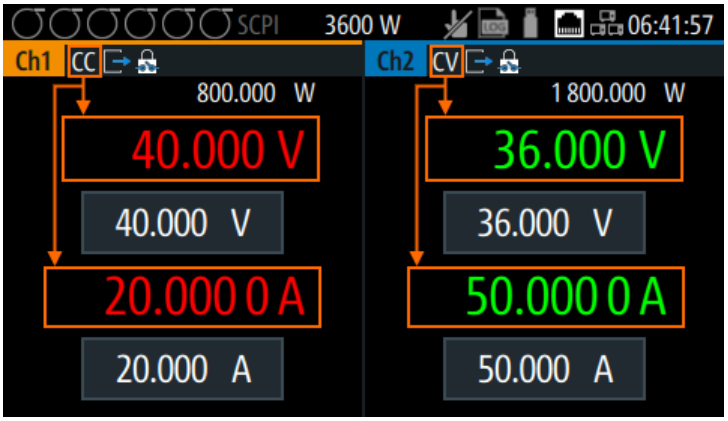


Figure 3-19: Font color in highlighted areas changes to green or red depending on the different operating modes of the instrument

3.3.4 Saving/Recalling of instrument settings

The R&S NGT3600 can save instrument settings and screenshots. Both instrument settings and screenshots can be saved on a USB flash drive or internally in the instrument to non-volatile storage media.

To save or recall instrument settings

1. Select [Settings] > "Device" > "Save/Recall Device Settings" > "Save Settings to File" to save current instrument settings.
2. Select the desired storage partition and filename.
   If partition "int" is selected, the default path is set to: `/int/settings/Setting 1.rds`.
   If partition "USB1A" is selected, the default path is set to: `/USB1A/NGT362x/settings/Setting 1.rds`, where "x" refers to "1" for the single-channel model and "2" for the two-channel model.
3. Confirm the selection by using the "Save" softkey.
   The instrument settings are saved.
4. Select [Settings] > "Device" > "Save/Recall Device Settings" > "Recall Settings from File" to load instrument settings.
5. Select the desired file partition and filename.
   The file manager dialog of the selected partition is displayed.
6. Select the desired filename and use "Load" to load the instrument settings.
   The selected instrument settings are loaded.

To retrieve the factory default settings, select [Settings] > "Device" > "Save/Recall Device Settings" > "Default Settings" to load back the factory default settings.

For more information, see Section 6.3, "Save and recall", on page 116.

See also Section 6.4, "Screenshot", on page 121.

3.4 Instrument control

This section provides an overview on how to work with the R&S NGT3600. 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.

3.4.1 Ways to operate the instrument

You can operate the R&S NGT3600 in two ways:

- Manual operation
  Use the touchscreen and front panel controls to configure the R&S NGT3600 settings.
  See Section 3.4.2, "Means of manual interaction", on page 42 for basic information on the manual operation of the instrument.
- Remote control
  Create programs to automatize repeating settings, tests and measurements. A controller PC with remote access to the instrument runs the programs.
  See Section 3.4.3, "Remote control", on page 55 for an overview of the interfaces provided for remote control.

3.4.2 Means of manual interaction

For manual interaction with the R&S NGT3600, you have several methods that you can use as an alternative to perform a task:

- Touchscreen
  Touchscreen operation is the most direct way to interact with the instrument. Almost all control elements and actions on the screen are based on the standard operating system concept. You can tap any user interface element, set parameters in dialogs, enter data using on-screen keyboards and swipe to scroll within a dialog.
  - **Tapping**

    Tap on the screen to select or toggle the value.
  - **Swipe up and down**

    Swipe up to scroll down and swipe down to scroll up the content in the menu or dialog box.

  For more information on touchscreen behavior, see Section 4.1, "Using the touchscreen", on page 57 in the user manual.
- Menu control, channel and output keys
  The menu control keys provide you with quick access to home window, instrument menu and shortcut key to user-defined functions. You can also access the instrument menu via the "Settings" softkey in the channel display area. See Section 3.4.2.1, "Understanding the display information", on page 43.
  Instrument channel selection and output activation are only accessible via the respective front panel keys, these keys illuminate when activated.
  For a detailed description on the front panel keys, see Section 4.2.1, "Menu control keys", on page 61.
- Navigation controls

The navigation controls include a rotary knob, [Back], [Enter] and arrow keys which allow you to navigate in the home window, instrument menus or dialogs and also make value adjustment in the entry field.

This manual describes the manual interaction with the instrument using the touchscreen. It mentions the alternative methods using the keys on the instrument or the on-screen keyboards if it deviates from the standard operating procedures.

Throughout the manual, the term "select" refers to any of the described methods, i.e. using a finger on the touchscreen or a key on the instrument or on a keyboard.

For basic instructions on how to control the R&S NGT3600, see Section 3.4.2.2, "Accessing the functionality", on page 53.

3.4.2.1 Understanding the display information

Depending on the instrument models, up to two channels are shown in the home window, with channel settings and device status displayed for each channel. See Table 3-7.

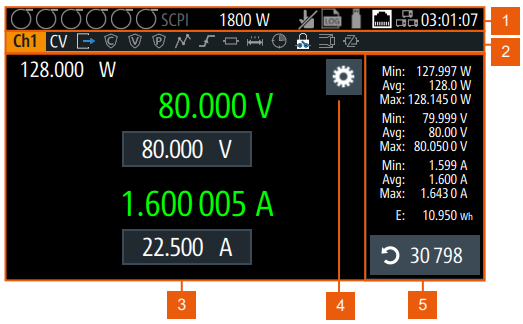
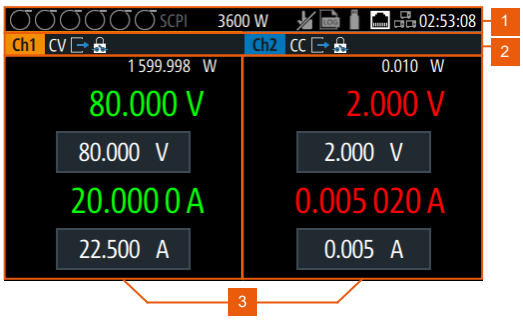
For the one-channel model, the historical channel information is displayed in the home window.

For the two-channel model, the historical channel information of the respective channel is running in the background and can be viewed in the detailed channel display window. In addition, you can view the alternate channel voltage and current values in the detailed channel display window. See "Alternate channel view" on page 47.

To access the detailed channel display window, tap anywhere in the respective channel display area. The channel display area shows the output voltage, current level and operating mode of the output. See Table 3-7.

For a detailed information on the output operating modes, see Section 4.4, "Modes of operation", on page 68.

Table 3-7: Home window of the R&S NGT3600 models

One-channel model: R&S NGT3621	Two-channel model: R&S NGT3622
	

- 1 = Device status bar
- 2 = Channel status bar
- 3 = Channel display area of respective channel
- 4 = Settings softkey (available in the detailed channel display window for the two-channel model)
- 5 = Historical channel information (available in the detailed channel display window for the two-channel model)

The following sections explain the information areas as labeled in Table 3-7.

Status bar information

There are two types of status bar information located at the top of the screen layout:

- Device status
- Channel status

Device status

The device status displays the state of the functions activated in the device.

Figure 3-20: Device status bar

Table 3-8: Device status bar information

Function	Description
DIO 	If enabled, the respective DIO icon is highlighted with a top or bottom blue line indicating the high or low active level of the signal. A filled or empty symbol indicates the trigger signal direction. •  : Trigger signal out with active level high/low •  : Trigger signal in with active level high/low A blinking DIO icon indicates that a trigger event has occurred. See Section 5.6, "Digital trigger I/O", on page 88.
SCPI command 	If a SCPI command is received successfully, the icon blinks once in white. If an error is in the SCPI error queue, the icon is highlighted in red. If no SCPI activity, the icon remains gray. See Section 9, "Remote control commands", on page 152.
Total output power 	Display information on the total power that the device can output. The total power that a device can output depends on the AC mains supply and the number of channels available on the device.
Touchscreen 	If touch input is disabled, the icon is displayed and highlighted in white. If touch input is enabled, the icon remains gray. See Section 4.2.1.3, "User key", on page 66.
Data logging 	If data logging is enabled, the icon is highlighted in white. If an error is present, the icon remains gray. See Section 5.8.2, "Data logging", on page 95.
USB interface 	If the USB device is busy, the icon is highlighted in white. If the USB device is idle, the icon remains gray. See Section 8.1.3, "USB interface", on page 141.
LAN interface 	If connected, the icon is highlighted in white. If not connected, the icon remains gray. See Section 8.1.2, "LAN interface", on page 138.

Function	Description
Multi-device mode	If connected, the icon is highlighted in white. If pending connection, the icon is highlighted in yellow. If an error is present in connection, the icon is highlighted in red. See Section 5.9.3, "Multi-device mode", on page 105.
Time 02:57:32	Time display in "hh:mm:ss" format. See Section 7.3, "Date and time", on page 126.

Channel status

The channel status displays the state of the indicators available in the device channel.

Figure 3-21: Channel status bar

Table 3-9: Channel status bar information

Function	Description
Channel number	Channel number indication.
Operating mode	The R&S NGT3600 has two operating modes: • CV: Constant voltage mode • CC: Constant current mode See Section 4.4, "Modes of operation", on page 68.
Output mode	The R&S NGT3600 has two output modes: • : Sink mode • : Source mode See Section 5.3.3, "Output mode", on page 76.
OCP	If enabled, the icon is highlighted in white. If triggered, the icon blinks. See Section 5.5.1, "Overcurrent protection (OCP)", on page 82.
OVP	If enabled, the icon is highlighted in white. If triggered, the icon blinks. See Section 5.5.2, "Overvoltage protection (OVP)", on page 83.
OPP	If enabled, the icon is highlighted in white. If triggered, the icon blinks. See Section 5.5.3, "Overpower protection (OPP)", on page 84.
Arbitrary mode	If enabled, the icon is highlighted in white. See Section 5.9.1, "Arbitrary", on page 100.

Function	Description
Ramp mode	If enabled, the icon is highlighted in white. See Section 5.9.2, "Ramp", on page 103.
Output impedance	If enabled, the icon is highlighted in white. See Section 5.3.1, "Impedance", on page 73.
Safety Limits	If enabled, the icon is highlighted in white. See Section 5.5.5, "Safety limits", on page 86.
Output Delay	If enabled, the icon is highlighted in white. The delay is the time between activation of the output and applying voltage to the output. See Section 5.3.2, "Delay", on page 74.
Output relay lock	If enabled, the icon is highlighted in white. See Section 5.3.4, "Output relay lock", on page 76.
Sense connection	If sense connection is set to "Ext" mode, the icon is highlighted in white. See Section 5.3.5, "Remote sensing", on page 77.
High impedance	If enabled, the icon is highlighted in white. See Section 5.3.6, "High impedance mode", on page 78.

Settings softkey

The "Settings" softkey, navigates to the instrument menu window. The alternative access to the instrument menu is via the [Settings] key on the front panel. See Section 4.2.1.2, "Settings key", on page 61 in the user manual.

For the two-channel model, the softkey is accessible in the detailed channel display window. Tap anywhere in the channel display area to access the detailed channel display window.

For more information on the "Settings" softkey behavior, see Section 4.1, "Using the touchscreen", on page 57 in the user manual.

Collapse softkey

Available only with the two-channel model, the "Collapse" softkey, closes the detailed channel display window which provides additional information on the channel historical information and alternate channel voltage and current values. See Figure 3-23.

For more information on "Collapse" softkey behavior, see Section 4.1, "Using the touchscreen", on page 57 in the user manual.

Alternate channel view

Available only with the two-channel model, the alternate channel view displays channel voltage and current values of the alternate channel in the detailed channel display window.

Tap anywhere within the alternate channel view to see the details in the respective detailed channel display window. See Figure 3-23.

Channel display area

The channel display area shows the output power, voltage and current values and the corresponding operating mode (CC, CV) of the R&S NGT3600 when the device output is turned on. See "Operating mode" on page 49 for the different operating modes that the R&S NGT3600 supported.

For the two-channel model, tap anywhere in the home window to access the detailed channel display window. See Figure 3-22. You can access the instrument settings and home window with the respective icon on the channel display area. In addition, tap on the alternative channel view to see the details in the respective detailed channel display window.

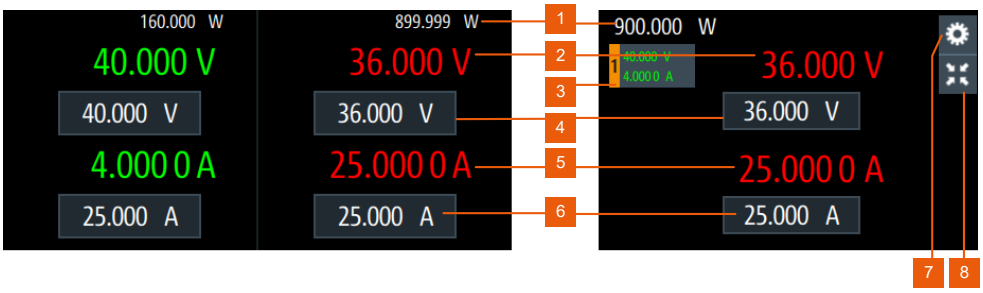


Figure 3-22: Channel display area for two-channel model in home window and detailed channel display window

1 = Output power displays in watt
2 = Output voltage displays in volt with display resolution of up to 3 decimal points
3 = Alternate channel view with display resolution of up to 6 decimal points
4 = Set voltage level with limits defined in "Safety Limits"
5 = Output current displays in ampere with display resolution of up to 6 decimal points
6 = Set current level with limits defined in "Safety Limits" and output mode defined in "Output"
7 = Settings softkey (available in the detailed channel display window)
8 = Collapse softkey (available in the detailed channel display window)

Historical channel information

The historical channel information shows the minimum, maximum and average values for power ("W"), voltage ("V") and current ("A") values. It also performs the calculation of energy result ("Wh") and number of samples collected for the result. To reset the historical channel information to zero value, select the reset softkey, .

For more information, see Section 5.8.1, "Statistics", on page 94.

The historical channel information is displayed in the home window for the one-channel model. For the two-channel model, the historical channel information is displayed in the detailed channel display window. To access the detailed channel display window, tap anywhere on the respective channel display area.

To return to the home window, tap the Collapse softkey.

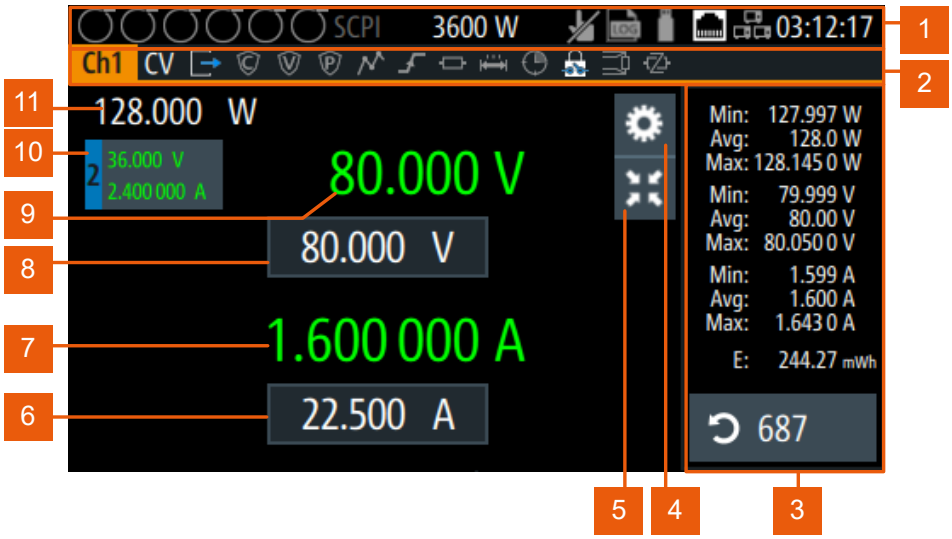


Figure 3-23: Detailed channel display window of a two-channel instrument model

1 = Device status bar
2 = Channel status bar
3 = Historical channel information
4 = Settings softkey
5 = Collapse softkey
6 = Set current level with limits defined in "Safety Limits" and output mode defined in "Output"
7 = Output current displays in ampere with display resolution of up to 6 decimal points
8 = Set voltage level with limits defined in "Safety Limits"
9 = Output voltage displays in volts with display resolution of up to 3 decimal points
10 = Alternate channel view with display resolution of up to 6 decimal points[1]
11 = Output power displays in watt

Operating mode

Different font colors on the screen are used to differentiate the various output status and operating conditions of the instrument. By looking at the font colors, it is easy to know and confirm the different output status and operating conditions of the instrument.

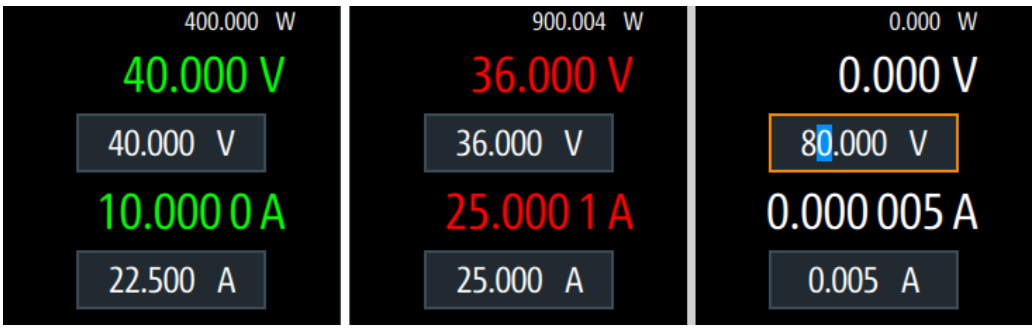


Figure 3-24: Color coding of difference operating conditions

Color	Operating mode	Description
☐	OFF mode	Output is OFF
■	Editing mode	A solid blue cursor is shown when an item is selected.
■	CV mode	Active outputs are operated in a constant voltage mode.
■	CC mode	Active outputs are operated in a constant current mode.

Additional display characteristics

The following section provides a short insight on the indication of the screen in general for dialogs and settings.

- Appearance of active elements
  - Active elements like "ON"/"OFF" switches and selected softkeys display a blue background. In the home window and detailed channel display window (for two-channel model), the selected element (voltage or current) is in editing mode.
  - Selected element is framed or highlighted in orange.

Figure 3-25: Appearance of active elements

- Appearance of inactive elements
  Inactive or disabled elements are displayed in gray.
  - Element icon on the device status bar appears gray when not activated. The following shows the various inactive element icons on the device status bar, e.g. USB icon appears gray when not detected.

Figure 3-26: Inactive element icons on device status bar

  - Menu appears grayed out due to conflicting operational conditions, i.e. ramp function disabled due to conflicting operational conditions with arbitrary function.
    Using related SCPI commands on a disabled function returns SCPI error.

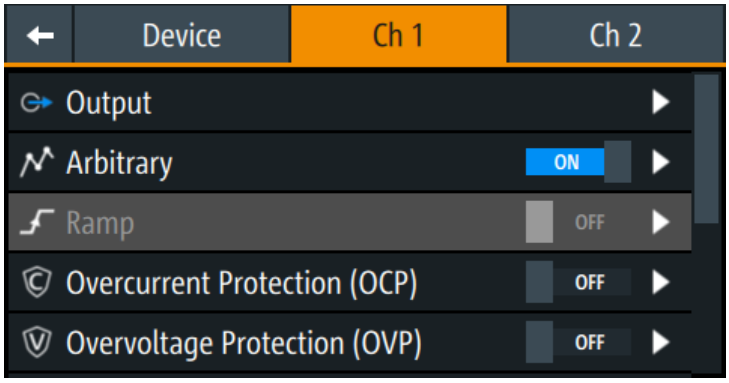


Figure 3-27: Ramp function disabled

– Menu item appear grayed out due to restricted operation conditions, i.e. enabling the logging function restricts further configuration of the logging parameters.

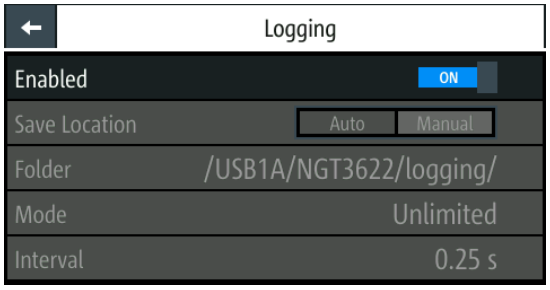


Figure 3-28: Restricting logging parameters

- Menus and dialogs
  Both menus and dialogs appear similar and contain selection lists. Throughout this manual, a list of functions that lead you to the settings of this function is referred to as a menu. The term dialog refers to the views that cover the parameters of a certain function. Some dialogs are divided into tabs with logically grouped parameters. The instrument functions are grouped into various menus based on the categories of "Device" and respective channel. See Figure 3-29.

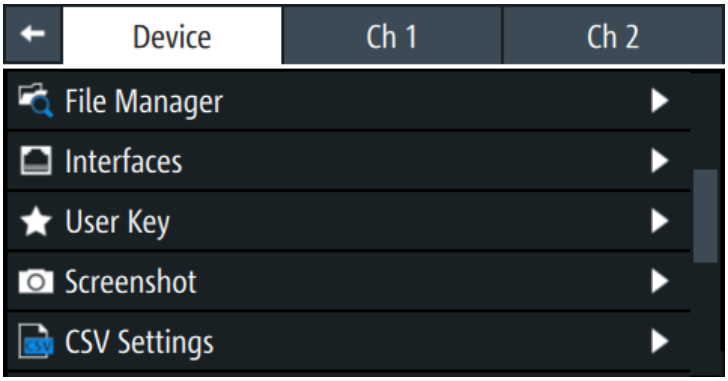


Figure 3-29: Example of a menu

The term dialog refers to the views that cover the parameters of a certain function. See Figure 3-30.

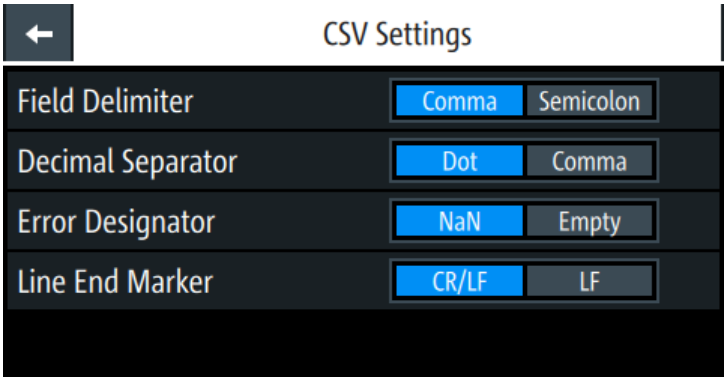


Figure 3-30: Example of a dialog

- Wizards
  The measurement wizard is provided to perform a sequence of standardized and recurring measurements with guided instructions during the measurement. All relevant parameters are set before the actual measurements and cannot be changed once the actual measurement procedure has begun. See Figure 3-31.

Figure 3-31: Example of an adjustment wizard

- On-screen keyboard
  The on-screen keyboard appears if alphanumeric or numeric entry is required. See "Entering numeric parameters" on page 55. For alphanumeric entry, you can select "_&123" or "ABC" on the on-screen keyboard to toggle between the numeric and alphabetical entry.

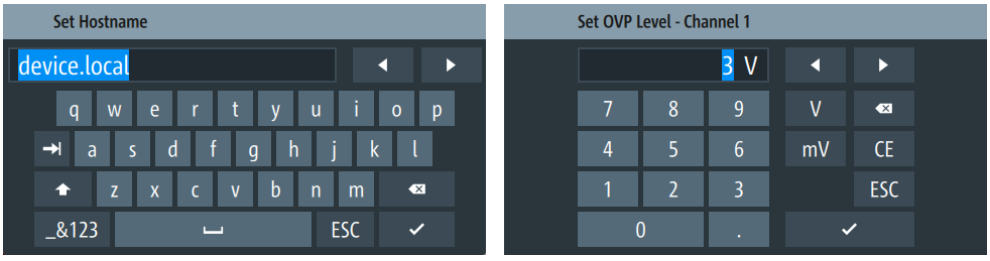


Figure 3-32: On-screen keyboard for alphanumeric and numeric entry field

- Info dialogs
  An "Info dialog" appears when an event generates a message. The generically assigned header shows the affected topic. The message describes the event and short instructions that lead you through the next steps.
- Scrollbar

The scrollbar appears when the list of selection parameters exceeds the size of the screen. Touch and swipe on the screen to scroll up and down the list.

3.4.2.2 Accessing the functionality

The main output control of the respective channels is only possible via the front panel keys. All other instrument functionalities are accessible via dialogs, menus or keyboards. You can control the instrument intuitively with the touchscreen. This section provides an overview of the accessing methods.

Apart from the instrument menus, we use the term "dialog" to refer to the editable windows in the instrument.

To open the menu

1. Press [Settings] key at the front panel. Alternatively, select the "Settings" softkey in the home window for R&S NGT3621 or via the respective channel display area in detailed channel display window for R&S NGT3622. See Table 3-7 and Figure 3-22.
   - If selection is via the [Settings] key, the "Device" menu is displayed.
   - If selection is via the "Settings" softkey, the respective channel menu is displayed.
2. To alternate between the "Device" and respective channel menu, select the corresponding tab on the top of the screen.
   The selection leads you to their respective menus.

To open the dialog

► Select the corresponding menu item from the displayed menu, i.e. "Interfaces" > "Network" > "LAN".
The corresponding dialog is displayed.

To close or exit a dialog or menu

To close or exit a dialog or menu, you have several options.

1. To return to the home window, press [Home] key.
2. To return to the previous menu level or exit the menu if it is already at the main menu level, the R&S NGT3600 provides several methods:
   - Softkey that prompts you to confirm or abort your selection, e.g. "Set" or "Cancel" automatically closes a dialog.
   - Select "Back" softkey, ← in the left upper corner of the menu.
   - Press [Back] key, [Enter] key or the rotary knob at the front panel.

To select a parameter in a dialog

If many parameters are available, they are often provided in a list:

1. If necessary, scroll through the list.

Tip: You do not need the focus exactly on the bar, touch and swipe the list.

2. As an alternative, you can use the rotary knob:
   a) Turn the rotary knob to select the parameter.
   b) Press the rotary knob to confirm your selection.

3.4.2.3 Entering data

For data input in dialogs, the instrument provides an on-screen keyboard for entering numeric and alphanumeric values. Thus, you can always set the parameters using the touchscreen. However, if the touchscreen is locked, data entry via navigation controls at the front panel works only in the home window and the detailed channel display window, see "To enter values by using the front panel controls" on page 55.

Data can be entered using one of the following methods:

- "To correct an entry" on page 54
- "To confirm an entry" on page 54
- "To abort an entry" on page 54

To correct an entry

1. To delete an entry, set the cursor to the right of the entry you want to delete.
   To select the position:
   - Select directly in the entry field.
   - Use the cursor softkeys of the on-screen keyboard.
   - Use the left or right arrow key on the front panel.
2. On the on-screen keyboard, select "Delete" softkey, .
   The R&S NGT3600 deletes the entry to the left of the cursor.
3. Enter your correction.

To confirm an entry

► On the on-screen keyboard, confirm your entry with the "Enter" softkey, .
Alternatively, you can also confirm your entry with the respective unit key (if any) on the on-screen keyboard.
Pressing the rotary knob or the [Enter] key also confirms the data entry.

To abort an entry

► On the on-screen keyboard, select "ESC" softkey.
Alternatively, you can also press [Back] key on the front panel to abort the data entry.
The on-screen keyboard closes without changing the settings.

Entering numeric parameters

To enter values with the on-screen keyboard

For numeric settings, the instrument displays the numeric keyboard. The units specified correspond to the units of the parameter.

1. Enter the numeric value.
2. Select the unit (if any) to complete the entry.
   The value changes according to the unit entry.
   If an entry does not require a unit, confirm the value with the "Enter" softkey, ✓.
   See also "To confirm an entry" on page 54.

To enter values by using the front panel controls

You can also change the parameters with the navigation controls on the front panel, e.g. if you have locked the touchscreen. However, these front panel controls work only in the home window and detailed channel display window.

For details on locking and unlocking the touchscreen, see Section 5.7, "User key", on page 93 in the user manual.

1. Navigates to the corresponding entry (voltage or current) by rotating the rotary knob on the front panel.
   Alternatively, you can use the left or right arrow key on the front panel to navigate to entry.
   The selected entry field is highlighted with an orange frame.
2. Press the rotary knob to select the entry.
   To enter a value, use the controls as follows:
   a) Turning the rotary knob decreases or increases the currently selected digit (highlighted in blue).
   b) Pressing the rotary knob again switches to the next digit.
   Alternatively, you can use the left or right arrow key on the front panel to position to next digit.
3. Press [Back] or [Enter] key to complete the entry.

Entering alphanumeric parameters

If a field requires alphanumeric input, you can use the on-screen keyboard to enter letters and (special) characters.

Access and control are similar as described above, see "To enter values with the on-screen keyboard" on page 55.

3.4.3 Remote control

In addition to operating the R&S NGT3600 directly on the instrument, it is also possible to operate and control it from a remote PC.

Remote control interfaces

The R&S NGT3600 provides several interfaces for remote control:

- Ethernet (LAN) interface
- USB standard interface

For detailed information on how to configure the remote control interfaces, see Section 8, "Network operation and remote control", on page 135.

See Section 3.1.9, "Connecting to LAN", on page 31 for an example of how to set up a LAN connection for remote control.

4 Operating basics

4.1 Using the touchscreen

The R&S NGT3600 provides a touch-sensitive screen. Touchscreen can be disabled (see Section 5.7, "User key", on page 93) in the instrument settings. The following illustrates the touchscreen gestures and highlight the different touchscreen features that can be performed on the instrument.

See Section 3.4, "Instrument control", on page 41.

4.1.1 Accessing functionality in the home window

The following illustrates various ways of accessing functions in the home window.

4.1.1.1 Settings softkey

The "Settings" softkey navigates to the device and channel menus window where you can set device or individual channel settings on the instrument.

See Section 4.2.1.2, "Settings key", on page 61.

1. For the one-channel model, select the "Settings" softkey in the channel display area. For the two-channel model, tap anywhere in the respective channel display area to access the "Settings" softkey in the detailed channel display window.

   The R&S NGT3600 displays device/channel menu window.
2. Select "Device" or the respective channel tab ("Ch 1" or "Ch 2") to open the menu.
3. Swipe up or down for the available items in the menu.
4. Select the required items to configure the settings.
5. Select the back arrow softkey or press [Back] key to close the menu.

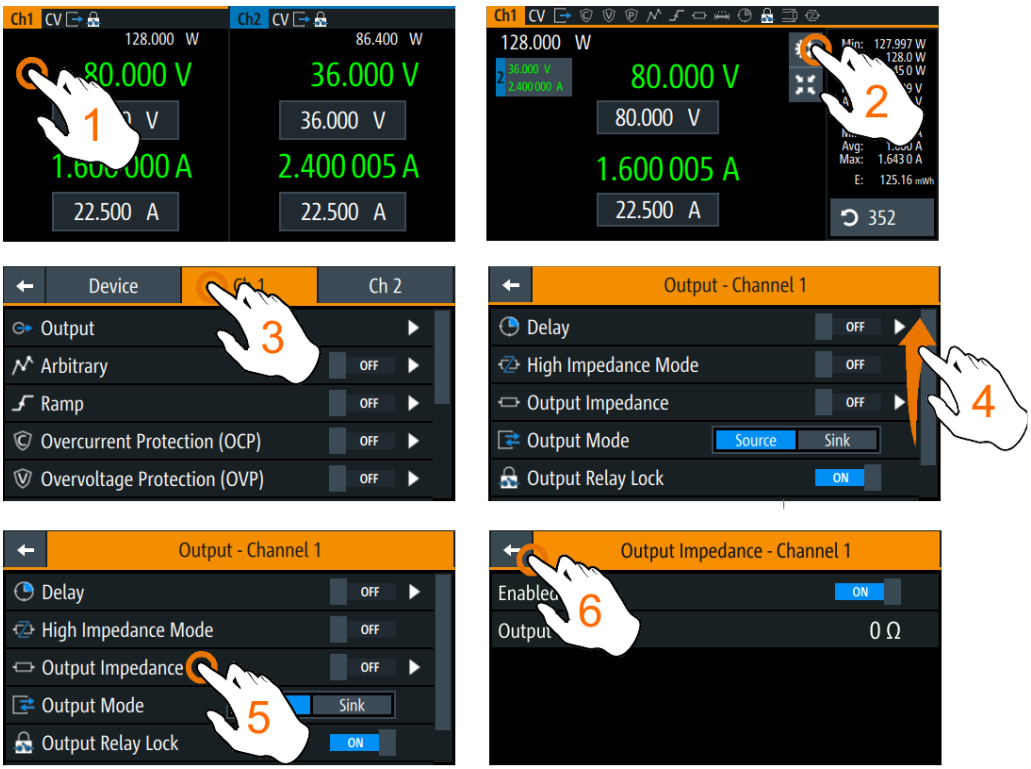


Figure 4-1: Navigation on home window > device/channel menu window

Settings,
Configures the device or channel settings. See Section 4.2.1.2, "Settings key", on page 61.

Back, [Back]
Returns to the home window.

See Figure 3-16.

4.1.1.2 Voltage and current inputs

You can directly change the target voltage and current level in the respective channel display area.

1. Select the voltage or current field in the channel display area to set the value.
   The R&S NGT3600 displays the on-screen keyboard to enter a value.
2. Set the required value.
   See Section 4.1.2, "Input data", on page 60.
   Note: The value is set within the value configured in the "Safety Limits" dialog.
3. Confirm the value by selecting a unit softkey ("V"/"mV" or "A"/"mA").
   Alternatively, select "Enter" softkey, ✓ to confirm your value.

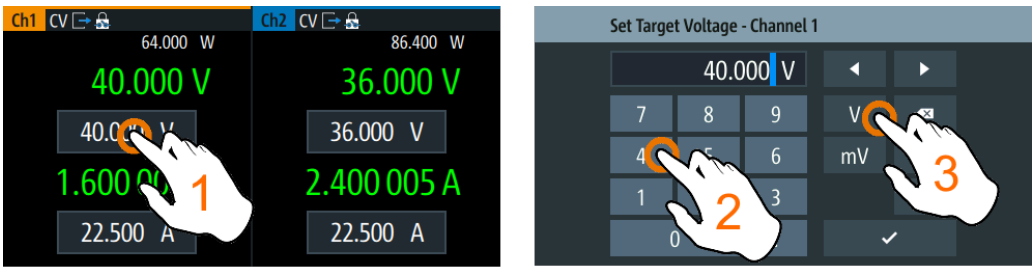


Figure 4-2: Set voltage and current in the home window

Set voltage level / Set current limit
Sets the output voltage level or current limit for the channel. See Section 5.1, "Voltage and current", on page 70.

4.1.1.3 Collapse softkey

Available only with the two-channel model, the "Collapse" softkey returns the R&S NGT3600 from detailed channel display window to home window.

1. Tap anywhere in the selected channel display area.
   The R&S NGT3600 expands the selected channel to a full screen displaying the statistics ("Min", "Avg" and "Max" values of power, voltage and current readings, energy calculation and count of samples recorded).
2. To reset the statistics, select "Reset" softkey, .
   The statistical values are reset to zero.
   Note: The statistics provide valid data for up to 365 days of continuous operation, after which the statistics are reset to zero.
3. Select "Collapse" softkey to return to the home window.

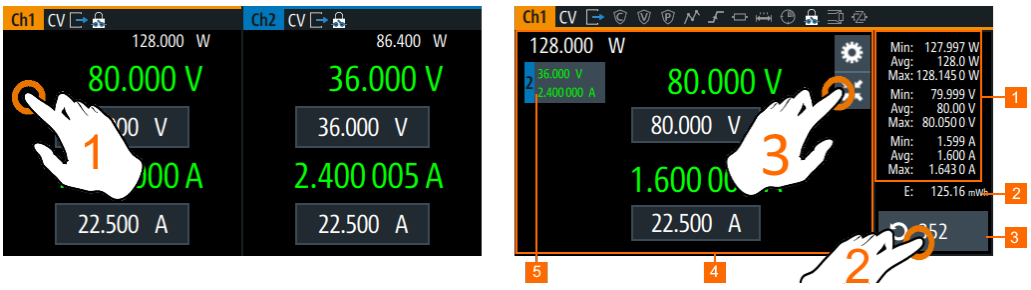


Figure 4-3: Display of detailed channel display window

1 = Minimum, maximum and average values for power, voltage and current
2 = Calculation of energy result
3 = Number of samples collected
4 = Channel display area of selected channel
5 = Alternate channel view

Collapse
Returns to home window.

4.1.2 Input data

The R&S NGT3600 provides an on-screen keyboard for you to enter numerical values. Use the "Back" softkey, on the on-screen keyboard to delete the numerical entries.

1. Select a menu item to enter the numeric value.
   The R&S NGT3600 displays the on-screen keyboard.
2. Enter the required value.
3. Depending on the type of numeric value, confirm the value with the appropriate unit softkey ("V"/"mV" or "A"/"mA" or "s"/"ms").
   Alternatively, select "Enter" softkey, to confirm your value.

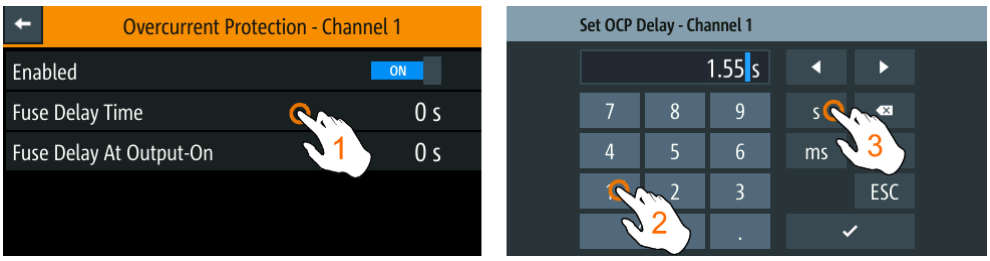


Figure 4-4: Enter numerical value and unit

For alphanumeric input, the on-screen keyboard works the same way.

1. Select "Caps Lock" softkey, to switch between capital letters and small letters.
   The "Caps Lock" softkey is highlighted in blue.
2. Select "_&123" or "ABC" softkey to switch between alphabet and numeric input data.

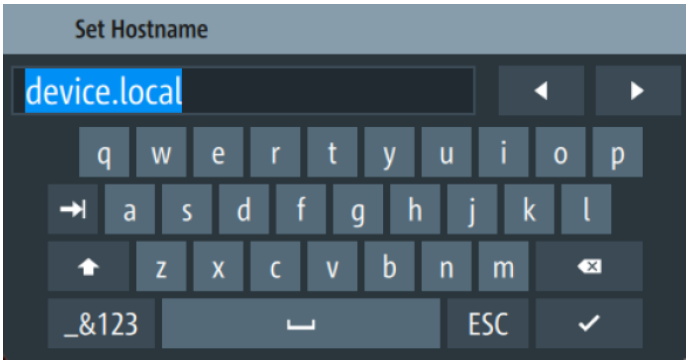


Figure 4-5: Alphanumeric input data

<input_data>
Data entries are entered via the on-screen keyboard.

4.2 Front panel keys

For an overview of the front panel keys, see Section 3.2.1, "Front panel", on page 32.

4.2.1 Menu control keys

The menu control keys provide navigation on the available menus in the instrument.

4.2.1.1 Home key

The [Home] key navigates to the instrument home window. See the display of the home window in Figure 3-16.

4.2.1.2 Settings key

The [Settings] key navigates to the device/channel menu window which consists of the "Device" menu and up to two channel menus ("Ch 1", "Ch 2").

Device menu

The "Device" menu provides access to general instrument settings, file arrangement and user key configuration. You can also obtain the instrument information via the menu.

Access:

1. Press [Home] key.
   The R&S NGT3600 displays the home window.
2. Press [Settings] key.
   Alternatively, select the "Settings" softkey on the respective channel display area.
   See Section 4.1.1.1, "Settings softkey", on page 57.
3. Select "Device" tab to access the device menu.

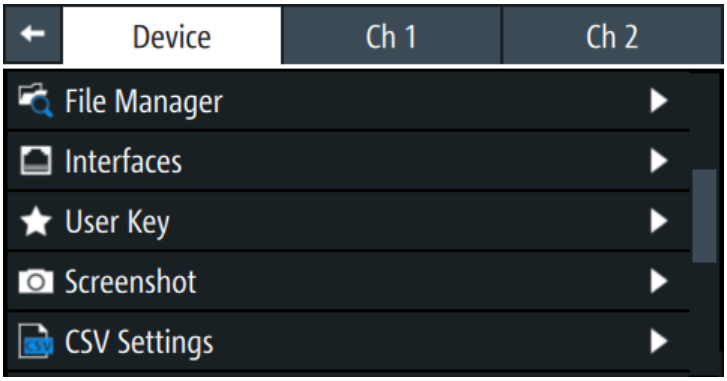


Figure 4-6: Device menu

Settings

Logging
Logs data such as instrument timestamp, voltage, current and power.

See Section 5.8.2, "Data logging", on page 95.

"ON" Enables data logging.

"OFF" Disables data logging.

Remote command:
`LOGGing[:STATe]` on page 214

Multi-Device
Configures the multi-device mode for up to six channels to generate higher current (parallel connection) or higher voltage (series connection).

See Section 5.9.3, "Multi-device mode", on page 105.

Digital I/O Trigger
Configures the digital I/O pins trigger modes and its associated settings.

See Section 5.6, "Digital trigger I/O", on page 88.

Remote command:
DIO<IO>[:ENABle] on page 164

File Manager
Transfers file between instrument internal memory and USB flash drive.

See Section 6.2, "File manager", on page 114.

Interfaces
Configures the LAN or USB interfaces.

See Section 8.1, "Remote control interfaces and protocols", on page 135.

User Key
Configures the shortcut key action (e.g. screenshot, toggle logging, reset statistics, toggle touch).

See Section 5.7, "User key", on page 93.

Screenshot
Configures the storage location for the captured screenshot of the instrument.

See Section 6.4, "Screenshot", on page 121.

CSV Settings
Configures the file formatting for CSV file.

See Section 5.8.3, "CSV settings", on page 99.

Date & Time
Configures the date and time of the instrument.

See Section 7.3, "Date and time", on page 126.

Appearance
Configures the brightness level of the display screen and front panel keys.

See Section 7.1, "Appearance settings", on page 123.

Sound
Enables or disables beeper for triggered events (e.g. error, fuse tripped, cc-mode continuous, output).

See Section 7.2, "Sound settings", on page 125.

Device Information
Displays instrument information.

See Section 7.4.1, "Device information settings", on page 127.

Update Device
Performs firmware update on the instrument.

See Section 7.6, "Update device", on page 133.

Save/Recall Device Settings
Saves, recalls or resets instrument settings.

See Section 6.3, "Save and recall", on page 116.

Device Settings Lock
Locks the instrument settings.

See Section 7.5, "Device settings lock", on page 130.

Channel menu

Depending on instrument models, the channel menu provides access to channel output settings, channel protection features, arbitrary and ramp functions, and safety limits settings.

Access:

1. Press [Settings] key.
   Alternatively, select the "Settings" softkey on the respective channel display area.
   See Section 4.1.1.1, "Settings softkey", on page 57.
2. Select the respective channel tab to access the channel menu.

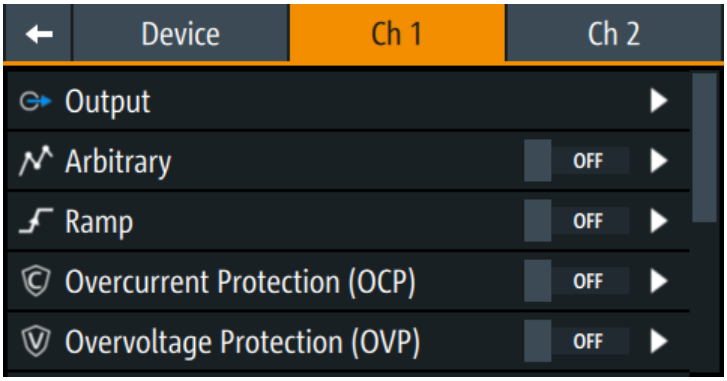


Figure 4-7: Channel 1 menu

Settings

Output
Sets the output parameters for the selected channel.

See Section 5.3, "Output setting", on page 72.

Arbitrary
Configures the arbitrary sequence, sequence repeatability response and the sequence ending behavior.

See Section 5.9, "Advanced features", on page 100.

"ON" Enables the arbitrary function.

"OFF" Disables the arbitrary function.

Remote command:
`ARBitrary[:STATe]` on page 206

Ramp
Configures the time taken to ramp up the voltage on the channel output.

See Section 5.9, "Advanced features", on page 100.

"ON" Enables the ramp function.

"OFF" Disables the ramp function.

Remote command:
`[SOURce:]VOLTage:RAMP[:STATe]` on page 208

Overcurrent Protection (OCP)
Configures the OCP protection settings ("Blowing Delay" and "Initial Delay") for the instrument.

See Section 5.5.1, "Overcurrent protection (OCP)", on page 82.

"ON" Enables the OCP function.

"OFF" Disables the OCP function.

Remote command:
`[SOURce:]CURRent:PROTection[:STATe]` on page 190

Overvoltage Protection (OVP)
Configures the OVP protection settings (OVP level) for the instrument.

See Section 5.5.2, "Overvoltage protection (OVP)", on page 83.

"ON" Enables the OVP function.

"OFF" Disables the OVP function.

Remote command:
`[SOURce:]VOLTage:PROTection[:STATe]` on page 192

Overpower Protection (OPP)
Configures the OPP protection settings (OPP level) for the instrument.

See Section 5.5.3, "Overpower protection (OPP)", on page 84.

"ON" Enables the OPP function.

"OFF" Disables the OPP function.

Remote command:
`[SOURce:]POWer:PROTection[:STATe]` on page 195

Protection Linking
Available in the two-channel instrument model. Protection linking turns on or off the interlink of the second channel with their electronic fuses. If a fuse trips during operation, the second channel interlink with this channel is turned off.

See Section 5.5.4, "Protection linking", on page 86.

Adjustment
Performs channel adjustment and restores factory adjustment.

See Section 5.10, "Adjustment", on page 107.

Safety Limit
Configures the voltage and current limit of the channel output.

See Section 5.5.5, "Safety limits", on page 86.

Channel Fusion
Available in the two-channel instrument model.

With channel fusion, you can operate the two-channel instrument model as a single channel instrument by combining the channels in series or parallel mode. Up to 160 V in series mode or 100 A in parallel mode is supported with channel fusion.

See Section 5.4, "Channel fusion", on page 78.

4.2.1.3 User key

The [*] key provides a shortcut function to one of the followings:

- Screenshot
- Data logging
- Reset statistics
- Toggle touchscreen input

The shortcut key is configurable in the "Device" > "User Key" menu. See Section 5.7, "User key", on page 93.

4.2.2 Navigation controls

Navigation in the menu and setting of values can be done via rotary knob, arrow keys, [Back] key and [Enter] key.

For more information on how to navigate menus, dialogs and data entry in the instrument, see Section 3.4.2.2, "Accessing the functionality", on page 53 and Section 3.4.2.3, "Entering data", on page 54.

4.2.3 Output and channel controls

Depending on the instrument models, up to two channel keys may be used to control the channel output settings of the instrument.

Function keys	Description
[Ch 1] [Ch 2]	Selects the respective channel for output.
[Output]	Primary output switch - it enables or disables the output for all selected channels.

Settings

[Ch 1] / [Ch 2]
Selects the respective channel for output.

Remote command:
`INSTrument:NSELect` on page 167
`INSTrument[:SELect]` on page 167

[Output]
Primary output switch - it enables or disables the output for all selected channels.

Remote command:
`OUTPut:GENeral[:STATe]` on page 183
`OUTPut[:STATe]` on page 185
`OUTPut:SELect` on page 186

4.3 Output power auto-ranging

The R&S NGT3600 power supply series provides a maximum output power of 1800 W for each channel. Depending on the instrument models and the supply input source, up to 3600 W of output power is provided for a two-channel model with a continuous voltage range of 2 V to 80 V. With input source of 100 VAC to 120 VAC, the maximum output power is however, limited to 1800 W for both one and two-channel instrument models.

Combination of the set voltage and current limit results in the following output performance graph.

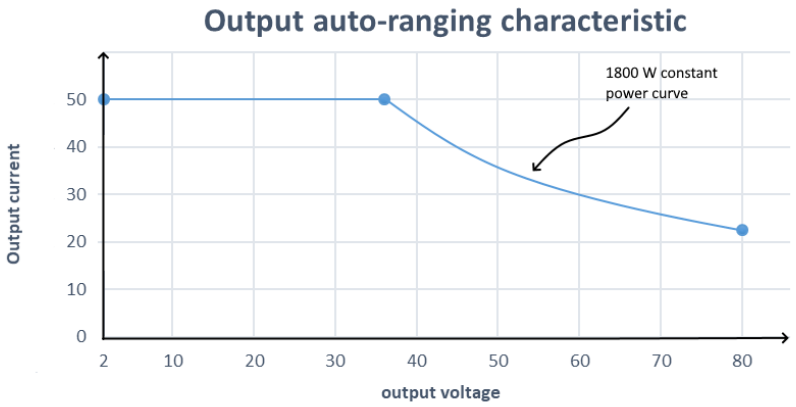


Figure 4-8: Output performance graph

For more information on the combination of channels, see Section 13, "Applications", on page 231.

4.4 Modes of operation

The R&S NGT3600 supports two operating modes, i.e. constant voltage (CV) and constant current (CC). The instrument automatically switches between CV and CC depending on the connected load conditions.

4.4.1 Constant voltage mode (CV)

Figure 4-9 shows that the instrument is in the range of voltage regulation. The output voltage V_{out} remains constant while the current may increase to its maximum value I_{max} when the connected load is increasing. In CV mode, the font text in the channel display area changes to green.

See also Figure 3-24.

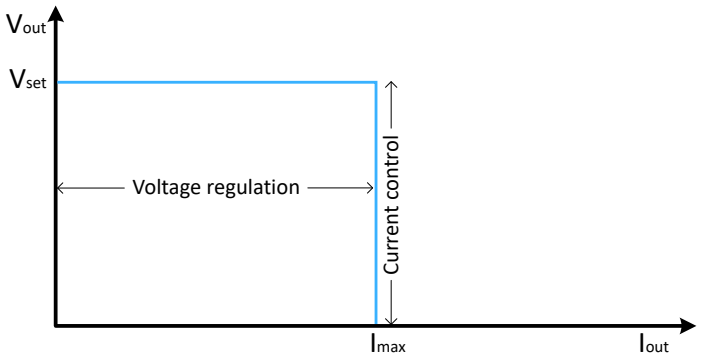


Figure 4-9: Current limit

4.4.2 Constant current mode (CC)

The current I_{max} corresponds to the current setting adjustable in the instrument.

If I_{out} reaches I_{max}, the instrument switches to CC mode, i.e. the output current remains constant and limited to I_{max} even if the load increases, the output voltage V_{out} decreases below V_{set}. In a short circuit, the output voltage drops towards zero. In CC mode, the font text in the channel display area changes to red.

See Figure 3-24 and Section 5.5.1, "Overcurrent protection (OCP)", on page 82.

5 Instrument functions

5.1 Voltage and current

The R&S NGT3600 comes with the following instrument models:

Models	Channels
R&S NGT3621	Ch1
R&S NGT3622	Ch1, Ch2

Toggle the respective channel key ([Ch 1], [Ch 2]) on the front panel to select these channels. When a channel is selected, the respective channel key illuminates.

Figure 5-1: Respective channel key illuminates when selected

Depending on the instrument models, the R&S NGT3600 adjusts the following voltage and current values in step size of 1 mV and 1 mA, respectively.

Model	Maximum voltage	Maximum current
R&S NGT3621, R&S NGT3622	80 V	50.00 A

The setting of current value corresponds to the I_{max} of the respective channel. It is recommended to set the current limit before operating the instrument to prevent damage to the load and instrument in the case of malfunction such as a short-circuit.

Access:

► Press [Home] key.
The R&S NGT3600 displays the home window.

To configure voltage and current settings

1. Set the voltage or current in the respective channel display area.
The R&S NGT3600 displays the on-screen keyboard to set the value.
2. Enter the required voltage or current value.
3. Confirm the value with the unit softkey ("V"/"mV" or "A"/"mA").
Alternatively, select "Enter" softkey, ✓ to confirm your value.
4. Press the required channel key ([Ch 1] or [Ch 2]) on the front panel.
The selected channel key is illuminated.

See Figure 5-1.

5. Press [Output] key on the front panel.
   The R&S NGT3600 outputs the set voltage of the selected channel and displays the corresponding values in the home window.
   For more information on the operation modes, see Section 4.4, "Modes of operation", on page 68.

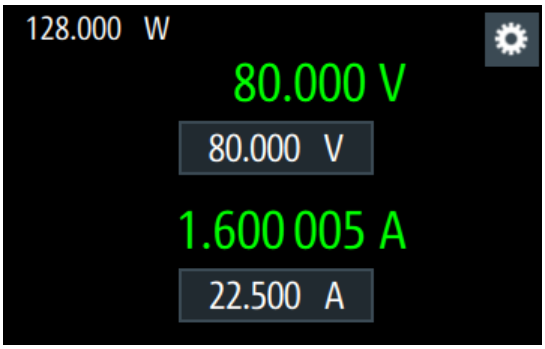


Figure 5-2: Voltage and current settings in the instrument

Settings

Voltage and current
Sets output voltage and current limit for the selected channel.

See also Section 5.2, "Channel output", on page 71.

Remote command:
`[SOURce:]APPLy` on page 180
`[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]` on page 175
`[SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement]` on page 176
`[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]` on page 178
`[SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement]` on page 179

5.2 Channel output

Depending on the instrument models, the outputs of the channels (Ch 1, Ch 2) can be switched on or off by toggling the [Output] key on the front panel.

By default, the output is turned off when the instrument is switched on. This design prevents a connected load from being damaged unintentionally.

Access:

► Press the required channel key.
  Selected channel key ([Ch 1], [Ch 2]) illuminates.

To activate a channel output

► Press [Output] key.
The R&S NGT3600 outputs the set voltage of the selected channel.
Depending on the operating modes, the font color in the channel display area shows green in CV mode and red in CC mode.
See Section 4.4, "Modes of operation", on page 68.
See also Section 4.3, "Output power auto-ranging", on page 67.

Multiple outputs can be turned on or off at the same time. See more information in Section 5.9.3, "Multi-device mode", on page 105 and Section 13, "Applications", on page 231.

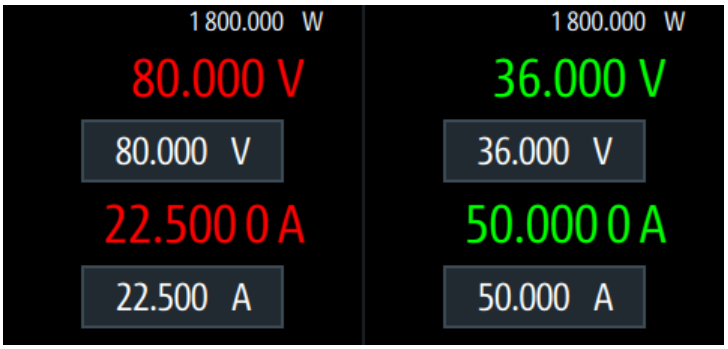


Figure 5-3: Output of R&S NGT3600 in CC and CV modes

Settings

[Output]
Activates or deactivates the channel output.

See details in Section 4.2.3, "Output and channel controls", on page 67.

Remote command:
`OUTPut:GENeral[:STATe]` on page 183
`OUTPut:SELect` on page 186
`OUTPut[:STATe]` on page 185

5.3 Output setting

The "Output" menu provides settings for parameters affecting the impedance, output delay and operation mode of the channel output.

Access:

► Select [Settings] > channel tab > "Output" to set the output controls.
The R&S NGT3600 displays the "Output" dialog.

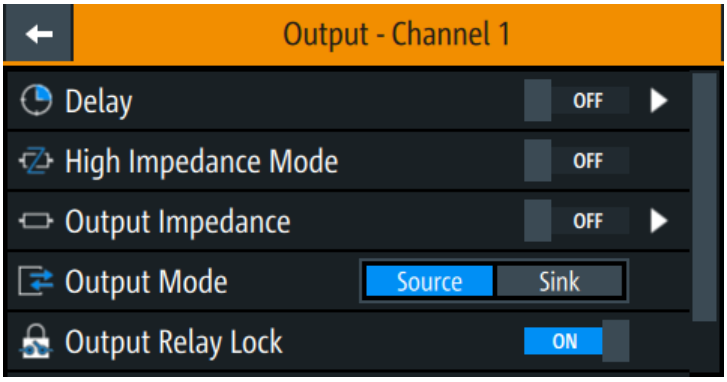


Figure 5-4: Output dialog

5.3.1 Impedance

The output impedance is only active during CV operating mode. Setting a proper output impedance improves load regulation, enhances transient response due to sudden changes in load, and minimizes noise and ripple on the output voltage.

Access:

► Select [Settings] > channel tab > "Output" > "Output Impedance" to configure the required values.
The R&S NGT3600 displays the "Output Impedance" dialog.

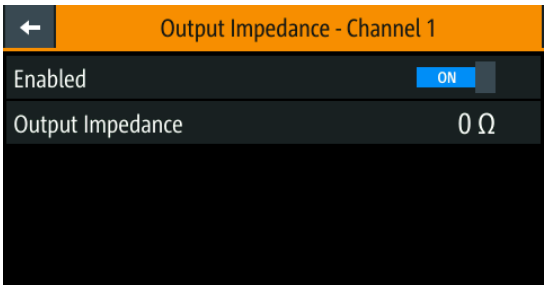


Figure 5-5: Output impedance dialog

To configure output impedance

1. Set the required value.
The R&S NGT3600 displays the on-screen keyboard for entry.
2. Confirm the value with the unit softkey ("mΩ" or "Ω").
Alternatively, select "Enter" softkey, ✓ to confirm your value.
3. Set the "Enabled" to "ON".
The R&S NGT3600 enables the output impedance function.

Settings

Enabled
Enables or disables the output impedance function.

ON	Enables the output impedance function.
OFF	Disables the output impedance function.

Remote command:
`OUTPut:IMPedance:STATe` on page 184

Output Impedance
Sets the output impedance value.

Remote command:
`OUTPut:IMPedance` on page 184

5.3.2 Delay

The output delay is the time between the "Output On" event and the available voltage at the output terminals. See Figure 5-6.

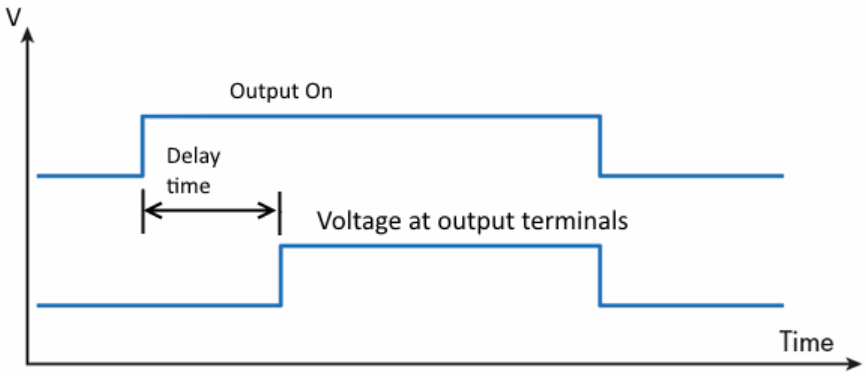


Figure 5-6: Output delay at the output terminals

When the instrument output delay is activated, the front panel of the respective channel key (i.e. [Ch 1], [Ch 2]) blinks in green until the delay time has reached.

These operating behaviors resume to normal after the delay time.

Access:

► Select [Settings] > channel tab > "Output" > "Delay" to configure the required values.
The R&S NGT3600 displays the "Output Delay" dialog.

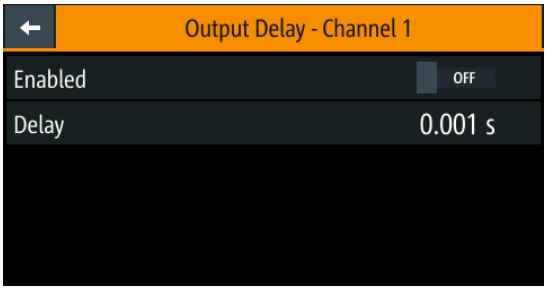


Figure 5-7: Output delay dialog

To configure output delay

1. Set the required value.
   The R&S NGT3600 displays the on-screen keyboard for entry.
2. Confirm the value with the unit softkey ("ms" or "s").
   Alternatively, select "Enter" softkey, ✓ to confirm your value.
3. Set "Enabled" to "ON".
   The R&S NGT3600 enables the output delay function.
   Observe that the delay icon, is present on the respective channel status bar.

Figure 5-8: Delay function activated in channel 1

Settings

Enabled
Enables or disables output delay.

"ON" Enables output delay.

"OFF" Disables output delay.

Remote command:
`OUTPut:DELay[:STATe]` on page 182

Delay
Sets the delay time before the voltage is available at the output terminals.

Remote command:
`OUTPut:DELay[:ON]:DURation` on page 182

5.3.3 Output mode

Access:

► Select the [Settings] > channel tab > "Output" > "Output Mode" to set the output mode.
See "Source and sink current" on page 38.

To configure output mode

► Select the required output mode.
See "Output Mode" on page 76.

Settings

Output Mode
Sets the output mode of the R&S NGT3600.

Sink	The R&S NGT3600 goes to sink mode, current flows into the instrument. On display, the current shows negative current.
Source	The R&S NGT3600 goes to source mode, current flows out from the instrument.

Remote command:
`OUTPut:MODE` on page 185

5.3.4 Output relay lock

When the output is turned off, the R&S NGT3600 uses a relay lock to provide isolation between the output terminals and the internal circuitry. See also Section 5.3.6, "High impedance mode", on page 78.

By default, the output relay lock is turned on.

Access:

► Select [Settings] > channel tab > "Output" > "Output Relay Lock" to activate/deactivate the output relay lock.
See "Output Relay Lock" on page 77.

Settings

Output Relay Lock
Activates or deactivates the output relay lock.

"ON" Activates output relay lock.

"OFF" Deactivates output relay lock.

Remote command:
`OUTPut:RELay[:LOCK][:STATe]` on page 186

5.3.5 Remote sensing

The "Remote sensing" is a mechanism used to monitor and compensate the voltage drops on the cables connected to the load.

Access:

► Select [Settings] > channel tab > "Output" > "Remote Sense" to configure the remote sensing mode.
See details in "Remote sensing" on page 77.

Once the remote sense is activated, it becomes part of the output feedback path for R&S NGT3600. Disconnection or shorting of the remote sense lines causes a mismatch in the actual output voltage versus the reported value of the instrument. The error of differences is detected by the instrument and the output is turned off automatically with a corresponding error displayed to instruct the user to check on the connection.

Excessive voltage drops on the loading cables, e.g. using too small wires, can also trigger remote sense protection.

For optimum connection, maintain a maximum voltage drop of 1V on loading cables is recommended.

Settings

Remote sensing
Sets remote sense mode for the selected channel.

External The internal voltage sense relay in the instrument is switched on and the connection of remote sensing wires (S+, S-) to the input of the load become necessary. Failure to connect remote sense can cause overvoltage or unregulated voltage output from the R&S NGT3600. The voltage sensing relay remains switched on even when the output is turned off.

Internal The internal voltage sense relay in the instrument is switched off. Remote sense is disabled.

Remote command:
[SOURce:]VOLTage:SENSe[:SOURce] on page 172
[SOURce:]VOLTage:SENSe:TRIPped? on page 173
[SOURce:]PROTection:CLEar on page 196

5.3.6 High impedance mode

The "High Impedance Mode" only affects the output behavior when switching off the R&S NGT3600 output. With the default settings, the output is discharged quickly using the active current sinking circuit. But if "High Impedance Mode" is enabled, the circuit is disabled when switching off the output, and the output capacitors discharge is determined by the instrument internal resistors and the connected load.

The "High Impedance Mode" does not affect the instrument functions when the output is turned on. Voltage down-programming is still assisted by the active current sinking circuit. If the output is disabled by protection trigger like OVP, OCP, the active current sinking circuit automatically discharges the output capacitors for safety reasons.

Due to circuit biases and offsets, the active current sinking circuit can still draw a small current of up to a few milliamps even if high impedance mode is enabled.

Access:

► Select [Settings] > channel tab > "Output" > "High Impedance Mode" to activate/ deactivate the high impedance mode.
See "High Impedance Mode" on page 78.

Settings

High Impedance Mode
Activates or deactivates the high impedance mode.

"ON" Activates the high impedance mode.

"OFF" Deactivates the high impedance mode.

Remote command:
OUTPut:HIMPedance[:STATe] on page 184

5.4 Channel fusion

For safety information, see Section 3.1.7, "Connecting the load", on page 27 and "Working with hazardous voltages" on page 11.

The "Channel Fusion" provides the recommended setup and configuration to set the connection mode (series or parallel) of the device.

By combining the multi-device mode connection setup of power supplies, you can generate higher current and voltage outputs. See Section 5.9.3, "Multi-device mode", on page 105.

The "Channel Fusion" is available only in the two-channel models.

When enabling or disabling the "Channel Fusion", the R&S NGT3600 resets its voltage and current to default.

The device operates as a 1-channel device which combines both channel 1 and channel 2 output. The maximum permissible voltage and current are limited to the combined output power of both channel 1 and channel 2.

For more information, see Section 13, "Applications", on page 231.

Access:

1. Select [Settings] > channel tab > "Channel Fusion" to configure the channel fusion mode.
   The R&S NGT3600 displays the "Channel Fusion" dialog.

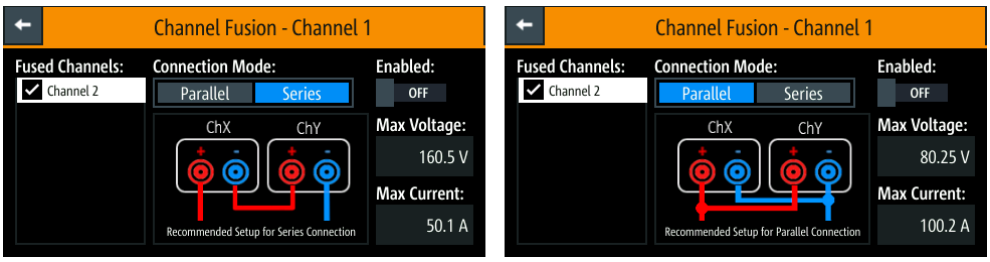


Figure 5-9: Channel fusion dialog for selected connection mode

2. If "Parallel" mode is selected, a dialog popup is displayed to connect the share bus terminal for optimum device performance.

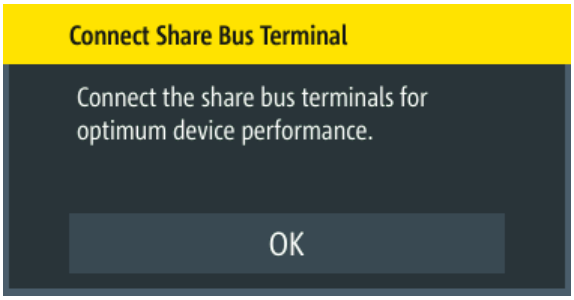


Figure 5-10: Share bus terminal dialog popup

Set channel fusion

1. Select the channels to be fused.
2. Set the required connection mode.

For details, see "Connection Mode" on page 80.

3. Enable the channel fusion function.

Settings

Fused Channels

Displayed the available channels for channel fusion.

Select the desired channel before enabling the channel fusion function.

Remote command:
`OUTPut:FUSion` on page 183

Connection Mode

Sets channel fusion connection mode.

"Series" Connect the series setup as shown in Figure 5-9. After the series mode is enabled, a message "Series with Ch1" is displayed in the channel display area of the selected fused channel. See Figure 5-11. See also Section 13.1, "Series mode", on page 231.

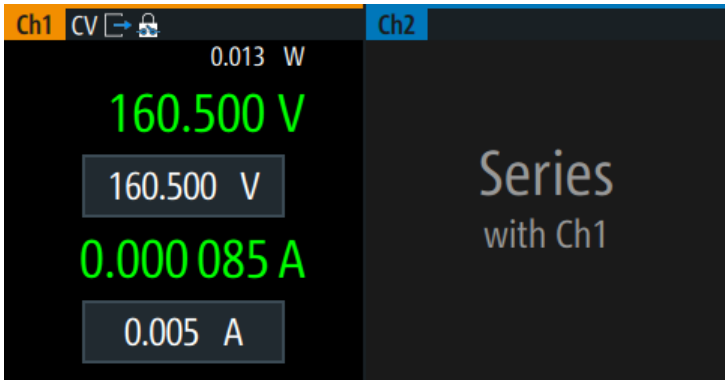


Figure 5-11: Series mode setting with Ch2 selected as the fused channel

"Parallel" Connect the parallel setup as shown in Figure 5-9. After the parallel mode is enabled, a message "Parallel with Ch1" is displayed in the channel display area of the selected fused channel. See Figure 5-12. See also Section 13.2, "Parallel mode", on page 232.

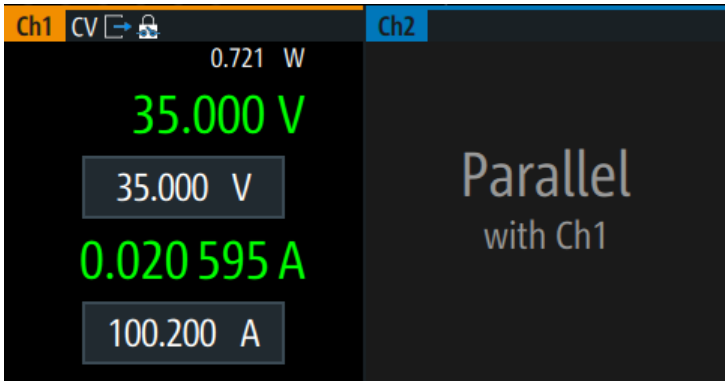


Figure 5-12: Parallel mode setting with Ch2 selected as the fused channel

Remote command:
`OUTPut:FUSion` on page 183

Enabled
Enables or disables channel fusion.

ON Enables channel fusion.

OFF Disables channel fusion.

Remote command:
`OUTPut:FUSion` on page 183

Max. Voltage
Displays the maximum voltage of the output channel.

In series connection mode, the maximum voltage is 160.5 V. In parallel connection mode, the maximum voltage is 80.25 V.

Max. Current
Displays the maximum current of the output channel.

In series connection mode, the maximum current is 50.1 A. In parallel connection mode, the maximum current is 100.2 A.

5.5 Protection

There are various ways in which the R&S NGT3600 protects itself and the connected load from damage due to overvoltage, overcurrent and overpower drawn by the load during testing.

5.5.1 Overcurrent protection (OCP)

When the drawn current exceeds the limit set for the respective channels, an alert is triggered and the affected channels are turned off according to the settings configured in the OCP dialog.

Access:

► Select [Settings] > channel tab > "Overcurrent Protection (OCP)" to set OCP controls.
The R&S NGT3600 displays the OCP dialog.

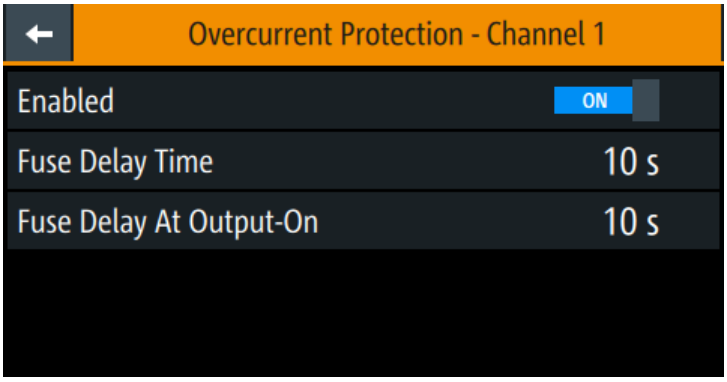


Figure 5-13: Overcurrent protection dialog

To configure overcurrent protection (OCP)

1. Set "Enabled" to "ON".
The R&S NGT3600 enables the OCP and displays the OCP icon on the selected channel status bar information.
2. Set the required "Fuse Delay Time" and "Fuse Delay At Output-On".
The R&S NGT3600 displays the on-screen keyboard to set the values.
3. Confirm the value with the unit softkey ("ms" or "s").
Alternatively, select "Enter" softkey, ✓ to confirm your value.

Settings

Enabled
Enables or disables the overcurrent protection feature.

"ON" Enables the OCP and displays the OCP icon on the selected channel status bar information.

"OFF" Disables the OCP feature.

Remote command:
`[SOURce:]CURRent:PROTection[:STATe]` on page 190
`[SOURce:]CURRent:PROTection:TRIPped?` on page 189
`[SOURce:]CURRent:PROTection:CLEar` on page 188
`[SOURce:]PROTection:CLEar` on page 196

Fuse Delay Time
Time taken to turn off the affected channel after OCP is triggered.

Remote command:
`[SOURce:]CURRent:PROTection:DELay[:BLOWing]` on page 189

Fuse Delay At Output-On
Time taken after channel output is turned on before OCP is put into operation.

Remote command:
`[SOURce:]CURRent:PROTection:DELay:INITial` on page 188

5.5.2 Overvoltage protection (OVP)

When the output voltage exceeds the limit set for the respective channel, an alert is triggered and the affected channel is turned off according to the settings configured in the OVP dialog.

Access:

► Select [Settings] > channel tab > "Overvoltage Protection (OVP)" to set OVP controls.
The R&S NGT3600 displays the OVP dialog.

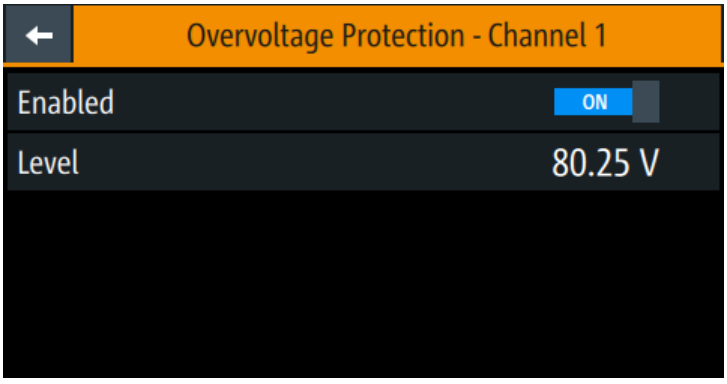


Figure 5-14: Overvoltage protection dialog

To configure overvoltage protection (OVP)

1. Set "Enabled" to "ON".

The R&S NGT3600 enables the OVP and displays the OVP icon on the selected channel status bar information.

2. Set the required level for OVP.
   The R&S NGT3600 displays the on-screen keyboard to set the value.
3. Confirm the value with the unit softkey ("mV" or "V").
   Alternatively, select "Enter" softkey, ✓ to confirm your value.

Settings

Enabled
Enables or disables the overvoltage protection feature.

"ON"	Enables the OVP and displays the OVP icon on the selected channel status bar information.
"OFF"	Disables the OVP feature.

Remote command:
`[SOURce:]VOLTage:PROTection[:STATe]` on page 192
`[SOURce:]VOLTage:PROTection:CLEar` on page 192
`[SOURce:]VOLTage:PROTection:TRIPped?` on page 193
`[SOURce:]PROTection:CLEar` on page 196

Level
Sets the required level for OVP.

Remote command:
`[SOURce:]VOLTage:PROTection:LEVel` on page 192

5.5.3 Overpower protection (OPP)

When the output power exceeds the limit set for the respective channels, an alert is triggered and the affected channels are turned off according to the settings configured in the OPP dialog.

Access:

► Select [Settings] > channel tab > "Overpower Protection (OPP)" to set OPP controls.
The R&S NGT3600 displays the OPP dialog.

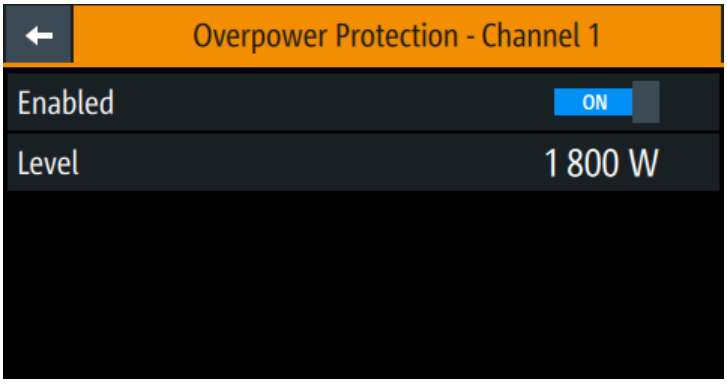


Figure 5-15: Overpower protection dialog

To configure overpower protection (OPP)

1. Set "Enabled" to "ON".
   The R&S NGT3600 enables the OPP and displays the "Overpower Protection (OPP)" icon on the selected channel status bar information.
2. Set the required level for OPP.
   The R&S NGT3600 displays the on-screen keyboard to set the value.
3. Confirm the value with the unit softkey ("mW" or "W").
   Alternatively, select "Enter" softkey, ✓ to confirm your value.

Settings

Enabled
Enables or disables the overpower protection feature.

"ON"	Enables the OPP and displays the OPP icon on the selected channel status bar information.
"OFF"	Disables the OPP feature.

Remote command:
`[SOURce:]POWer:PROTection[:STATe]` on page 195
`[SOURce:]POWer:PROTection:CLEar` on page 195
`[SOURce:]POWer:PROTection:TRIPped?` on page 196
`[SOURce:]PROTection:CLEar` on page 196

Level
Sets the required level for OPP.

Remote command:
`[SOURce:]POWer:PROTection:LEVel` on page 195

5.5.4 Protection linking

With protection linking activated, the R&S NGT3600 allows you to turn off the linked channel when there is an OCP, OVP, OPP or OTP event triggered.

See OCP, OVP and OPP.

Access:

► Press [Settings] > channel tab > "Protection Linking" to configure the channel linking.
The R&S NGT3600 displays the "Protection Linking" dialog.

Figure 5-16: Protection linking dialog

To set channel linking

► Enable or disable the channel linking.
If enabled, the linked channel is turned off when an OCP, OVP, OPP or OTP event is triggered.

Settings

Link to Channel 2/Link to Channel 1
Enables or disables the channel linking for protection feature.

"ON"	Enables the channel linking. If an OCP, OVP, OPP or OTP event is triggered, the linked channel is turned off.
"OFF"	Disables the channel linking.

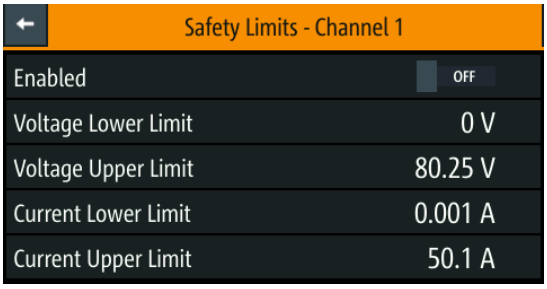
Remote command:
`[SOURce:]PROTection:LINK` on page 197
`[SOURce:]PROTection:UNLink` on page 197

5.5.5 Safety limits

With safety limits set in the instrument, the range of the output voltage and/or output current can be limited. The safety limit prevents inadvertently setting dangerous values for the connected DUT.

Access:

► Select [Settings] > channel tab > "Safety Limits" to set safety limits.
The R&S NGT3600 displays the "Safety Limits" dialog.



To configure safety limits

1. Set the required minimum and maximum value for voltage and current level.
The R&S NGT3600 displays an on-screen keyboard to set the value.
2. Confirm the value with the unit softkey ("V"/"mV" or "A"/"mA").
Alternatively, select "Enter" softkey, ✓ to confirm your value.
3. Set "Enabled" to "ON".
The R&S NGT3600 limits the set voltage and current level and displays the "Safety Limits" icon on the selected channel status bar information.

   Note: The R&S NGT3600 displays a popup message to inform you if both the lower and upper current safety limits are not set within the current range of the configured output mode. In this case, the R&S NGT3600 will automatically switch to the matching output mode, e.g. switch output mode from source to sink mode or vice versa.

Settings

Enabled
Enables or disables setting the safety limits of the instrument.

"ON"	Limits the set voltage and current level and displays the "Safety Limits" icon on the selected channel status bar information.
"OFF"	Disables the safety limit of the instrument.

Remote command:
`[SOURce:]ALIMit[:STATe]` on page 170

Voltage Lower Limit / Voltage Upper Limit
Sets the maximum or minimum voltage level of the output channels.

Remote command:
`[SOURce:]VOLTage[:LEVel][:IMMediate]:ALIMit:LOWer` on page 170
`[SOURce:]VOLTage[:LEVel][:IMMediate]:ALIMit[:UPPer]` on page 171

Current Lower Limit / Current Upper Limit
Sets the maximum or minimum current level of the output channels.

`[SOURce:]CURRent[:LEVel][:IMMediate]:ALIMit:LOWer` on page 171

`[SOURce:]CURRent[:LEVel][:IMMediate]:ALIMit[:UPPer]` on page 172

5.5.6 Oscillation detection

Depending on the load impedance, the control loop may start to oscillate. To protect the load, an oscillation detector will trigger and deactivate the output. If oscillation occurs, particularly with low-impedance loads, it is recommended to add a resistor or diode in series with the load.

Adding a resistor increases the overall impedance seen by the control loop, which can help stabilize the output. In contrast, a diode maintains a higher output voltage when the channels operate in constant current (CC) mode, ensuring stable and reliable performance even with very low-impedance loads.

5.6 Digital trigger I/O

NOTICE

Risk of instrument damage

Do not exceed the maximum voltage rating of the digital I/O pins (0 V to 24 V max) when supplying voltages to the pins.

Do not supply more than 500 mA to the digital I/O pin when it is in a device-driven low state configured as trigger output.

For more information, see the instrument specification.

The six data lines of the digital I/O interface are mutually independent and can be used as trigger input or trigger output separately. See Table 3-6 and also Figure 5-17.

- Trigger input
- Trigger output

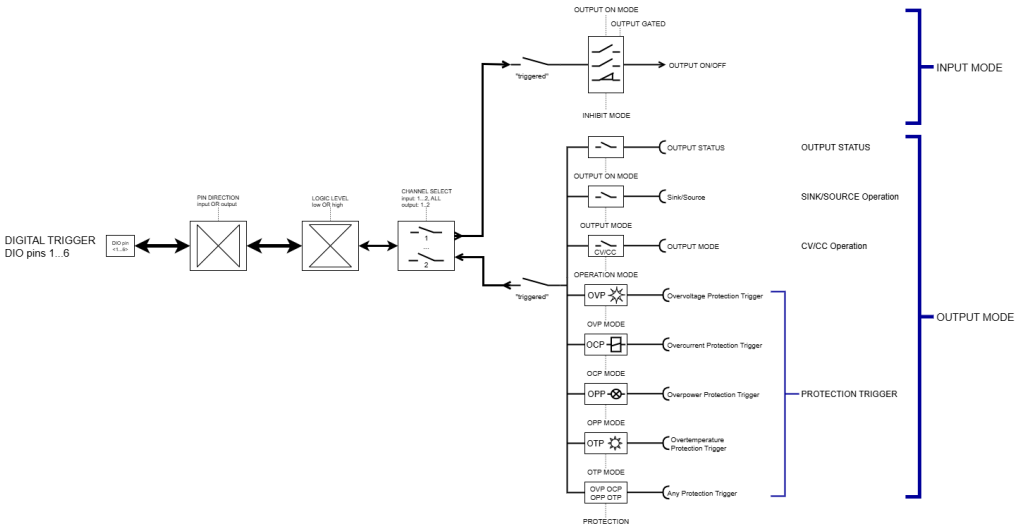


Figure 5-17: DIO trigger block diagram

Trigger input

The data lines of the digital I/O interface receive an external trigger signal. The external trigger signal triggers the selected channel ("Ch 1", "Ch 2" or "All") with the set response when the trigger logic ("Active High" or "Active Low") is met.

Table 5-1: Trigger in parameters and conditions

Trigger in parameters	Trigger conditions	Description
Channel	"Ch 1", "Ch 2" or "All"	Target output channel selected for trigger response.
Condition	"Output On"	Selected channel output is turned on when the selected logic level is met.
	"Output Gated"	Selected channel is turned on and gated when the selected logic level is met. If the selected channel output is put to gated state, manual or remote operation on the selected channel output is no longer possible. Channel output can only be turned off with protection tripped.
	"Inhibit"	Selected channel output is inhibited when the selected logic level is met. If the selected channel output is put to "inhibit" state, manual or remote operation on the selected channel output is no longer possible. To reverse the "inhibit" state, remove the source of the trigger signal. You can either disable the affected digital I/O interface or remove the source from the affected digital I/O interface at the rear panel.

Trigger in parameters	Trigger conditions	Description
Active Level	"High"	Set the logic level of the trigger in signal.
	"Low"	

Trigger output

The data lines of the digital I/O interface output an "Active High" or "Active Low" signal when the trigger logic of the selected channel ("Ch 1", "Ch 2") is met.

Table 5-2: Trigger out parameters and conditions

Trigger out parameters	Trigger conditions		Description
Channel	"Ch 1", "Ch 2"		Output channel selected to monitor for trigger conditions.
Condition	"Output On"		Output the selected logic level when the output is turned on at the selected channel.
	"Output Mode"		Output the selected logic level when the selected channel operates in sink mode. See Section 5.3.3, "Output mode", on page 76.
	"Operation Mode"		• "CC": Output the selected logic level when the selected channel operates in the CC mode. See Section 4.4.2, "Constant current mode (CC)", on page 69. • "CV": Output the selected logic level when the selected channel operates in the CV mode. See Section 4.4.1, "Constant voltage mode (CV)", on page 68.
	"Protection"		Output the selected logic level if any of the protection events (OCP, OVP, OPP, or OTP) occur on the selected channel.
	Critical event	"OCP"	Output the selected logic level when the selected critical event ("OCP", "OVP", "OPP", "OTP") occurs on the selected channel. See Section 5.5, "Protection", on page 81.
		"OVP"	
		"OPP"	
		"OTP"	
Active Level	"High"		Set the logic level of the trigger out signal.
	"Low"		

Access:

► Select [Settings] > "Device" tab > "Digital I/O" to configure digital I/O trigger.
The R&S NGT3600 displays the "Digital I/O" dialog.

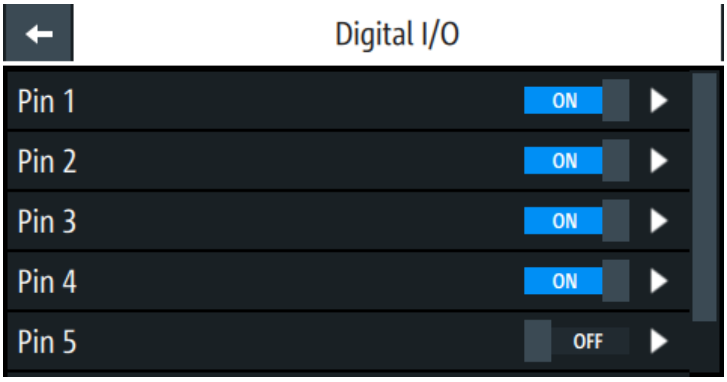


Figure 5-18: Digital trigger menu

To configure digital I/O triggers

1. Select the respective pins to configure the trigger settings.
   The R&S NGT3600 displays the respective pin dialog for configuration.

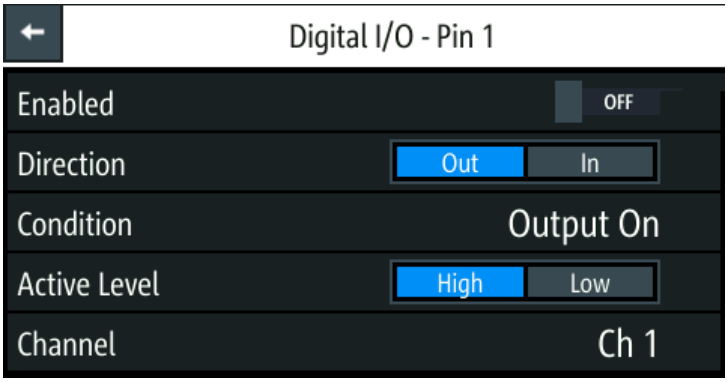


Figure 5-19: Digital trigger settings for pin 1

2. Set the required pin "Direction".
   Depending on the pin direction, different operating conditions are available for trigger settings.
   See Table 5-1 and Table 5-2.
3. Set the required "Active Level" and "Channel" settings.
4. Set the "Enabled" to "ON" to enable the digital I/O trigger.
   The R&S NGT3600 monitors the digital I/O trigger conditions and feedback to the respective channels or pins.

Settings

Pin 1 / ... / Pin 6
Sets the selected digital I/O pin settings.

"ON" Enables the selected digital I/O settings. This is the same setting as "Enabled" on page 92.

"OFF" Deactivates the selected digital I/O settings. This is the same setting as "Enabled" on page 92.

Remote command:
`DIO<IO>[:ENABle]` on page 164

Enabled ← Pin 1 / ... / Pin 6
Enables or disables the digital I/O trigger.

"ON" Activates the selected digital I/O trigger.

"OFF" Deactivates the selected digital I/O trigger.

Remote command:
`DIO<IO>[:ENABle]` on page 164

Direction ← Pin 1 / ... / Pin 6
Sets the trigger direction.

See Table 5-1 and Table 5-2.

Remote command:
`DIO<IO>:DIRection` on page 163

Condition ← Pin 1 / ... / Pin 6
Sets the trigger condition for the selected digital I/O interface.

See Table 5-1 and Table 5-2.

Remote command:
`DIO<IO>:CONDition` on page 161

Active Level ← Pin 1 / ... / Pin 6
Sets the trigger logic of the selected digital I/O interface.

"High" Trigger logic is set to active high for the selected digital I/O interface.

"Low" Trigger logic is set to active low for the selected digital I/O interface.

Remote command:
`DIO<IO>:LOGic` on page 163

Channel ← Pin 1 / ... / Pin 6
Sets the channel for monitoring of the trigger conditions.

For details, see Table 5-1 and Table 5-2.

Remote command:
`DIO<IO>:INSTrument` on page 163

Operation Mode ← Pin 1 / ... / Pin 6
Available only for trigger output and "Condition" is set to "Operation Mode".

Outputs the selected logic level when the selected channel operates in the CC or CV mode.

See also Section 4.4, "Modes of operation", on page 68.

Remote command:
`DIO<IO>:CONDition` on page 161

5.7 User key

The R&S NGT3600 allows you to configure the user action for one of the following functions:

- Screenshot image from instrument
- Reset statistical data
- Data logging
- Enable/Disable touchscreen function

Access:

► Select [Settings] > "Device" tab > "User Key" > "User Key Action" to configure the user key action.
Alternatively, long-press [*] key to configure the user key action.
The R&S NGT3600 displays the "Select User Key Action" dialog.

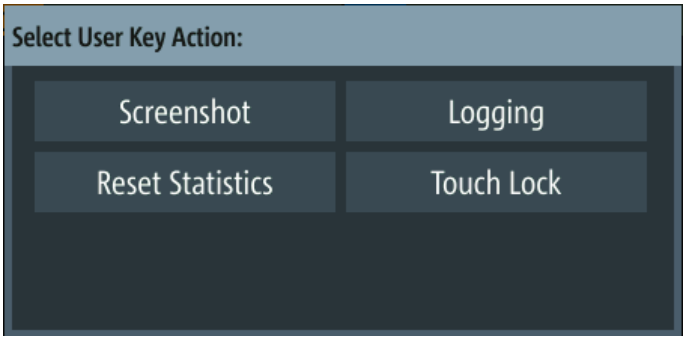


Figure 5-20: User key action

To configure a user key action

► Select the required user action.
For details, see "Settings" on page 94.

Settings

Screenshot
Captures the current screen image of the instrument.

Remote command:
n.a.

Logging
Enables or disables the data logger function.

Remote command:
`LOGGing[:STATe]` on page 214

Reset Statistics
Resets sample count, energy result, power, voltage and current values.

Remote command:
`MEASure[:SCALar]:STATistic:RESet` on page 199

Touch Lock
Enables or disables the touchscreen function of the instrument.

Remote command:
n.a.

5.8 Measurement function

5.8.1 Statistics

The R&S NGT3600 includes a statistic function which is able to determine statistic values (Min/Max/Avg) for power, current and voltage for each channel.

For details, see "Historical channel information" on page 48.

See also Section 4.1.1.3, "Collapse softkey", on page 59.

To reset statistics settings

► Select "Reset", ↺ to reset all statistical values in respective channel.
The R&S NGT3600 resets all statistic values to 0.
Alternatively, you can configure a user short key to reset all statistical values from all channels. For details, see Section 5.7, "User key", on page 93.

Settings

Min
Displays the minimum value for power, voltage and current measurements.

Remote command:
`MEASure[:SCALar]:POWer:MIN?` on page 201
`MEASure[:SCALar][:VOLTage][:DC]:MIN?` on page 202
`MEASure[:SCALar]:CURRent[:DC]:MIN?` on page 200

Max
Displays the maximum value for power, voltage and current measurements.

Remote command:
`MEASure[:SCALar]:POWer:MAX?` on page 201
`MEASure[:SCALar][:VOLTage][:DC]:MAX?` on page 202
`MEASure[:SCALar]:CURRent[:DC]:MAX?` on page 200

Avg
Displays the average value for power, voltage and current measurements.

Remote command:
`MEASure[:SCALar]:POWer:AVG?` on page 201
`MEASure[:SCALar][:VOLTage][:DC]:AVG?` on page 202
`MEASure[:SCALar]:CURRent[:DC]:AVG?` on page 199

E
Displays the energy consumption of the channel.

Remote command:
`MEASure[:SCALar]:ENERgy?` on page 198

Reset,
The "Reset" softkey resets the statistic values of the channel.

Remote command:
`MEASure[:SCALar]:STATistic:RESet` on page 199
`MEASure[:SCALar]:STATistic:COUNt?` on page 198
`MEASure[:SCALar]:CURRent[:DC]:STAT?` on page 200
`MEASure[:SCALar]:POWer:STAT?` on page 201
`MEASure[:SCALar][:VOLTage][:DC]:STAT?` on page 203

5.8.2 Data logging

When data logging is activated, the R&S NGT3600 records the voltage, current and power data and stores it in the predefined target folder. The measurement data can be stored on the USB flash drive or in the instrument internal memory location.

The logging interval can be set in the range from 10 ms to 600 s with a step size of 10 ms.

External USB hard disc drives (or USB extension) are not supportable. Only FAT32 formatted USB flash drives can be used.

The following shows a sample of a log file captured from R&S NGT3600.

#Mode	Unlimited					
#Start Time	11:53:06					
#Stop Time	11:53:12					
#Actual Count	0000000022					
#Calibration Ch1						
#Calibration Date Ch1						
#Calibration Ch2						
#Calibration Date Ch2						
Timestamp	U1[V]	I1[A]	P1[W]	U2[V]	I2[A]	P2[W]
53:06.0	1.9969240E+00	2.179735E-04	4.352766E-04	1.9950941E+00	-1.84E-04	-3.67E-04
53:06.3	1.9969025E+00	2.035501E-04	4.064697E-04	1.9951102E+00	-1.98E-04	-3.95E-04
53:06.5	1.9968971E+00	1.991429E-04	3.976679E-04	1.9950619E+00	-2.06E-04	-4.10E-04
53:06.8	1.9968971E+00	1.871234E-04	3.736662E-04	1.9950780E+00	-2.17E-04	-4.33E-04
53:07.0	1.9968917E+00	2.143677E-04	4.280690E-04	1.9950780E+00	-1.85E-04	-3.69E-04
53:07.3	1.9968864E+00	1.967390E-04	3.928654E-04	1.9950352E+00	-2.29E-04	-4.57E-04
53:07.5	1.9968542E+00	2.179735E-04	4.352613E-04	1.9951209E+00	-2.00E-04	-4.00E-04
53:07.8	1.9968327E+00	2.091592E-04	4.176559E-04	1.9950994E+00	-2.27E-04	-4.53E-04
53:08.0	1.9968596E+00	2.071559E-04	4.136613E-04	1.9950941E+00	-1.92E-04	-3.84E-04
53:08.3	1.9969133E+00	1.927325E-04	3.848701E-04	1.9950780E+00	-2.22E-04	-4.43E-04
53:08.5	1.9968703E+00	2.063546E-04	4.120634E-04	1.9951047E+00	-1.79E-04	-3.57E-04
53:08.8	1.9968220E+00	2.023481E-04	4.040532E-04	1.9950405E+00	-2.08E-04	-4.16E-04
53:09.0	1.9967682E+00	2.143677E-04	4.280425E-04	1.9950887E+00	-2.18E-04	-4.35E-04
53:09.3	1.9969240E+00	1.983416E-04	3.960731E-04	1.9950672E+00	-2.19E-04	-4.37E-04
53:09.5	1.9968327E+00	2.091592E-04	4.176559E-04	1.9951047E+00	-2.06E-04	-4.11E-04
53:09.8	1.9968971E+00	2.191755E-04	4.376709E-04	1.9950994E+00	-1.93E-04	-3.85E-04
53:10.0	1.9968810E+00	2.139670E-04	4.272667E-04	1.9950887E+00	-2.05E-04	-4.09E-04
53:10.3	1.9968381E+00	2.239833E-04	4.472584E-04	1.9950941E+00	-2.06E-04	-4.11E-04
53:10.5	1.9968274E+00	2.107618E-04	4.208549E-04	1.9950352E+00	-2.07E-04	-4.13E-04
53:10.8	1.9968059E+00	2.183742E-04	4.360508E-04	1.9950405E+00	-2.08E-04	-4.14E-04
53:11.0	1.9968005E+00	2.047520E-04	4.088490E-04	1.9950726E+00	-2.00E-04	-3.99E-04
53:11.3	1.9968436E+00	2.207781E-04	4.408593E-04	1.9950994E+00	-1.78E-04	-3.56E-04

Figure 5-21: Sample of data logging

Access:

1. If available, attach a USB storage to the USB connector on the front panel.
   If no USB flash drive is available, the device stores the data in its internal memory.
2. Select [Settings] > "Device" tab > "Logging" to configure the data logger.
   The R&S NGT3600 displays the "Logging" dialog.

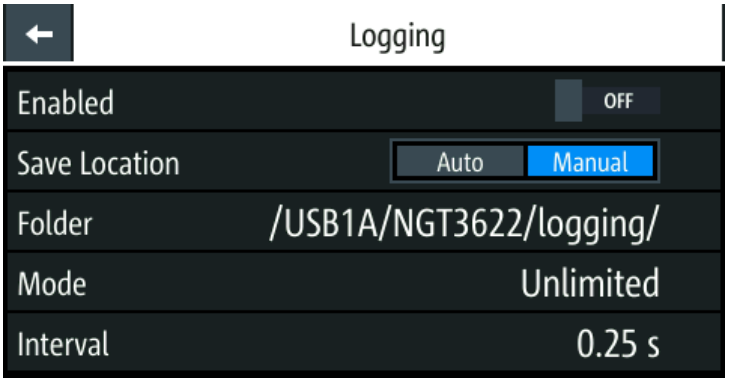


Figure 5-22: Logging dialog

To configure data logging

1. Select "Save Location" to set the predefined target folder for data logging.
   If no USB flash drive is detected, the "Folder" is set to an internal memory ("int") partition. By default, the "USB1A" partition is selected if the USB flash drive is detected.
2. Set the required "Save Location".
3. Select "Mode" to set the logging duration.
   See details in "Mode" on page 98.
4. Depending on the selected mode, configure the required settings for the data logging duration.
5. Set "Enabled" to "ON" to enable data logging.
   The R&S NGT3600 activates the logging and locks the file saved location and logging mode settings.
6. Configure the "CSV Settings".
   See Section 5.8.3, "CSV settings", on page 99.

Settings

Enabled
Enables or disables data logging events.

"ON" Enables data logging.

"OFF" Disables data logging.

Remote command:
`LOGGing[:STATe]` on page 214

Save Location
Sets the saved location for the logging data.

See also "Folder" on page 98.

Auto "Folder" is auto-selected.
If no USB flash drive is detected, "Folder" is set to an internal memory ("int") partition. Otherwise, "USB1A" partition is selected.

Manual Choice of "Folder".

Remote command:
`LOGGing:LOCation:MODE` on page 216

Folder
Selects the predefined partition for data logging.

See also "Save Location" on page 98.

"USB1A" Selects `/USB1A/NGT362x/logging` as the partition, where "x" refers to "1" for the single-channel model and "2" for the two-channel model.

"int" Selects `/int/logging` as the partition.

Remote command:
`LOGGing:LOCation:FNAMe?` on page 216
`LOGGing:LOCation:PARTition` on page 216
`LOGGing:LOCation:PARTition:CATalog?` on page 217

Interval
Sets the time interval for data logging.

Remote command:
`LOGGing:INTerval` on page 215

Mode
Sets logging duration.

"Duration" Time taken for data logging with duration and time interval setting.

"Span" Time taken for data logging with start time, time interval and duration setting.

"Unlimited" Data logging with time interval setting. The data is logged continuously until the function is deactivated.

"Count" Data logging with number of counts and time interval setting.

Remote command:
`LOGGing:MODE` on page 218
`LOGGing:COUNt` on page 214
`LOGGing:DURation` on page 215
`LOGGing:STIMe` on page 218

5.8.3 CSV settings

The CSV file stores tabular data (numbers and text) in plain text. Each line of the file is a data record and each record consists of one or more fields, separated by a file delimiter. The "CSV Settings" provides you with ways to format the fields that are stored in the data logging. See Figure 5-21.

Access:

► Select [Settings] > "Device" tab > "CSV Settings" to configure the CSV parameters. The R&S NGT3600 displays the "CSV Settings" dialog.

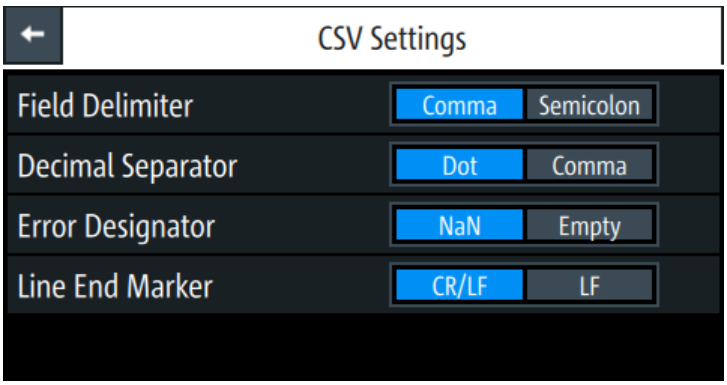


Figure 5-23: CSV settings dialog

To set CSV parameters

► Set the required CSV parameters.
For details, see "Settings" on page 99.

Settings

Field Delimiter
Sets the field delimiter.

"Comma" Sets comma as the field separator.

"Semicolon" Sets semicolon as the field separator.

Remote command:
`MMEMory:STORe:CSV:FDELimiter` on page 219

Decimal Separator
Sets the decimal separator.

"Dot" Sets dot as the decimal separator.

"Comma" Sets comma as the decimal separator.

Remote command:
MMEMory:STORe:CSV:DSEParator on page 218

Error Designator
Sets the error designator.

"NaN" Sets "NaN" as the error designator.

"Empty" Sets empty value as the error designator.

Remote command:
MMEMory:STORe:CSV:EDESignator on page 219

Line End Marker
Sets the line end marker.

"CR/LF" Sets CR/LF as the line end marker.

"LF" Sets LF as the line end marker.

Remote command:
MMEMory:STORe:CSV:LEMarker on page 219

5.9 Advanced features

Apart from providing the correct voltage and current to the load, as well as setting limits and load protection during testing, the R&S NGT3600 offers advanced features such as programmable output voltage and current. It also supports daisy-chaining multiple power supplies for higher voltage and current outputs, with parallel control for uniform current distribution in a shared bus connection setup.

5.9.1 Arbitrary

The arbitrary function allows you to generate freely programmable waveforms for voltage and current.

Access:

► Select [Settings] > channel tab > "Arbitrary" to configure the arbitrary function.
The R&S NGT3600 displays the "Arbitrary" dialog.

Figure 5-24: Arbitrary dialog

To configure the arbitrary function

1. Select "Load from file..." to load the arbitrary file.
   The R&S NGT3600 opens a dialog to configure the arbitrary file.

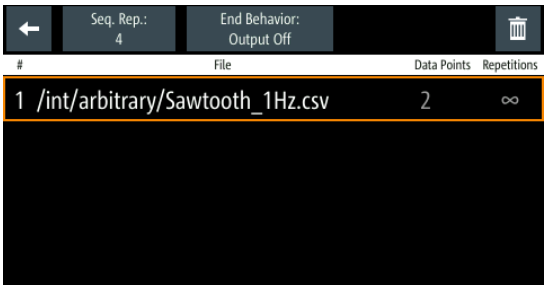


Figure 5-25: Configure arbitrary file dialog

2. Select the first row to load or change the arbitrary file in the arbitrary sequence. A maximum of 1024 data points can be loaded with the arbitrary file.
   The R&S NGT3600 opens a dialog to select the file location.
3. Select the desired file location.
4. Select "Load" to load the selected file.
   The R&S NGT3600 loads the selected arbitrary file.

Figure 5-26: Select an arbitrary file location

5. If needed, use delete softkey, to delete the arbitrary test sequence before loading another new arbitrary test sequence. See Figure 5-26.
6. Set "Seq. Rep." and "End Behavior" to configure the arbitrary sequence behavior.
7. Select "Back" softkey > "Arbitrary" to "ON".
   The R&S NGT3600 enables the arbitrary function and displays the arbitrary icon on the selected channel status bar information.

Settings

Back
Returns to the previous menu.

Remote command:
n.a.

Seq. Rep.
Sets the number of times the waveform is output in the arbitrary table. If "Seq. Rep." is set to infinity, the waveform is output continuously.

Remote command:
`ARBitrary:SEQuence:REPetitions` on page 207

End Behavior
Sets end behavior of the automation of the arbitrary function.

"Off" Output of the selected channel is turned off after performing the arbitrary function.

"Hold" Last voltage and current values output at the instrument.

Remote command:
`ARBitrary:SEQuence:BEHavior:END` on page 207

Delete,
Delete the selected arbitrary file from the arbitrary test sequence.

Remote command:
`ARBitrary:BLOCk<n>:CLEar` on page 205
`ARBitrary:SEQuence:CLEar` on page 207

<Arbitrary test sequence>
Displays the list of loaded arbitrary files in the arbitrary test sequence.

 # ← <Arbitrary test sequence>
Index numbering of the block in an arbitrary test sequence.

Remote command:
n.a.

File ← <Arbitrary test sequence>
File directory of the loaded arbitrary file.

Remote command:
`ARBitrary:BLOCk<n>:DATA` on page 205

Data Points ← <Arbitrary test sequence>
Number of data points in an arbitrary file.

Remote command:
`ARBitrary:BLOCk<n>:ENDPoint?` on page 205
`ARBitrary:SEQuence:ENDPoint?` on page 206
`ARBitrary:BLOCk<n>:COUNt?` on page 205

Repetitions ← <Arbitrary test sequence>
Repetition cycle of the arbitrary file.

Remote command:
`ARBitrary:BLOCk<n>:REPetitions` on page 206

5.9.2 Ramp

The ramp function configures a constant rise of supply voltage within a set timeframe. The output voltage can be increased continuously within a range of 10 ms to 10 s with a step size of 1 ms. Each channel has an independent ramp configuration. See Figure 5-27.

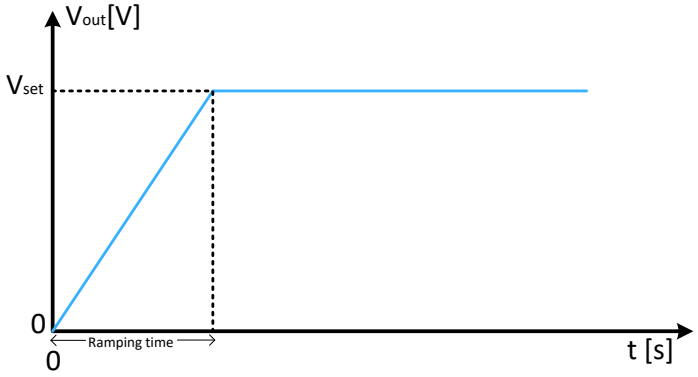


Figure 5-27: Ramping voltage output

Access:

► Select [Settings] > channel tab > "Ramp" to configure the ramp function.
The R&S NGT3600 displays the "Ramp" dialog.

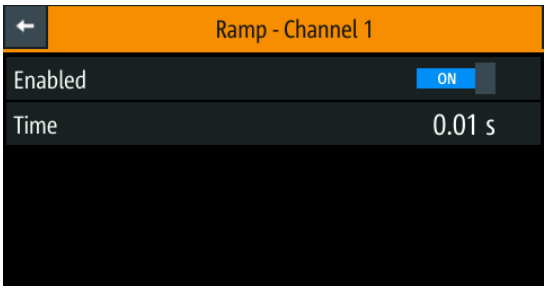


Figure 5-28: Ramp dialog

To configure the ramp function

1. Set "Enabled" to "ON" to configure the ramp function.
The R&S NGT3600 enables the ramp function and displays the ramp icon on the selected channel status bar information.
2. Set the required "Ramp Time".
The R&S NGT3600 displays the on-screen keyboard to set the value.
3. Confirm the value with the unit softkey (ms or s).

Settings

Enable
Activates or deactivates the ramp function.

"ON" Ramp function is activated.

"OFF" Ramp function is deactivated.

Remote command:
`[SOURce:]VOLTage:RAMP[:STATe]` on page 208

Ramp Time
Sets the ramp time.

Remote command:
`[SOURce:]VOLTage:RAMP[:UP]:DURation` on page 208

5.9.3 Multi-device mode

For safety information, see Section 3.1.7, "Connecting the load", on page 27 and "Working with hazardous voltages" on page 11.

The "Multi-Device Mode" function facilitates the setting of a daisy-chained connection for multiple R&S NGT3600 to generate higher supplies of voltage or current.

In a multi-device connection setup, one of the R&S NGT3600 is designated as the "Host" and the rest is configured as "Client". Up to six single-channel or three two-channel R&S NGT3600 power supplies can be connected in the connection setup.

For a detailed description on the series and parallel connections, see Section 13, "Applications", on page 231. See also Section 5.4, "Channel fusion", on page 78.

Access:

► Select the [Settings] > "Device" > "Multi-Device Mode" to set up the daisy-chained connection for multiple R&S NGT3600 power supplies.
The R&S NGT3600 displays the "Multi-Device Mode" dialog.

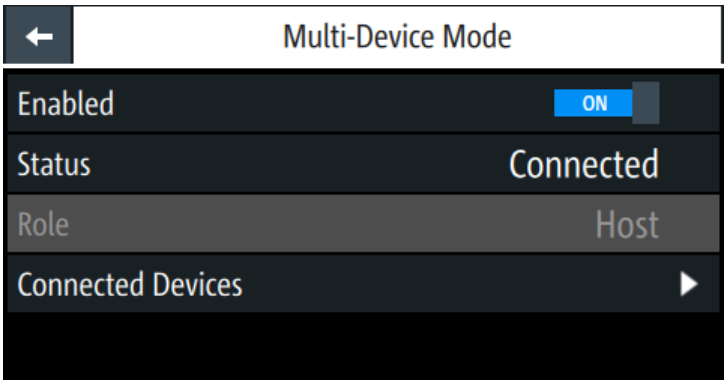


Figure 5-29: Multi-Device mode dialog

To configure multi-device mode

1. **NOTICE!** Potential damage of CAN transceiver. Do not plug the LAN connection into the multi-device connector due to the risk of potential damage to the CAN transceiver.

   Connect the LAN cable to the multi-device connector at the rear panel. See Figure 5-30.

Figure 5-30: Daisy-chained connection using LAN cable

2. By default, the role is set as "Host". Set one of the connected R&S NGT3600 as "Client".

3. Set "Enabled" to "ON".
   The R&S NGT3600 enables the multi-device mode function.
   If the connection is successful, the "Status" shows "Connected".
4. Select the "Connected Devices" to show the connected R&S NGT3600 in the connection setup.
   The R&S NGT3600 displays a list of connected devices, see "Connected Devices" on page 106.

Settings

Enabled
Enables or disables the "Multi-Device Mode" feature.

"ON" Enables the multi-device mode and displays the "Multi-Device Mode" icon on the device status bar information.

"OFF" Disables the "Multi-Device Mode" feature.

Remote command:
`INSTrument:MDMode[:STATe]` on page 168

Status
Displays the device connection status.

"Connected" Device connected.

"Disconnected" Device not connected.

Remote command:
`INSTrument:MDMode:CONNection:STATus?` on page 167

Role
Sets the role of the connected devices.

"Host" Only one device is set as the "Host" in the setup connection. The "Host" controls the data and generates the total output of the power.

"Client" The rest of the connected devices are set as "Client".

Remote command:
`INSTrument:MDMode:ROLE` on page 168

Connected Devices
Displays a list of connected R&S NGT3600. Up to 6 R&S NGT3600 power supplies are set up in the list.

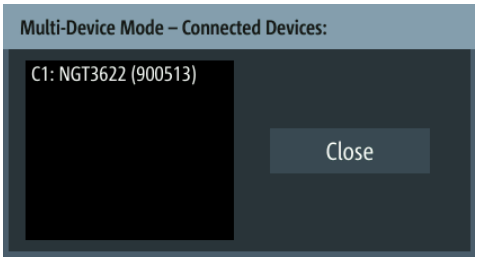


Figure 5-31: List of connected devices

5.10 Adjustment

Adjustment is done at ambient temperature of 25 °C ± 2 °C.

The instrument must be operated for at least 30 minutes before executing the adjustment.

Thick wires are recommended for connecting the shunt resistor to avoid huge voltage drops and excessive heating.

Adjustments must be performed using only calibrated instruments that are recommended, see "Channel adjustment setup" on page 107.

For ease of maintenance, the R&S NGT3600 provides the following adjustment procedures which you can apply on the instrument:

- Section 5.10.1, "Channel adjustment", on page 107

5.10.1 Channel adjustment

The "Adjustment" calculates the required adjustment coefficient internally for voltage and current on the selected channel.

Channel adjustment setup

Recommended instruments:

- Digital multimeter (DMM): 6 ½ digits.
- Shunt resistor: 10 mΩ, at least 50 A rating and 0.02 % accuracy.
- Shunt resistor: 200 mΩ, at least 3 A rating and 0.02 % accuracy.
- Rectifier diode for high current adjustment: 50 A and forward voltage > 2 V
- Test resistors for low current adjustment:
  - Adjustment point 1: 100Ω/1W/1%
  - Adjustment point 2: 4.7Ω/25W/1%
- External power supply unit (PSU) for sink current adjustment: 30 V, 5 A.
- Connect the DMM to the instrument and monitor the measured voltage or current.

See Figure 5-32, Figure 5-33, Figure 5-34 and Figure 5-35.

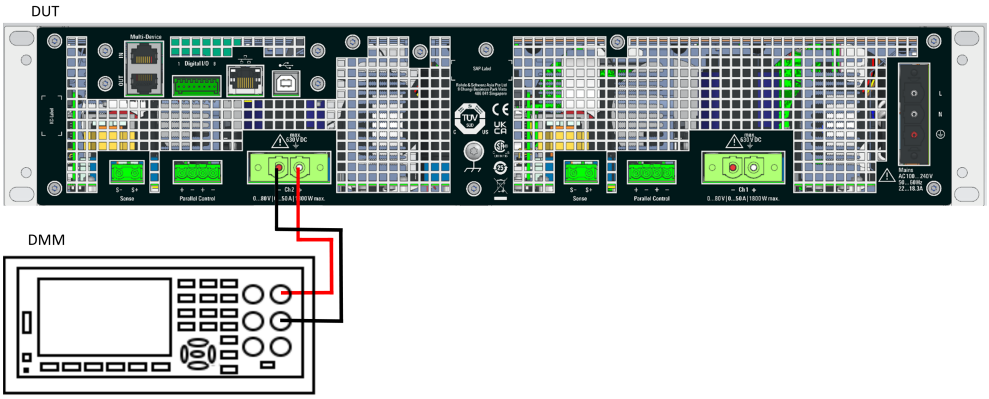


Figure 5-32: Voltage adjustment setup

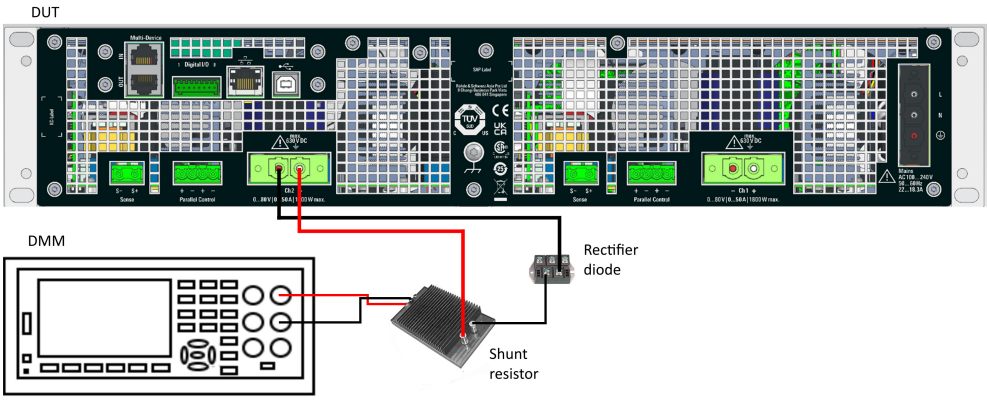


Figure 5-33: High current adjustment

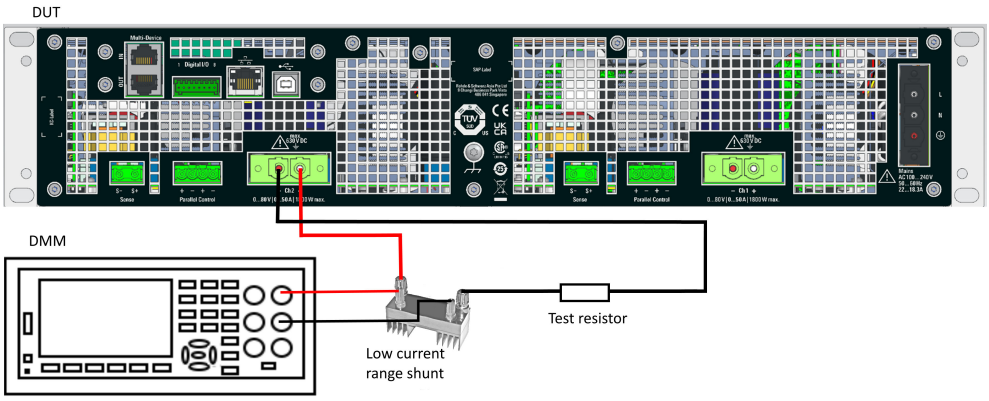


Figure 5-34: Low current adjustment

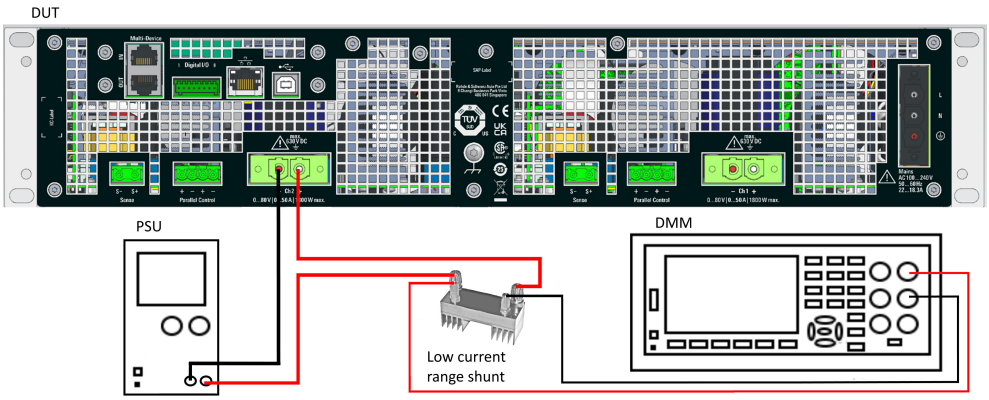


Figure 5-35: Sink current adjustment setup

Access:

► Select [Settings] > channel tab > "Adjustment" to perform the channel adjustment.
The R&S NGT3600 displays the selected channel adjustment dialog.

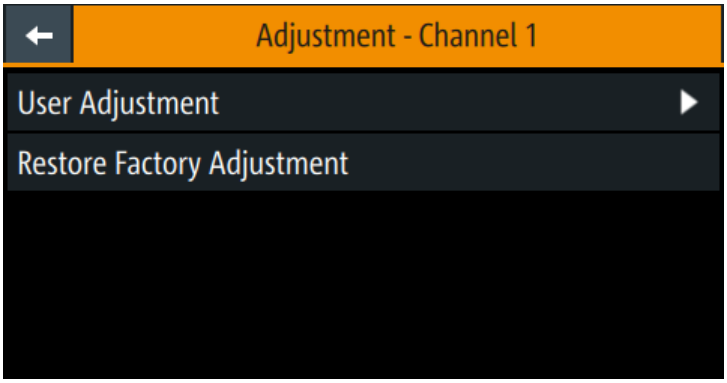


Figure 5-36: Adjustment dialog

To perform channel adjustment

1. Select "User Adjustment" to perform channel adjustment.
The R&S NGT3600 displays the "ADJUSTMENT" wizard to guide the channel adjustment procedures.

Figure 5-37: Channel adjustment wizard

2. Select "Proceed" to start the channel adjustment procedures.
   The R&S NGT3600 displays the "Reset Device Settings" dialog.

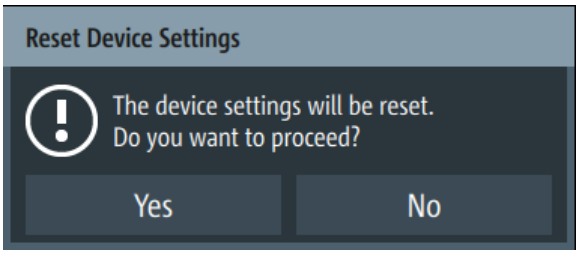


Figure 5-38: Reset device settings dialog

3. Select "Yes" to continue the channel adjustment procedures.
   Select "No" to return to the channel adjustment wizard, see Figure 5-37.
4. Depending on the types of adjustment (voltage or current), set up the instruments illustrated in Figure 5-32 or Figure 5-33 or Figure 5-34 or Figure 5-35.

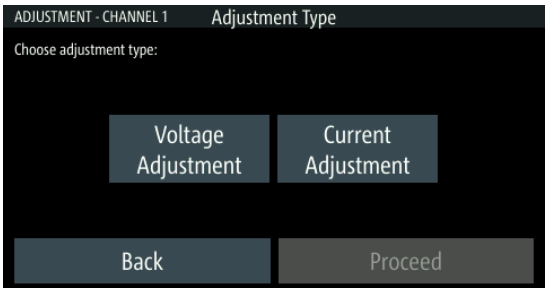


Figure 5-39: Types of adjustment

5. Follow the on-screen instructions displayed in the "ADJUSTMENT" wizard.
   You can select the voltage or current adjustment in any order of preference and repeat the adjustment as needed. See Figure 5-39 and Figure 5-40.

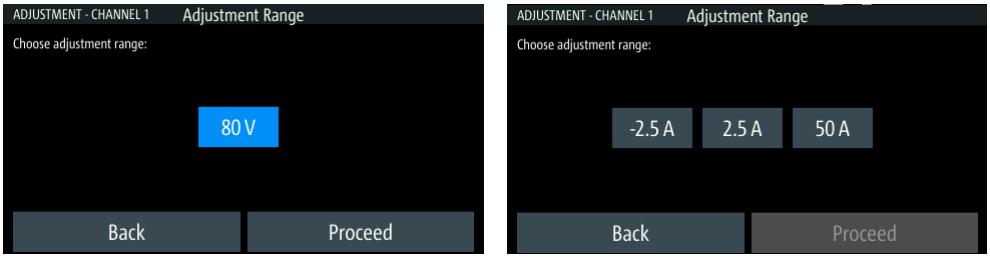


Figure 5-40: Voltage/current adjustment range

6. Based on the selection, the R&S NGT3600 applies a voltage/current respectively for the voltage/current adjustment. Key in the measured value from DMM using the on-screen keyboard. See Figure 5-41.

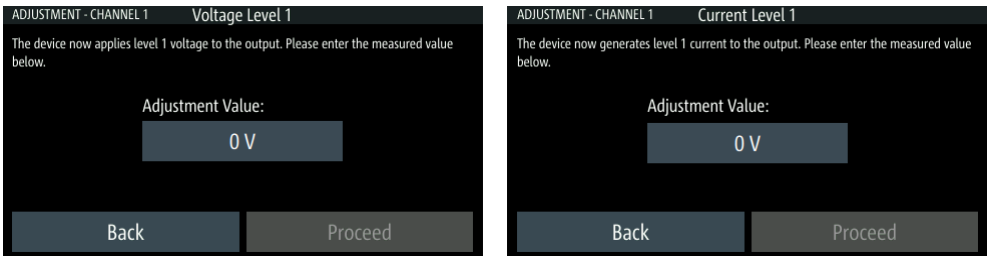


Figure 5-41: Channel adjustment procedure

Note: If the "Adjustment Value" is not editable, this maybe due to the improper setup of measurement.
Depending on the selected channel adjustment, check that you have the correct setup illustrated in Figure 5-32 or Figure 5-33 or Figure 5-34 or Figure 5-35.

7. Confirm the entry with Proceed.
8. Leave the setup connections as open.
   Select Proceed to start the voltage adjustment automatically.
9. Follow the on-screen instructions for current adjustment.
10. If the adjustment is successful, the R&S NGT3600 displays a message to indicate that the adjustment is successful.
    The R&S NGT3600 overwrites the last channel adjustment.
11. If the adjustment fails after repeated tries, contact your local service partner for support.

To restore factory adjustment

1. Select "Restore Factory Adjustment" to restore the channel factory adjustment settings.
   The R&S NGT3600 displays the "Restore Channel Factory Adjustment" dialog.

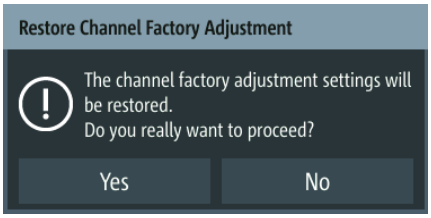


Figure 5-42: Restore channel factory adjustment dialog

2. Select "Yes" to restore factory adjustment.
   The R&S NGT3600 restores the channel factory adjustment settings.

Settings

User Adjustment
Activates user-defined adjustment.

Remote command:
`CALibration:BEGin` on page 210
`CALibration:COUNt?` on page 210
`CALibration:CURRent` on page 210
`CALibration:DATE` on page 211
`CALibration:END` on page 211
`CALibration:FACTory:RESTore` on page 211
`CALibration:INPut` on page 211
`CALibration:LEVel` on page 211
`CALibration:LEVel:COUNt?` on page 212
`CALibration:RESet` on page 212
`CALibration:SAVE` on page 212
`CALibration:STATus?` on page 212
`CALibration:VOLTage` on page 213

Restore Factory Adjustment
Restores the factory channel adjustment.

Remote command:
`CALibration:FACTory:RESTore` on page 211

6 File and data management

The R&S NGT3600 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 the 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 3.3.4, "Saving/Recalling of instrument settings", on page 41.
- *Measurement readings*: recorded measurement results saved for evaluation, see Section 5.8, "Measurement function", on page 94.
- *Screenshots*: screen captures of settings or measurement mode windows, see Section 6.4, "Screenshot", on page 121.
- *Device documentation*: open source acknowledgment of the device documentation, see Section 6.5, "Device documentation", on page 122.

File memory location

The R&S NGT3600 saves user files on internal memory or, if connected, on a USB flash drive. With the "File Manager" functions, you can exchange files between the internal and external memory, provided you have connected a USB flash drive.

The memory locations on the internal memory are predefined, on an external USB flash drive, 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 instrument 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 NGT3600 creates, such as user files that contain user-defined configurations or data, like instrument settings or measurement data.

The R&S NGT3600 saves this data in the configuration file, see Section 6.3, "Save and recall", on page 116.

Non-operational data (usage data)

The R&S NGT3600 does not generate non-operational data during and through its use.

6.2 File manager

The "File Manager" provides file transfer functions between the USB flash drive and the internal memory of the instrument. You can copy and delete files in both the USB flash drive and internal memory of the instrument.

Access:

► Select [Settings] > "Device" tab > "File Manager" to access the file manager function.
The R&S NGT3600 displays the file manager dialog.

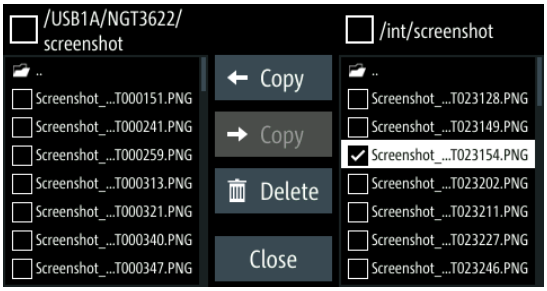


Figure 6-1: File manager dialog

To manage files

1. Select the file that you want to copy or delete.
2. Select the required action in the file manager dialog.
3. To view the selected file information, long-press the selected filename in the file manager dialog.
   A pop-up message box displays the selected file information.

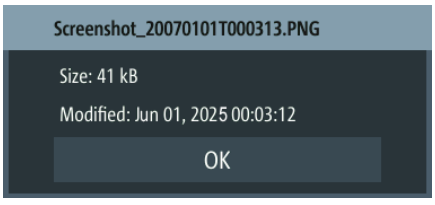


Figure 6-2: File information

Settings

<USB_directory>
Lists all the files available in the USB flash drive for file operations. Selected files are marked in the checkbox.

Remote command:
n.a.

<Internal_memory>
Lists all the files available in the internal memory for file operations. Selected files are marked in the checkbox.

Remote command:
n.a.

Int to USB copy, Copy
Copies from internal memory to USB.

Remote command:
n.a.

USB to Int copy, Copy
Copies from USB to internal memory.

Remote command:
n.a.

Delete, Delete
Deletes the selected file.

Remote command:
`MMEMory:DELete` on page 217

Close
Closes the file manager dialog, Close.

Remote command:
n.a.

6.3 Save and recall

Upon power-up, the instrument loads the last saved settings from an internal memory location. Auto saved parameters are also applied during startup.

The R&S NGT3600 output states of all channels are disabled when the recall function is activated.

Auto saved instrument settings

Auto saved of the instrument settings is applied when any of the following parameters are changed:

- USB connection mode
- Ethernet settings
- CSV settings

Instrument settings

In addition to the auto saved instrument settings, the following instrument settings are saved or recalled in internal memory:

- Set voltage and current level
- Settings in the protection function, safety limits
- Settings in the output setting function, ramp settings, digital I/O settings

Access:

► Select [Settings] > "Device" tab > "Save/Recall Device Settings" to configure the save and recall functions.
The R&S NGT3600 loads the "Save/Recall Device Settings" dialog.

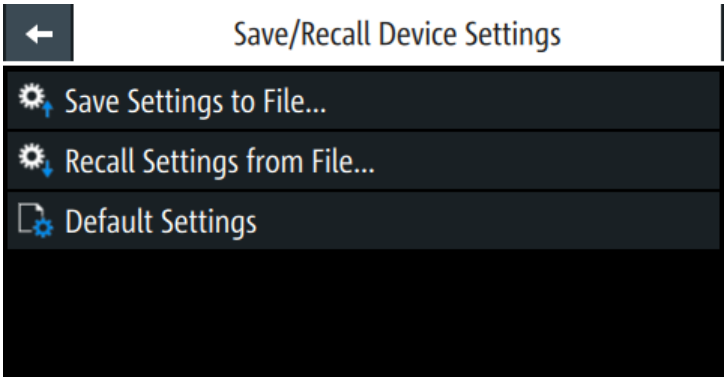


Figure 6-3: Save/Recall device settings dialog

To save and recall instrument settings

1. Select "Save Settings to file..." to save current instrument settings.

The R&S NGT3600 opens a dialog to select the file partition.

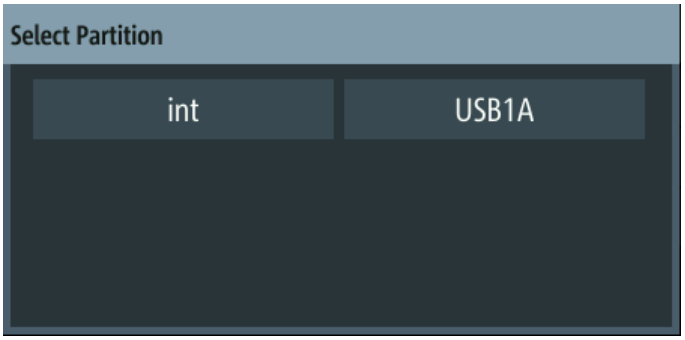


Figure 6-4: Select partition dialog

2. Set the desired file partition.
   The R&S NGT3600 opens the file manager dialog of the selected file partition.

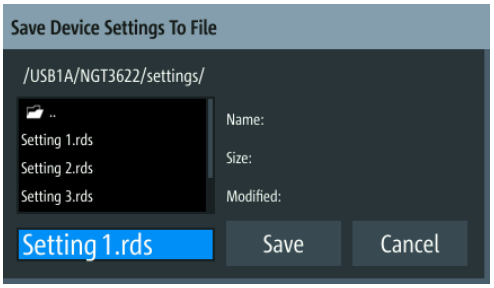


Figure 6-5: Save device settings to file dialog

3. Set the desired file location.
4. The R&S NGT3600 provides a selection of four filenames for saving the instrument settings.
   Select the filename entry field, the R&S NGT3600 opens the filename selection dialog.

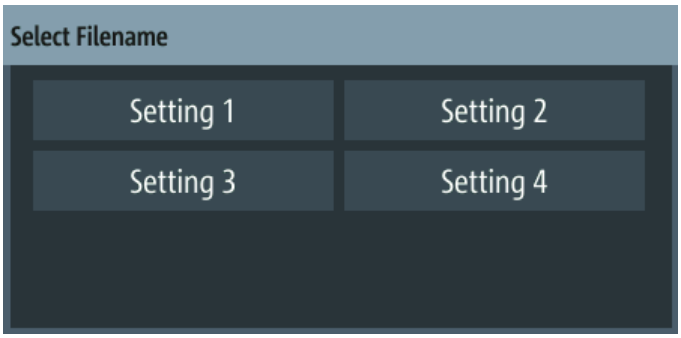


Figure 6-6: Select filename dialog

5. Select the desired filename.
   The R&S NGT3600 returns back to the file manager dialog.
6. Confirm the selection by using the "Save" softkey.

The R&S NGT3600 saves the current instrument settings.

7. Similar, you can select "Recall Settings from file..." to load instrument settings.
   The R&S NGT3600 opens a dialog to select the file partition.

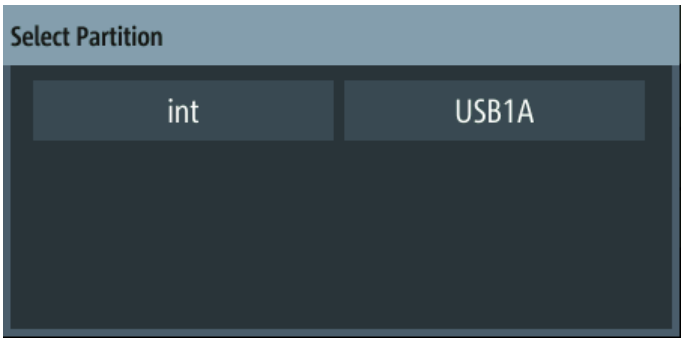


Figure 6-7: Select partition dialog

8. Set the desired file partition.
   The R&S NGT3600 opens the file manager dialog of the selected file partition.

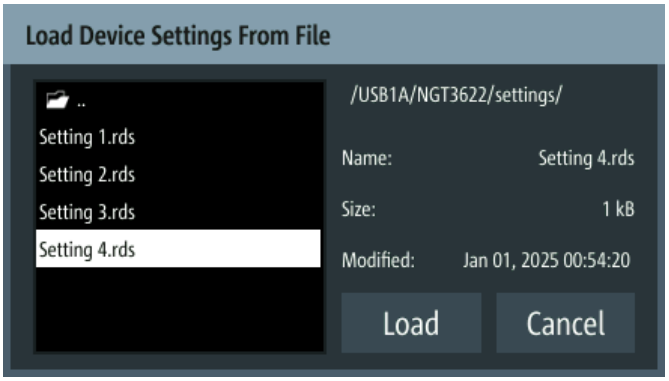


Figure 6-8: Load device settings from file dialog

9. Set the desired file location.
10. Confirm the selection using "Load" to load the instrument settings.
    The R&S NGT3600 resets the instrument with the loaded instrument settings.

To reset the instrument to default settings

1. Select "Default Settings" from the "Save/Recall Device Settings" dialog.
   The R&S NGT3600 displays a popup message.

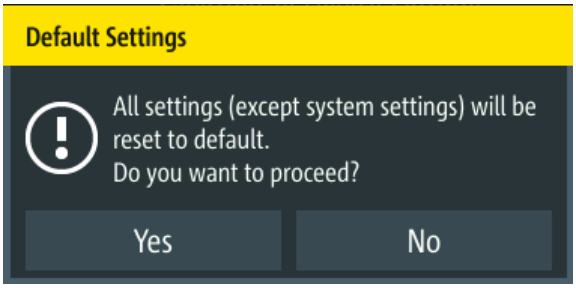


Figure 6-9: Default settings warning message

2. Select "Yes" to overwrite instrument settings to default.
   The R&S NGT3600 resets current instrument settings to default.
3. The R&S NGT3600 displays a popup message to show that all settings reset to default.

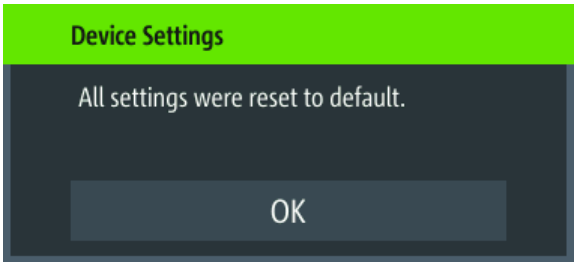


Figure 6-10: Default settings completion message

Settings

Save Settings to file
Saves current instrument settings.

Remote command:
`*SAV` on page 154

Select Partition ← Save Settings to file
Sets partition to save instrument settings.

int Internal storage location.
Default path: `/int/settings/.`

USB1A USB storage location.
Default path: `/USB1A/NGT362x/settings/` where "x" refers to "1" for the single-channel model and "2" for the two-channel model.

Select Filename ← Save Settings to file
Selects filename for saving instrument settings.

Setting 1 Filename: `Setting 1.rds` is used for saving instrument settings.

Setting 2 Filename: `Setting 2.rds` is used for saving instrument settings.

Setting 3 Filename: `Setting 3.rds` is used for saving instrument settings.

Setting 4 Filename: `Setting 4.rds` is used for saving instrument settings.

Save Device Settings To File ← Save Settings to file
File manager dialog to save instrument settings.

Save ← Save Device Settings To File ← Save Settings to file
Saves the current instrument settings to selected location and filename.

Cancel ← Save Device Settings To File ← Save Settings to file
Cancels the saving of instrument settings.

Recall Settings from file
Loads instrument settings.

Remote command:
`*RCL` on page 155

Select Partition ← Recall Settings from file
Sets partition to save instrument settings.

int Internal storage location.
Default path: `/int/settings/.`

USB1A USB storage location.
Default path: `/USB1A/NGT362x/settings/` where "x" refers to "1" for the single-channel model and "2" for the two-channel model.

Load Device Settings From File ← Recall Settings from file
File manager dialog to load instrument settings.

Load ← Load Device Settings From File ← Recall Settings from file
Loads the instrument settings from the selected location and filename.

Cancel ← Load Device Settings From File ← Recall Settings from file
Cancels the loading of instrument settings.

Default Settings
Overwrites instrument settings to default.

Remote command:
*RST on page 153

6.4 Screenshot

With screenshot, you can capture image easily from the instrument. The images can be stored in the USB flash drive or internal memory of the instrument. By default, screen images are stored on the USB device if a USB flash drive is detected.

Access:

► Select [Settings] > "Device" tab > "Screenshot" to configure screenshot file location.
The R&S NGT3600 displays the "Screenshot" dialog.

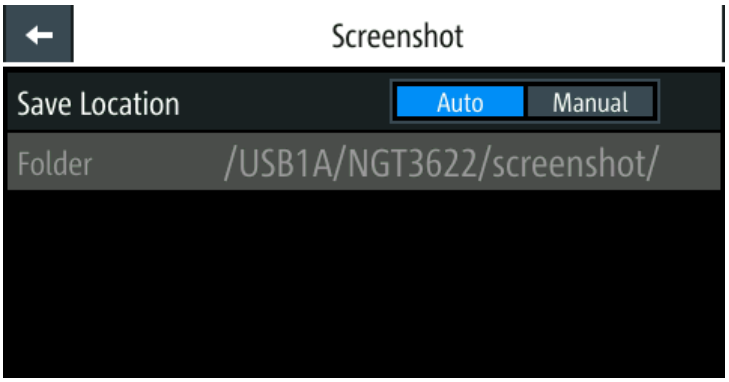


Figure 6-11: Screenshot dialog

To save a screenshot

1. Select "Save Location" to configure the screenshot save partition.
See details in "Save Location" on page 121.
2. Select the required save location.

Settings

Save Location

Sets the saved location for the screenshot.

See also "Folder" on page 122.

Auto	"Folder" is auto-selected. If no USB flash drive is detected, "Folder" is set to an internal memory ("int") partition. Otherwise, "USB1A" partition is selected.
Manual	Choice of "Folder".

Remote command:
n.a.

Folder
Selects the predefined folder for the screenshot.

"USB1A" Selects `/USB1A/NGT362x/screenshot` as the partition, where "x" refers to "1" for the single-channel model and "2" for the two-channel model.

"int" Selects `/int/screenshot` as the partition.

Remote command:
n.a.

6.5 Device documentation

You can retrieve the R&S NGT3600 open source acknowledgment documentation from the instrument documentation folder: `/int/documentation`.

Access:

► Select [Settings] > "Device" tab > "File Manager" to access the file manager.
The R&S NGT3600 displays the file manager dialog.
See Section 6.2, "File manager", on page 114.

1. Select the documentation folder in the file manager dialog.
The R&S NGT3600 displays the available files in the documentation folder.
2. Select the file that you want to copy from the documentation folder.

Settings

For details, see "Settings" on page 115.

7 General instrument functions

The following sections provide the general instrument information and utilities services in R&S NGT3600, regardless of the selected operating mode and measurement.

7.1 Appearance settings

Access:

► Select [Settings] > "Device" tab > "Appearance" to set the display and key brightness.
The R&S NGT3600 displays the appearance dialog.

Figure 7-1: Appearance dialog

To configure display and key brightness

1. Select "Display Brightness" or "Key Brightness" to set the desired instrument brightness.
The R&S NGT3600 displays the "Set Display Brightness" or "Set Key Brightness" dialog.

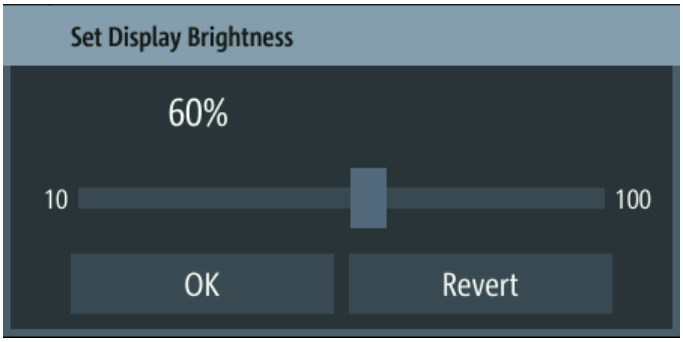


Figure 7-2: Display brightness dialog

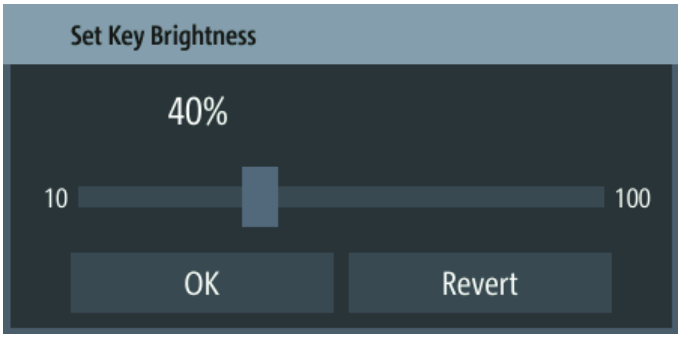


Figure 7-3: Key brightness dialog

2. Drag the indicator along the brightness indicator bar to set the desired brightness.
3. Select "OK" to confirm the setting or "Revert" to undo the changes.

Settings

Display Brightness
Sets the display brightness.

Range: 10 % to 100 %

Remote command:
`DISPlay:BRIGhtness` on page 161

OK ← Display Brightness
Confirms brightness settings.

Remote command:
n.a.

Revert ← Display Brightness
Undo brightness settings.

Remote command:
n.a.

Key Brightness
Sets the brightness of the keys.

Range: 10 % to 100 %

Remote command:
`SYSTem:KEY:BRIGhtness` on page 158

OK ← Key Brightness
Confirms brightness settings.

Remote command:
n.a.

Revert ← Key Brightness
Undo brightness settings.

Remote command:
n.a.

7.2 Sound settings

Access:

► Select [Settings] > "Device" tab > "Sound Settings" to set sound settings.
The R&S NGT3600 displays the sound settings dialog.

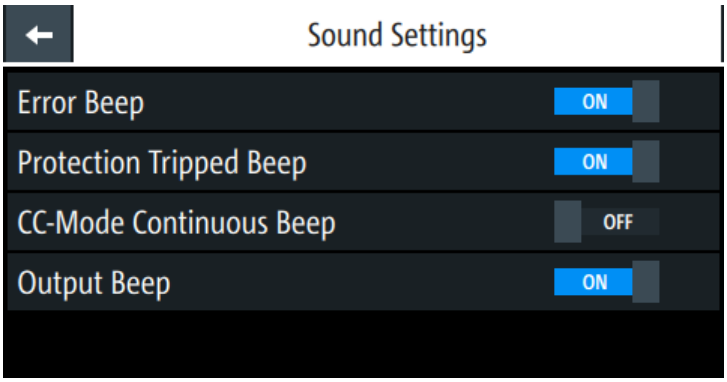


Figure 7-4: Sound settings dialog

► Select the required fields to set an alert.
See details in "Settings" on page 125.

Settings

Error Beep
It sounds a single beep alert when an error occurs.

"ON"	Activates the single beep alert.
"OFF"	Deactivates the single beep alert.

Remote command:
SYSTem:BEEPer:WARNing:STATe on page 157
SYSTem:BEEPer:WARNing[:IMMediate] on page 157

Protection Tripped Beep
It sounds a single beep alert when a protection tripped occurs. See Section 5.5, "Protection", on page 81.

"ON" Activates the single beep alert.

"OFF" Deactivates the single beep alert.

Remote command:
SYSTem:BEEPer:PROTection:STATe on page 156
SYSTem:BEEPer:PROTection[:IMMediate] on page 157

CC-Mode Continuous Beep
It sounds a continuous beep sound when any channel goes into CC mode. See Section 4.4.2, "Constant current mode (CC)", on page 69.

"ON" Activates the continuous beep alert.

"OFF" Deactivates the continuous beep alert.

Remote command:
SYSTem:BEEPer:CURRent:STATe on page 156

Output Beep
It sounds a single beep alert when the output state of any channel changes.

"ON" Activates the single beep alert.

"OFF" Deactivates the single beep alert.

Remote command:
SYSTem:BEEPer:OUTPut:STATe on page 156

7.3 Date and time

The time is regarded as UTC. There is no time zone selectable.

Access:

1. Select [Settings] > "Device" tab > "Date & Time" to set the system date and time.
   The R&S NGT3600 displays the date and time dialog.

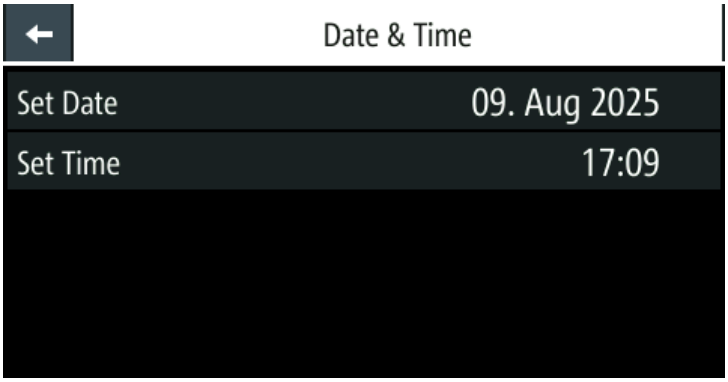


Figure 7-5: Date and time setting dialog

2. Select the required field to configure.
   The R&S NGT3600 reset the instrument date and time accordingly.

Settings

Set Date
Sets the system date.

Remote command:
`SYSTem:DATE` on page 160

Set Time
Sets the system time.

Remote command:
`SYSTem:TIME` on page 160

7.4 Device information

The "Device Information" allows you to get an overview of the configuration of your device and supporting channels. You can retrieve information on the device model, its hardware components and interfaces using the device information function.

7.4.1 Device information settings

Access:

1. Select [Settings] > "Device" tab > "Device Information" > "Device Info" to display the device information.
   The R&S NGT3600 displays the device information dialog.

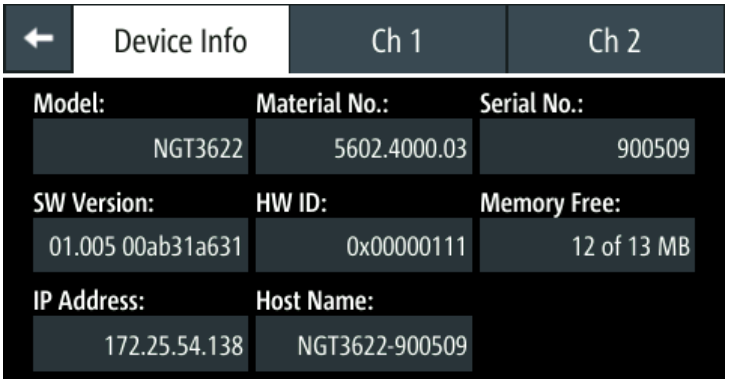


Figure 7-6: Device information dialog

2. Select [Settings] > "Device" tab > "Device Information" > channel tab to display the channel information.

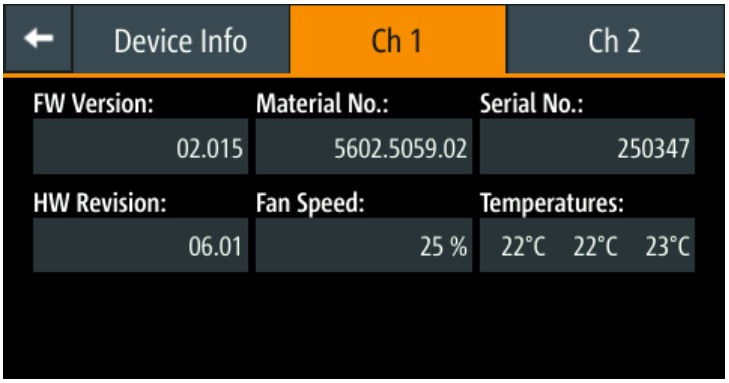


Figure 7-7: Channel information dialog

Settings

Device Info
Displays device information.

Model ← Device Info
Model of the instrument.

Remote command:
`*IDN?` on page 153

Material No. ← Device Info
Instrument's order number.

Remote command:
`*IDN?` on page 153

Serial No. ← Device Info
A unique identification number for the instrument.

Remote command:
`*IDN?` on page 153

SW Version ← Device Info
Software version that is installed in the instrument.

Remote command:
`*IDN?` on page 153

HW ID ← Device Info
Hardware identity of the instrument.

Remote command:
n.a.

Memory Free ← Device Info
Available memory space in the instrument.

Remote command:
n.a.

IP Address ← Device Info
IP address of the instrument.

Remote command:
`SYSTem:COMMunicate:LAN:ADDRess` on page 158

Host Name ← Device Info
Host name of the instrument.

Remote command:
`SYSTem:COMMunicate:LAN:HOSTname` on page 159

Ch1 / Ch2
Displays channel information.

FW Version ← Ch1 / Ch2
Firmware version that is installed for the respective channel.

Remote command:
n.a.

Material No. ← Ch1 / Ch2
Instrument's order number.

Remote command:
n.a.

Serial No. ← Ch1 / Ch2
A unique identification number for the instrument.

Remote command:
n.a.

HW Revision ← Ch1 / Ch2
Hardware revision of the channel.

Remote command:
n.a.

Fan Speed ← Ch1 / Ch2
Fan speed of the channel.

Remote command:
n.a.

Temperatures ← Ch1 / Ch2
Temperature in degrees measured in the channel.

Remote command:
n.a.

7.5 Device settings lock

To prevent unauthorized changes to the device settings, you can lock the settings with a passcode.

Access:

► Select [Settings] > "Device" tab > "Device Settings Lock" to lock device settings.
The R&S NGT3600 displays the device settings lock dialog.

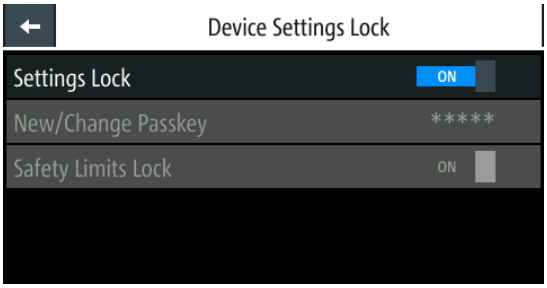


Figure 7-8: Device settings lock dialog

To configure device settings lock

1. Set the required field (e.g. "Safety Limits Lock") to lock by enabling it to "ON".
2. Set the "Settings Lock" to "ON" to enable the lock mechanism for the selected locked field.
   If the "Settings Lock" is disabled for selection, you need to create a new passkey to enable the selection. See "To set up passkey" on page 131.
   The R&S NGT3600 displays the passkey dialog.

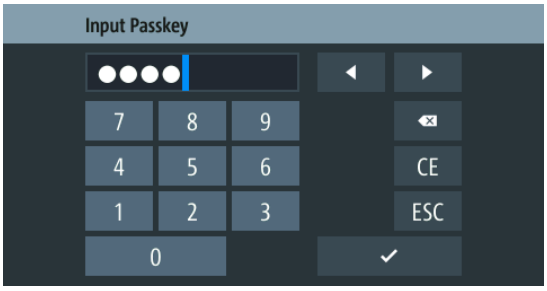


Figure 7-9: Passkey dialog

3. Enter a valid passkey to authorize the change.
   The selected field is locked for access.

To set up passkey

A new passkey must be set up when using the "Device Setting Lock" for the first time.

1. Enter a passkey between 4 digits to 10 digits long.
   If an invalid new passkey is entered, the R&S NGT3600 displays a popup message for invalid passkey entry.

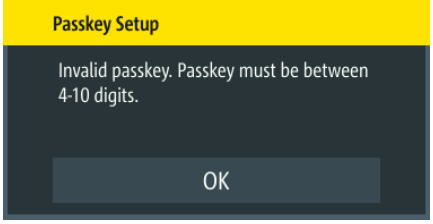


Figure 7-10: Invalid passkey

If an old passkey is available, it cannot be reused for the new passkey. The R&S NGT3600 displays a popup message indicating the error.

Figure 7-11: Invalid new passkey

2. Confirm the entry with the same passkey.
   If an incorrect passkey is entered, the R&S NGT3600 displays a popup message indicating the error.

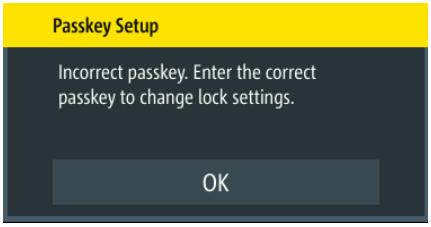


Figure 7-12: Incorrect passkey

   If a valid passkey is entered, the R&S NGT3600 displays a popup message for successful passkey setup.

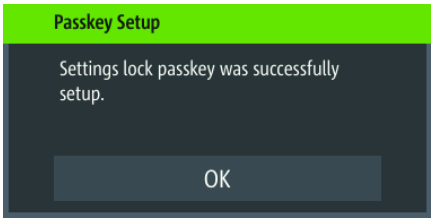


Figure 7-13: Successful passkey setup

3. After the passkey is set up, you can only reset it via remote command, see "New/Change Passkey" on page 133.

Settings

Settings Lock
Enables or disables the locking mechanism for selected locked fields.

"ON"	Enables the locking mechanism for selected locked fields.
"OFF"	Disables the locking mechanism for selected locked fields.

Remote command:
n.a.

New/Change Passkey
Passkey to enable or disable the Settings Lock.

Remote command:
`SYSTem:PASSkey:RESet` on page 160

Safety Limits Lock
Enables or disables the lock for safety limit.

"ON" Enables the lock for safety limit.

"OFF" Disables the lock for safety limit.

Remote command:
n.a.

7.6 Update device

Using the USB interface at the front panel, you can update the firmware.

We recommend that you use the latest firmware available on the product page at http://www.rohde-schwarz.com/product/ngt3600.

Do not power off or operate the instrument during a firmware update.

Required equipment

- Software:
  Firmware update file in RSU format.
  If the downloaded file is in ZIP format, unpack it to obtain the RSU update file.
  Copy the RSU update file to a USB flash drive and connect the USB flash drive to the USB port of the power supply.
- Hardware:
  USB flash drive with enough free space to save the update file.
  The USB flash drive does not need to be bootable and previous data on the USB flash drive is not affected. During update procedure, the USB flash drive is not modified by the instrument.
  The USB flash drive file system supports FAT32 only. See also Section 3.1.10, "Connecting USB devices", on page 32.

To update the instrument firmware

1. Download the latest version of the R&S NGT3600 firmware from the Rohde & Schwarz website. If the downloaded file is in ZIP format, unpack it to obtain the RSU update file.
2. Save the file in the USB flash drive.

3. Connect the USB flash drive to the USB port of the instrument.
4. Select [Settings] > "Device" > "Update Device" to update instrument firmware.
   The R&S NGT3600 displays the update device dialog.

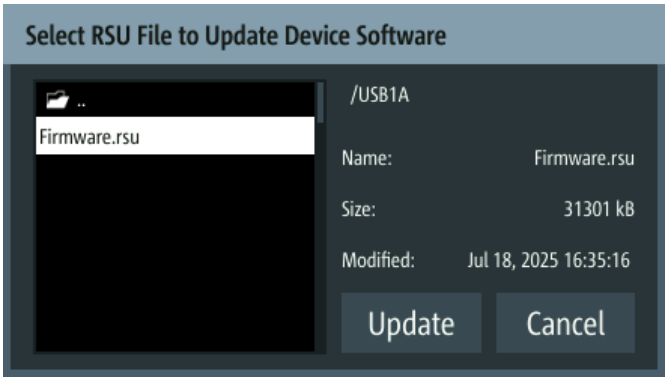


Figure 7-14: Update device dialog

5. Select the file to update the instrument firmware.
6. **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 that needs to be sent in for maintenance.

   Select "Update" to update the instrument firmware.
   The R&S NGT3600 updates the instrument firmware accordingly.
7. Alternatively, press "Cancel" to cancel the firmware update process.
8. Wait for the completion of the update process.
   It takes a few minutes to complete the firmware update process.

Settings

<Firmware_list>
Displays all firmware contained in the selected storage location.

Update
Updates the instrument firmware.

Remote command:
n.a.

Cancel
Cancels the instrument firmware update.

Remote command:
n.a.

8 Network operation and remote control

As an alternative to interactive operation directly at the instrument, the R&S NGT3600 can also be operated remotely, for example a controller PC.

The interfaces of the R&S NGT3600 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 NGT3600 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 on 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

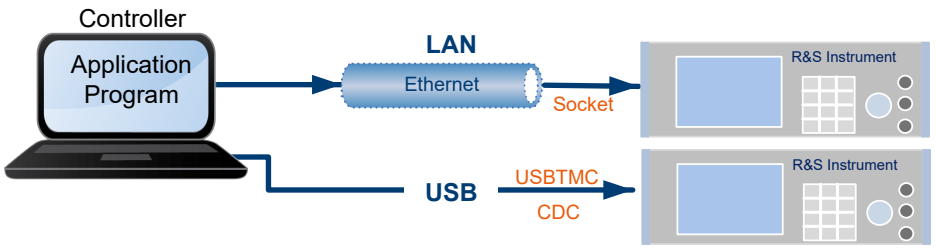


Figure 8-1: Supported remote connections

8.1 Remote control interfaces and protocols

The R&S NGT3600 comes with the following interfaces for remote control:

- Ethernet (LAN) interface
- USB standard interface

Establish a remote connection between the R&S NGT3600 and the controller PC using a supported interface. An application software 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[1] address string and library	Remarks

Local area network (LAN)	• **VXI-11**
	`TCPIP::host address[::LAN device name][::INSTR]`
	VISA
	• **Socket communication** (Raw Ethernet, simple Telnet)
	`TCPIP::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 8.1.2, "LAN interface", on page 138.

USB	• **USBTMC** `USB::<vendor ID>::<product ID>::<serial number>[::INSTR]` VISA • **CDC** (communications device class, corresponds to VCP (virtual COM port))	The USB Type-B connector is at the rear panel of the instrument. For a description of the interface, refer to Section 8.1.3, "USB interface", on page 141.

[1] 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 (if applicable), 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 NGT3600 can be remotely accessed and controlled.

Access:

1. Select [Settings] > "Device" tab > "Interfaces" to configure the required interface.
   The R&S NGT3600 displays the "Interfaces" dialog.

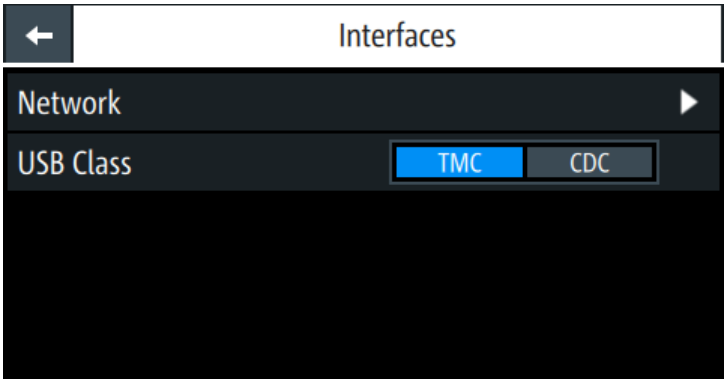


Figure 8-2: Interfaces dialog

2. Select the connected interface (Network or USB Class) to configure the necessary parameters for remote access.

8.1.1 Network connection

The "Network" configures the remote access via the LAN interfaces.

Access:

► Select "Network" from Figure 8-2.
The R&S NGT3600 displays the "Network" dialog.

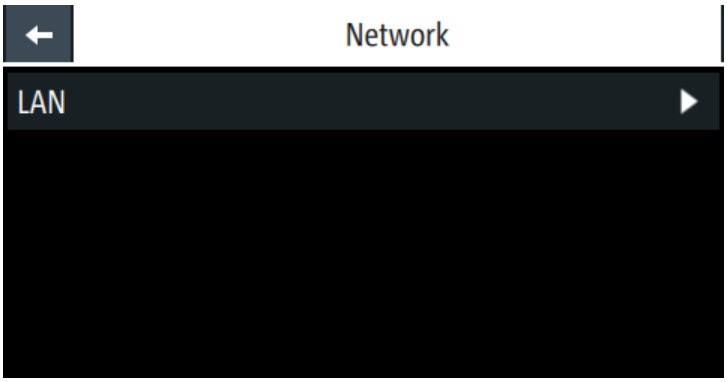


Figure 8-3: Network dialog

To configure network parameters

► Select "LAN" to configure the network parameters
For details, see LAN interface.

When the connection is available, the network icon is highlighted in white on the device status bar information.

Settings

LAN
Configures LAN network.

See Section 8.1.2, "LAN interface", on page 138.

Remote command:
n.a.

8.1.2 LAN interface

The R&S NGT3600 is equipped with a network interface and can be connected to an Ethernet LAN (local area network). If you are 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.

To establish a network connection, connect a commercial RJ-45 cable to the LAN port of the instrument and to a PC or network switch.

For more information on the connection, see Section 8.2.1, "LAN connection", on page 144.

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

- If the network supports dynamic TCP/IP configuration using the Dynamic Host Configuration Protocol (DHCP), and a DHCP server is available, all address information can be assigned automatically.
- Otherwise, the address must be set manually. Automatic Private IP Addressing (APIPA) is not supported.

By default, the instrument is configured to use dynamic TCP/IP configuration and obtain all address information automatically. This means that it is safe to establish a physical connection to the LAN without any previous instrument configuration.

Access:

1. **NOTICE!** Risk of network failure. Before connecting the instrument to the network or configuring the network, consult your network administrator. Connection errors may affect the entire network.

   If your network does not support DHCP, or if you choose to disable dynamic TCP/IP configuration, you must assign valid address information before connecting the instrument to the LAN. Contact your network administrator to obtain a valid IP address.

2. Connect the LAN cable to the LAN port.
   See also Section 8.2.1, "LAN connection", on page 144.

3. For manual configuration, select [Settings] > "Device" tab > "Interfaces" > "Network" > "LAN" to set LAN connection.
   The R&S NGT3600 displays the "LAN" dialog.
   Note: The "MAC Address" is fixed.

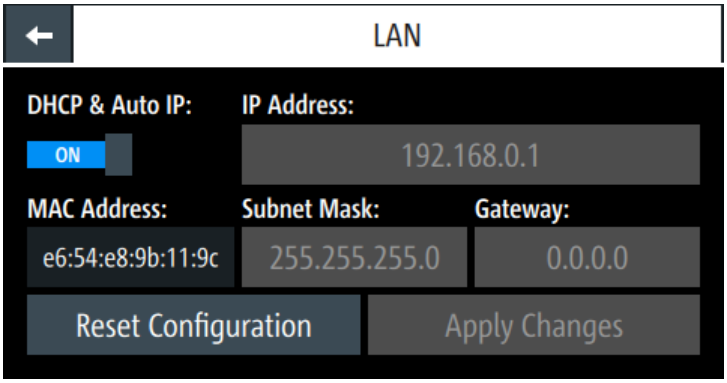


Figure 8-4: Ethernet settings dialog

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 NGT3600 displays additional parameters for information on the LAN interface and the status of the connection.

To manually configure Ethernet settings

By default, the R&S NGT3600 is configured to use a 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.

1. Configure the required Ethernet settings, see Settings.
   The R&S NGT3600 displays the on-screen keyboard to set the IP address.

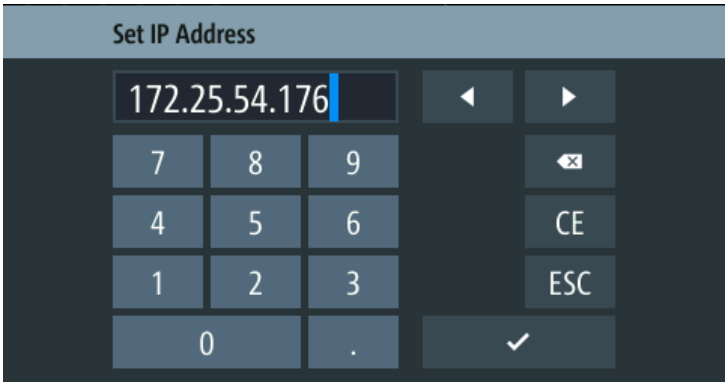


Figure 8-5: On-screen keyboard to set IP address

2. Confirm the value with the "Enter" softkey, .
3. Select "Apply Changes" to apply the changes.
4. Select "Reset Configuration" to reset the LAN settings to factory default.

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 can validate if the LAN connection is established and working properly:

► Check the LAN connection using ping: `ping <IP address>`.

If the ping is successful, you get a reply from the <IP address> of the target instrument.

Settings

DHCP & Auto-IP
Sets IP address via DHCP or manually.

"ON"	Enables DHCP for automatic network parameter distribution and shows the values of the IP Address. By default, the instrument is configured to use dynamic configuration and obtain all address information automatically.
"OFF"	If the network does not support DHCP, the IP addresses must be set manually.

Remote command:
`SYSTem:COMMunicate:LAN:DHCP` on page 159

IP Address
Address used in communication with the network.

This address is manually configured if "DHCP & Auto-IP" is set "OFF".

Remote command:
`SYSTem:COMMunicate:LAN:ADDRess` on page 158

MAC Address
Display the MAC address of the network.

Remote command:
`SYSTem:COMMunicate:LAN:MAC?` on page 159

Subnet Mask
Secondary address used in communication with the network.

This address is manually configured if "DHCP & Auto-IP" is set "OFF".

Remote command:
`SYSTem:COMMunicate:LAN:SMASk` on page 160

Gateway
Gateway address to connect to the network.

This address is manually configured if "DHCP & Auto-IP" is set "OFF".

Remote command:
`SYSTem:COMMunicate:LAN:DGATeway` on page 158

Reset Configuration
Reset LAN configuration.

Remote command:
`SYSTem:COMMunicate:LAN:RESet` on page 159

Apply Changes
Applies the changes made to "IP Address" on page 140, "Subnet Mask" on page 141 and "Gateway" on page 141.

Remote command:
`SYSTem:COMMunicate:LAN:APPLy` on page 158

8.1.3 USB interface

Change of USB class
If a change in "USB Class" is detected (i.e. from TMC to CDC or vice versa), the rebooting of the instrument is necessary to load the correct USB driver.

- A popup message is displayed:

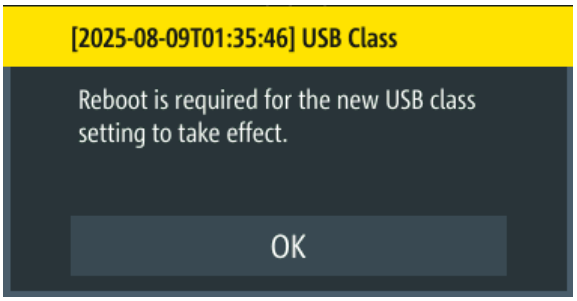


Figure 8-6: USB class - reboot message

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.

For more information on the connection, see Section 8.2.2, "USB connection", on page 146.

Access:

► Select [Settings] > "Device" tab > "USB Class" to set the USB connection.

To configure the USB class

► Set the desired USB class.
See details in "CDC (VCP)" on page 142 and "USB TMC" on page 142.
See also "Change of USB class" on page 141.

CDC (VCP)

The following requirements for USB CDC driver installation are necessary:

- A PC with operating system Windows XP, VISTA, Windows 7, Windows 8 (32Bit or 64Bit), Windows 10 or Windows 11.
- Administrator rights are necessary for the installation of the driver.

The CDC (Communications Device Class) also known as VCP (Virtual COM Port) is a protocol that allows the communication to the R&S NGT3600 using any terminal program (e.g. HMExplorer) via SCPI commands once the corresponding Windows drivers have been installed. The driver and software HMExplorer are available for download on the product homepage (http://www.rohde-schwarz.com/product/ngt3600).

If a connection between the PC and the instrument has been established and no R&S NGT3600 USB CDC driver is installed, the PC operating system displays a "Found New Hardware" wizard. In this case, the R&S NGT3600 USB CDC driver must be installed.

The HMExplorer window application provides the R&S NGT3600 a terminal function and also the option to create screenshots and an editor function to create the arbitrary table.

For more information of the driver installation and HMExplorer window application, see the installation guide of the driver file and the internal HMExplorer help.

USB TMC

The USB Test & Measurement class (USB-TMC) is a protocol that allows GPIB-like communication via USB interfaces and is a separate instrument class of the USB specification. The USB-TMC protocol supports service queries, triggers, and other GPIB-specific instructions.

VISA drivers are installed and that it can be used directly in the corresponding environments. The driver is included in the NI-VISA package and can be downloaded at http://www.ni.com/downloads/ni-drivers/.

A major benefit of the USB TMC class is that by sampling specific registers, the controlling software can determine if commands have been terminated and if they have been processed correctly. With USB CDC, communication with instrument requires analysis and polling mechanisms within the controlling software which may significantly strain the interface of the measurement instruments. The TMC status registers solve this problem with the USB TMC in the same manner as in the case with the GPIB interface for the hardware via the corresponding control lines.

HMExplorer

The window application supports the communication via LAN and USB CDC.

For more information of the VISA driver installation, see the installation guide of the VISA driver file.

Once the driver is installed, the "USB Test and Measurement Device (IVI)" is displayed in the "Device Manager" window, see Figure 8-7.

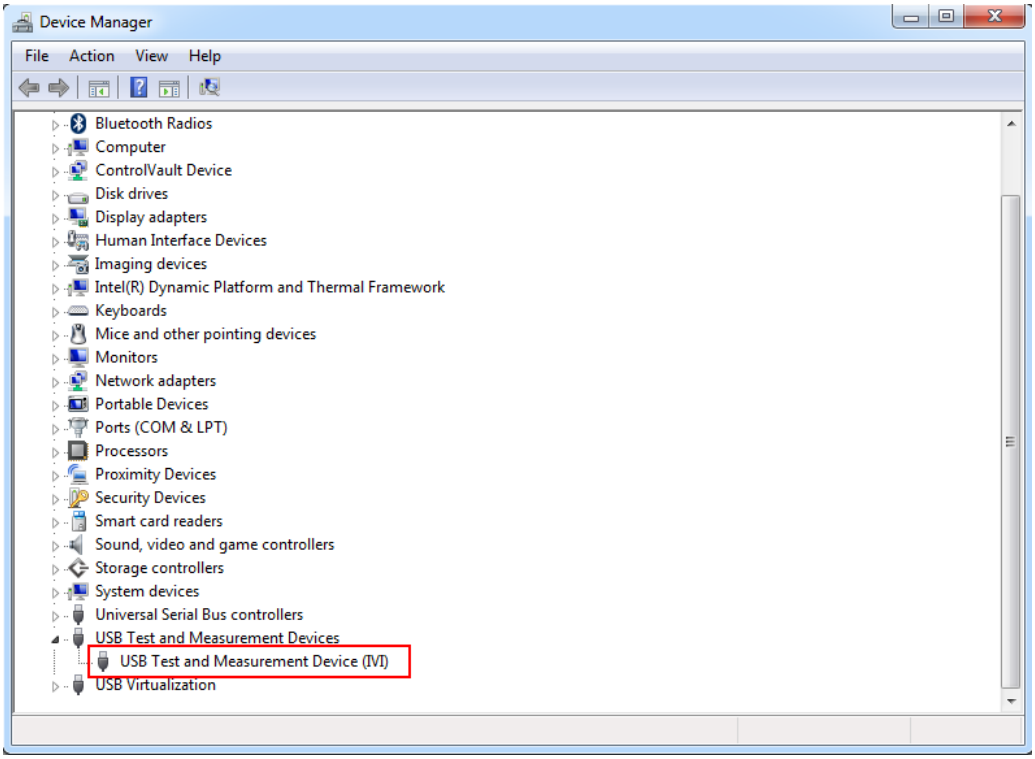


Figure 8-7: Device manager

Settings

USB Class

Configures the USB class.

"CDC" Selects the USB communication device class.

"TMC" Selects the USB test and measurement class.

Remote command:
INTerfaces:USB:CLASs on page 197

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"" by John M. Pieper (R&S order number 0002.3536.00) provides detailed information on SCPI and IEEE 488.2 concepts and definitions.

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 152.

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 Setting up remote control connection

The resource string represents an addressing scheme that is used to establish a communication session with the instrument. The following sections show the resource string format used when setting up a remote connection via the various interfaces.

The end character must be set to line feed (LF).

8.2.1 LAN connection

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.

See Section 8.1.2, "LAN interface", on page 138 for configuring the LAN parameters.

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.

To set up the connection, the IP address of the instrument is required. It is part of the resource string used by the program to identify and control the instrument. The resource string has the form:

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 that the device is registered on the network.

Example:

If the instrument has the IP address 192.1.2.3, the valid resource string is:

```
TCPIP::192.1.2.3::INST
```

See Section 3.1.9, "Connecting to LAN", on page 31.

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 fixed at port 5025.

Example:

```
TCPIP::192.1.2.3::5025::SOCKET
```

8.2.2 USB connection

See Section 8.1.3, "USB interface", on page 141 for configuring the USB parameters.

For remote control over the USB connection, the PC and the instrument must be connected over the USB Type-B interface at the rear panel of the instrument. Depending on the used USB port, the connection requires the VISA library or a USB VCP driver to be installed.

On the controller, you need to install any application for instrument control, for example the R&S HMExplorer, and if available, a VISA program library. VISA detects and configures the Rohde & Schwarz instrument automatically when the USB connection is established. You do not have to enter an address string or install a separate driver.

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 TMC

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

  USB = denotes the used interface
  <vendor ID> = is the manufacturer ID
  <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:
  `USB0::0x0AAD::0x0197::4000.0005<device_variant>-<device_serial_number>::INSTR`

- USB VCP

  `ASRL<COM>::INSTR`, where "COM" refers to the COM port number shown on the controlling PC (e.g. `ASRL15::INSTR`).

8.3 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 registers and in the error queue. You can query both via USB or LAN interface (`STATus...` commands).

8.3.1 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.

`STATus:QUEStionable:INSTrument:ISUMmary1` exists as often as device channels are available (e.g. R&S NGT3622 = 2 channels = 2 status register). Accordingly, the description text of the channel information changes in Figure 8-8 (e.g. instrument 1 = channel 1, instrument 2 = channel 2).

Depending on the value of the read register, you can draw conclusions on the current status of the device. For example, when the unit operates in constant voltage, the result of the returned ISUM register is a decimal "2" which corresponds to the binary value of "0000000000000010".

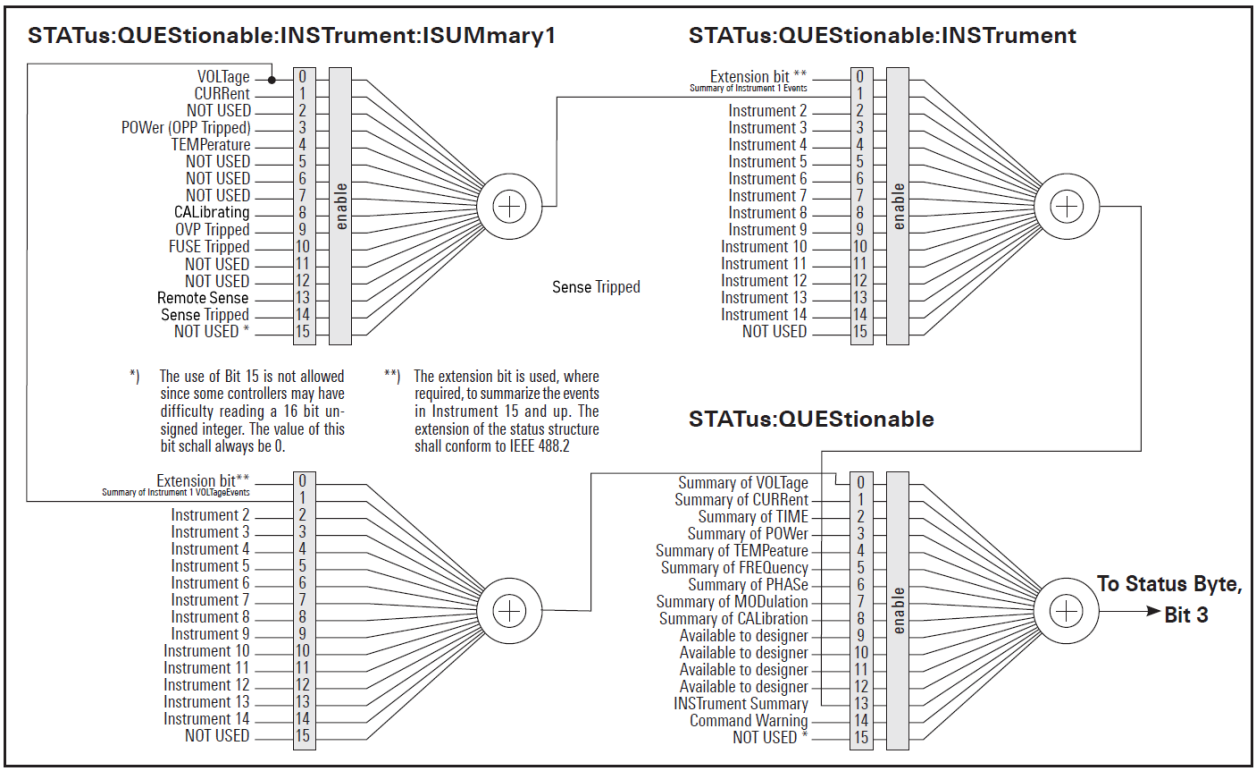


Figure 8-8: Structure of the STATus:QUEStionable register

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.

Each channel of the power supply is considered as separate "instrument" (SCPI standard definition). Therefore, e.g. the register
`STATus:QUEStionable:INSTrument:ISUMmary` of the R&S NGT3622 is also present two times (Isummary1 - Isummary2).

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. If you want to query the constant voltage or current mode, you have to use the `CONDition` register.

The `CONDition` register delivers a "1" (first bit set) in constant current mode (CC) and a "2" (second bit set) in constant voltage mode (CV).

If the correct channel is selected and the red LED of the channel button lights up (CC mode), the query of the `CONDition` register must deliver a "1".

Example:

```
STAT:QUES:INST:ISUM1:COND?
```

EVENt

- The `EVENt` status register is set (1) until it is queried. After reading (query), the `EVENt` status register is set to zero.

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

For further description of the status register, see Section 9.9, "Status reporting commands", on page 220.

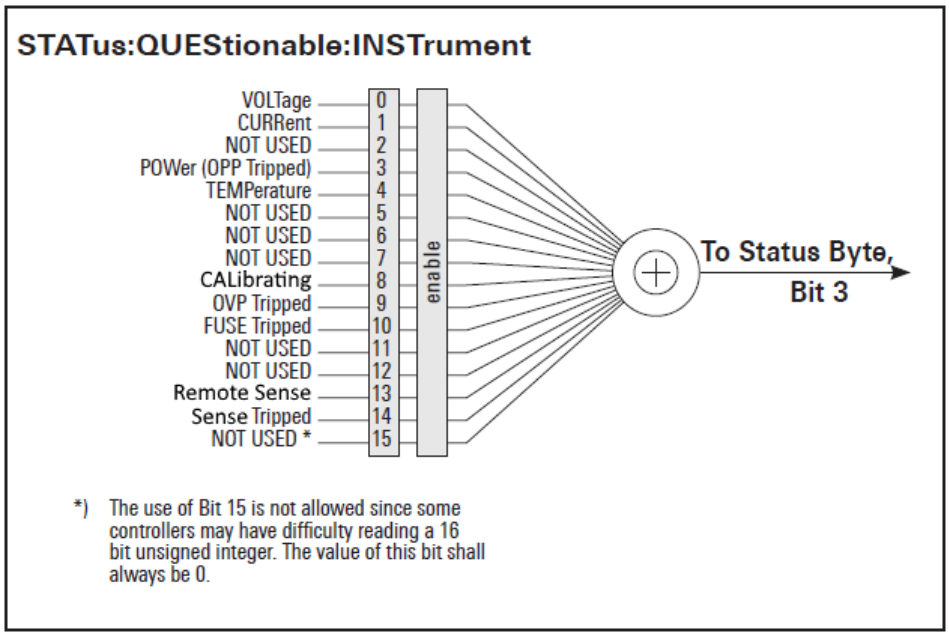


Figure 8-9: Structure of the status:QUEStionable:INSTrument register

8.3.2 Contents of the status registers

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

The ESR is defined in IEEE 488.2. It can be compared with the `EVENt` part of a SCPI register. The event status register can be read out using the command `*ESR?`. The ESE corresponds to the `ENABle` 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?`.

8.3.2.2 STATus:OPERation register

In the `CONDition` part, this register contains information on which actions the instrument is being executing or, in the `EVENt` part, information on which actions the instrument has executed since the last reading. It can be read using the commands `STATus:OPERation:CONDition?` or `STATus:OPERation[:EVENt]?`.

Bit No.	Meaning
0	Not used
1 to 3	Not used
4	**MEASuring** This bit is set on event new measurement available.

Bit No.	Meaning
5 to 9	Not used
10	**Logging** This bit is set as long as "Logging" is enabled
11	Not used
12	Not used
13 to 14	Not used
15	This bit is always 0

8.3.2.3 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[:EVENt]?`. See Figure 8-8.

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

Bit No.	Meaning
0	**Voltage** This bit is set while the instrument is in constant current mode (CC). The voltage is regulated and the current is constant.
1	**Current** This bit is set while the instrument is in constant voltage mode (CV). The current is variable and the voltage is constant.
2	**Not used**
3	**POWer (OPP Tripped)** This bit is set if an over power protection has tripped.
4	**Temperature Overrange** This bit is set if an over temperature occurs.
5 to 8	**Not used**
9	**OVP Tripped** This bit is set if the over voltage protection has tripped.
10	**Fuse Tripped** This bit is set if the fuse protection has tripped.
11 to 12	**Not used**
13	**Remote Sense** This bit is set if EXT sense mode is enabled.
14	**Sense Tripped** This bit is set if the remote sense has tripped
15	This bit is always 0

8.3.2.4 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.

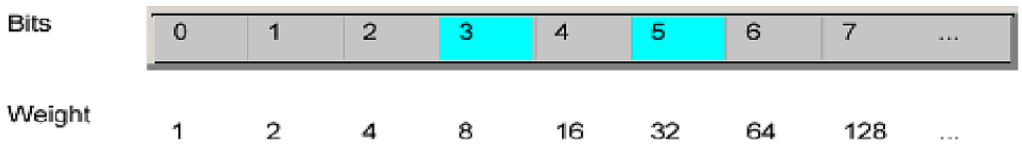


Figure 8-10: Decimal representation of a bit pattern

8.3.3 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 9.1, "Common setting commands", on page 152.

9 Remote control commands

This section provides the description of all remote commands available for the R&S NGT3600 series. The commands are sorted according to the menu structure of the instrument. A list of commands in alphabetical order is given in the "List of Commands" at the end of this documentation.

9.1 Common setting 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.

***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?**

Identification

Returns the instrument identification.

Return values:
<ID> "Rohde&Schwarz,<device type>,<part number>/<serial number>,<firmware version>"

Example: `Rohde&Schwarz,NGT3622,5602.4000.03/900123,01.010 00e9d16ff8`

Manual operation: See "Model" on page 129
See "Material No." on page 129
See "Serial No." on page 129
See "SW Version" on page 129

***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.

The R&S NGT3600 does not support parallel processing of remote commands. If the query *OPC? returns a „1“, the device is able to process new commands.

***RST**

Reset

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

We recommend to start a program by *RST in order to set the instrument to a defined status prior to starting a program.

Usage: Setting only

Manual operation: See "Default Settings" on page 120

***SRE** <Contents>

Service request enable

The SRE is an enable register. Consequently, there are no denotations about the bits. This register conduces for the "OR" combination of the bits in the status byte.

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

***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

***SAV** <arg0>

Save

Stores the current instrument settings under the specified number in an internal memory. The settings can be recalled using the command *RCL with the associated number.

Parameters:
<number> Range: 1..3

Manual operation: See "Save Settings to file" on page 119

***RCL** <arg0>

Recall

Loads the instrument settings from an internal memory identified by the specified number. The instrument settings can be stored to this memory using the command `*SAV` with the associated number.

Parameters:
<number> Range: 1..3

Manual operation: See "Recall Settings from file" on page 120

9.2 System settings commands

The `SYSTem` subsystem contains the commands for general functions, which do not affect signal generation directly.

SYSTem:BEEPer:CURRent:STATe <arg0>
SYSTem:BEEPer:CURRent:STATe?

Sets or queries "current control" beeper tone state.

Parameters:

<state>
0
Current control beeper is deactivated.
1
Current control beeper is activated.

Example:
```
SYSTem:BEEPer:CURRent:STATe 1
```
The "CC-Mode Continuous Beep" is activated, a continuous beep sound alert is triggered when any output channel enters CC mode.

Manual operation: See "CC-Mode Continuous Beep" on page 126

SYSTem:BEEPer:OUTPut:STATe <arg0>
SYSTem:BEEPer:OUTPut:STATe?

Sets or queries "output" beeper tone state.

Parameters:

<state>
0
Output beeper is deactivated.
1
Output beeper is activated.

Example:
```
SYSTem:BEEPer:OUTPut:STATe 1
```
The "Output Beep" is activated, a single beep alert is triggered when the output state of any channel is changed.

Manual operation: See "Output Beep" on page 126

SYSTem:BEEPer:PROTection:STATe <arg0>
SYSTem:BEEPer:PROTection:STATe?

Sets or queries "protection" beeper tone state.

Parameters:

<state>
0
Protection beeper is deactivated.
1
Protection beeper is activated.

Example:
```
SYSTem:BEEPer:PROTection:STATe 1
```
The "Protection Tripped Beep" is activated, a single beep alert is triggered when a protection tripped event occurs.

Manual operation: See "Protection Tripped Beep" on page 126

SYSTem:BEEPer:PROTection[:IMMediate]

Issues a single "protection" beep immediately.

Usage: Event

Manual operation: See "Protection Tripped Beep" on page 126

SYSTem:BEEPer:WARNing:STATe <arg0>
SYSTem:BEEPer:WARNing:STATe?

Sets or queries beep sound for errors and warnings.

Parameters:

<state>
0
Disables beep sound for errors and warnings.
1
Enables beep sound for errors and warnings.

Example: `SYSTem:BEEPer:WARNing:STATe 1`
The "Error Beep" is activated, a beep alert for errors and warnings is triggered when such events occur.

Manual operation: See "Error Beep" on page 125

SYSTem:BEEPer:WARNing[:IMMediate]

Issues a single error/warning beep immediately.

Usage: Event

Manual operation: See "Error Beep" on page 125

SYSTem:BEEPer[:COMPlete]:STATe <En-/Disable operation complete beep>
SYSTem:BEEPer[:COMPlete]:STATe?

Sets or queries beep sound for operation complete.

Parameters:

<state>
0
Disables beep sound for operation complete.
1
Enables beep sound for operation complete.

Example: `SYSTem:BEEPer:STATe 1`
A beep sound is triggered when an operation is completed.

SYSTem:BEEPer[:COMPlete][:IMMediate]

Issues a single operation complete beep immediately.

Usage: Event

SYSTem:KEY:BRIGhtness <arg0>
SYSTem:KEY:BRIGhtness?

Sets or queries the front panel key brightness.

Parameters:
<brightness> Sets the key brightness.
Range: 10 to 100
Increment: 10

Example: `SYSTem:KEY:BRIGhtness 80`
`SYSTem:KEY:BRIGhtness?` -> 80
Returns key brightness value: 80.

Manual operation: See "Key Brightness" on page 124

SYSTem:COMMunicate:LAN:ADDRess <arg0>
SYSTem:COMMunicate:LAN:ADDRess?

Sets or queries IP address of the LAN interface.

Parameters:
<address> IP address.

Example: `SYSTem:COMMunicate:LAN:ADDRess "192.168.1.128"`
Set IP address 192.168.1.128 for the LAN interface.

Manual operation: See "IP Address" on page 129
See "IP Address" on page 140

SYSTem:COMMunicate:LAN:APPLy

Applies LAN configuration settings.

Usage: Event

Manual operation: See "Apply Changes" on page 141

SYSTem:COMMunicate:LAN:DGATeway <Gateway>
SYSTem:COMMunicate:LAN:DGATeway?

Sets or queries gateway for LAN.

Parameters:
<gateway> Gateway address.

Example: `SYSTem:COMMunicate:LAN:DGATeway?`
Returns gateway address from LAN.

Manual operation: See "Gateway" on page 141

SYSTem:COMMunicate:LAN:DHCP <arg0>
SYSTem:COMMunicate:LAN:DHCP?

Sets or queries the LAN interface mode.

Parameters:

<DHCP>

0
DHCP is disabled.
Manually set IP address.

1
DHCP is enabled.
Automatic IP address from DHCP server.

Example: `SYSTem:COMMunicate:LAN:DHCP 1`
DHCP is enabled.

Manual operation: See "DHCP & Auto-IP" on page 140

SYSTem:COMMunicate:LAN:HOSTname <Device hostname>
SYSTem:COMMunicate:LAN:HOSTname?

Sets or queries hostname.

Parameters:

<hostname> Device hostname.

Example: `SYSTem:COMMunicate:LAN:HOSTname?`
Returns device hostname.

Manual operation: See "Host Name" on page 129

SYSTem:COMMunicate:LAN:MAC?

Queries MAC address.

Example: `SYSTem:COMMunicate:LAN:MAC?`
Returns MAC address from LAN.

Usage: Query only

Manual operation: See "MAC Address" on page 140

SYSTem:COMMunicate:LAN:RESet

Resets LAN settings.

Usage: Event

Manual operation: See "Reset Configuration" on page 141

SYSTem:COMMunicate:LAN:SMASk <Subnet mask>
SYSTem:COMMunicate:LAN:SMASk?

Sets or queries the subnet mask for LAN.

Parameters:
<address> Subnet address.

Example: `SYSTem:COMMunicate:LAN:SMASk "255.255.0.0"`
Sets subnet mask 255.255.0.0.

Manual operation: See "Subnet Mask" on page 141

SYSTem:DATE <arg0>, <arg1>, <arg2>
SYSTem:DATE?

Sets or queries system date.

Parameters:
<year> Sets year in the system date.

<month> Sets month in the system date.

<day> Sets day in the system date.

Example: `SYSTem:DATE 2025,07,15`
`SYSTem:DATE?` -> 2025,07,15
Returns system date.

Manual operation: See "Set Date" on page 127

SYSTem:PASSkey:RESet

Resets the passkey.

Usage: Event

Manual operation: See "New/Change Passkey" on page 133

SYSTem:TIME <arg0>, <arg1>, <agr2>
SYSTem:TIME?

Sets or queries system time.

Parameters:
<hour> Sets hour in the system time.

<minute> Sets minutes in the system time.

<second> Sets second in the system time.

Example: `SYSTem:TIME 12,05,50`
`SYSTem:TIME?` -> 12,05,50
Returns system time.

Manual operation: See "Set Time" on page 127

9.3 Display commands

The `DISPlay` subsystem contains the command for display brightness, which does not affect signal generation directly.

DISPlay:BRIGhtness <arg0>
DISPlay:BRIGhtness?

Sets or queries the display brightness.

Parameters:

<brightness> Displays brightness for the instrument.

Range: 10 to 100
Increment: 10

Example: `DISPlay:BRIGhtness 50`
`DISPlay:BRIGhtness?` -> 50
Returns the display brightness value.

Manual operation: See "Display Brightness" on page 124

9.4 DIO commands

The `DIO` subsystem contains the commands for DIO signal triggering.

DIO<IO>:CONDition <arg0>
DIO<IO>:CONDition?

Sets or queries the trigger condition of the specified digital I/O line.

Suffix:

<IO> 1..6

Parameters:

<condition> OUTPut | OMODe | OVP | OCP | OTP | OPP | PROTection | CMODe | VMODe | INHibit | GATed

OUTPut
If digital I/O line direction is set to output, it outputs the selected logic level when the output is turned on at the selected channel. If digital I/O line direction is set to input, the output of the channel will be turned on if the selected logic level is met.

OMODe
Outputs the selected logic level when the selected channel operates in the sink mode.

OVP
Outputs the selected logic level when the selected critical event (OVP) occurs on the selected channel.

OCP
Outputs the selected logic level when the selected critical event (OCP) occurs on the selected channel.

OTP
Outputs the selected logic level when the selected critical event (OTP) occurs on the selected channel.

OPP
Outputs the selected logic level when the selected critical event (OPP) occurs on the selected channel.

Protection
Outputs the selected logic level when any of the critical events (OVP, OCP, OTP, OPP) occur on the selected channel.

CMODe
Outputs the selected logic level when the selected channel operates in the CC mode.

VMODe
Outputs the selected logic level when the selected channel operates in the CV mode.

INHibit
Selected channel output is inhibited when the selected logic level is met.
Note 1: If the selected channel output is put to inhibit state, manual or remote operation on selected channel output is no longer possible.
Note 2: To reverse the inhibit state, remove the source of the trigger signal. You can either disable the affected DIO interface or remove the source from the affected DIO interface at the rear panel.

GATed
Selected channel is turned on and gated when the selected logic level is met.

*RST: OUTPut

Example:
```
DIO1:CONDition OPP
```
Sets DIO pin 1 condition to "OPP".

Manual operation:
See "Condition" on page 92
See "Operation Mode" on page 93

DIO<IO>:DIRection <arg0>
DIO<IO>:DIRection?

Sets or queries the direction (OUTPut/INPut) of the specified digital I/O line.

Suffix:
<IO> 1..6

Parameters:
<logic> OUTPut | INPut

OUTPut
Sets direction as output.

INPut
Sets direction as input.

*RST: OUTPut

Example: `DIO1:DIRection OUTPut`
Sets DIO pin 1 direction to "OUTPut".

Manual operation: See "Direction" on page 92

DIO<IO>:INSTrument <arg0>
DIO<IO>:INSTrument?

Sets or queries the trigger channel of the specified digital I/O line.

Suffix:
<IO> 1..6

Parameters:
<channel> OUT1 | OUT2 | ALL

OUT1
Channel 1 is selected.

OUT2
Channel 2 is selected.

ALL
Available only if digital I/O direction is set to input.
Both channel 1 and channel 2 are selected.

*RST: OUT1

Example: `DIO1:INSTrument OUT1`
Sets DIO pin 1 trigger channel as channel 1.

Manual operation: See "Channel" on page 92

DIO<IO>:LOGic <arg0>
DIO<IO>:LOGic?

Sets or queries the trigger logic (Active High/Active Low) of the specified digital I/O line.

Suffix:
<IO> 1..6

Parameters:
<logic> LOW | HIGH

LOW
Sets trigger logic as active low.

HIGH
Sets trigger logic as active high.

*RST: HIGH

Example: `DIO1:LOGic HIGH`
Sets DIO pin 1 trigger logic as active high.

Manual operation: See "Active Level" on page 92

DIO<IO>[:ENABle] <arg0>
DIO<IO>[:ENABle]?

Sets or queries the enable state of the specified digital I/O line.

Suffix:
<IO> 1..6

Parameters:
<state>

0
Digital I/O line is disabled.

1
Digital I/O line is enabled.

*RST: 0

Example: `DIO1 1`
Enables DIO pin 1.

Manual operation: See "Digital I/O Trigger" on page 62
See "Pin 1 / ... / Pin 6" on page 92
See "Enabled" on page 92

9.5 Configuration commands

The following subsystems contain the commands for channel selection, voltage and current settings for the instrument.

9.5.1 Instrument configuration

The `INSTrument:CATalog` and `INSTrument:SELect` subsystem contains the commands for managing and selecting the output channels.

The INSTrument:MDMode subsystem contains the commands for configuring the multi-device mode settings.

Each channel of the power supply is considered as separate "instrument", which is required by the SCPI standard. Therefore, the SCPI commands use the INSTrument node to select a channel.

You can only address the number of channels a device is equipped with, e.g. a maximum of two channels for the R&S NGT3622 or single channel for R&S NGT3621.

Example: Selecting a channel

You can select a channel either with an OUTPut parameter, or just by the channel number. This example lists all ways how you can select and query a selected channel.

```
// ***********************************************
// Select a channel
// ***********************************************
// selects channel 1
INST OUT1
// queries the channel selection
INST?
// response: "OUT1"
// ***********************************************
// Select a channel by its number
// ***********************************************
// selects channel number 1
INST:NSEL 1
// queries the selected channel number
INST:NSEL?
// response: "1"
```


INSTrument:CATalog?

Returns a comma-separated list of strings which contains the names of all logical instruments and groups

Example: INSTrument:CATalog? -> "OUT1,OUT2"
Returns the logical instrument names of the R&S NGT3600.

Usage: Query only

INSTrument:CATalog:FULL?

Returns a comma-separated list of strings (number pairs) which contains the names of the logical instrument.

Example: `INSTrument:CATalog:FULL?` -> "OUT1,1,OUT2,2"
Returns the logical instrument names of the R&S NGT3600.

Usage: Query only

INSTrument:DEFine:GROup <Group name>, <Instrument name>...
INSTrument:DEFine:GROup? <Group name>

Defines or queries a group of instruments.

Setting parameters:
<instrument_name> Comma-separated list of strings which contains the names of logical instruments.

Parameters for setting and query:
<group> Name of the group.

Example: `INSTrument:DEFine:GROup Group1,"OUT1","OUT2"`
`INSTrument:DEFine:GROup? Group1` -> "OUT1","OUT2"

INSTrument:DEFine[:NAME] <Group name>, <Instrument name>...
INSTrument:DEFine[:NAME]? <Group name>

Defines or queries a logical instrument name.

Setting parameters:
<instrument_name> Logical instrument name.

Parameters for setting and query:
<group_name> Name of the group.

Example: `INSTrument:DEFine Group1,1`
`INSTrument:DEFine? Group1` -> 1

INSTrument:DELete:ALL

An event that disassociates all identifiers from their logical instrument numbers or identifier list, except for the currently selected identifier and any intrinsic identifier definitions.

Usage: Event

INSTrument:DELete[:NAME] <Group name>

An event that disassociates the logical instrument name from its logical instrument number.

Parameters:
<Group name>

Usage: Setting only

INSTrument:NSELect <arg0>

This command is used in conjunction with the `INSTrument[:SELect]` command. It serves the same purpose, except that it uses a numeric value instead of the identifier used in the `INSTrument[:SELect]` command.

Parameters:
<instrument>

1
Selects channel 1 (Ch 1).

2
Selects channel 1 (Ch 2).

Example: See Section 9.5.1, "Instrument configuration", on page 164.

Manual operation: See "[Ch 1] / [Ch 2]" on page 67

INSTrument[:SELect] <arg0>

Selects a path or entire instrument or group as the default.

Parameters:
<instrument>

OUT1
Selects channel 1 (Ch 1).

OUT2
Selects channel 2 (Ch 2).

Example: See Section 9.5.1, "Instrument configuration", on page 164.

Manual operation: See "[Ch 1] / [Ch 2]" on page 67

INSTrument:MDMode:CONNection:STATus?

Queries the multi-device mode connection status.

- "ERRor" - Error detected in the mult-device connection.
- "CONFiguring" - Setting up of the multi-device connection.
- "CONNected" - Device connected.
- "DISConnected" - Device disconnected.

Example: `INSTrument:MDMode:CONNection:STATus?`
Returns status of the multi-device mode connection.

Usage: Query only

Manual operation: See "Status" on page 106

INSTrument:MDMode:ROLE <arg0>[, <Client number>]
INSTrument:MDMode:ROLE? [<Client number>]

Sets or queries the multi-device mode role.

Parameters:

<role> HOST | CLIent

HOST
Sets the multi-device role to host mode.

CLIent
Sets the multi-device role to client mode.

Parameters for setting and query:

<Client number> Depending on the connected device model in a multi-device setting, up to 5 clients (1 to 5) can be assigned.

Example: `INSTrument:MDMode:ROLE? CLIent,2`
Returns multi-device role mode for client 2.

Manual operation: See "Role" on page 106

INSTrument:MDMode[:STATe] <arg0>
INSTrument:MDMode[:STATe]?

Sets or queries the multi-device mode status.

Parameters:

<state> **0**
Disables the multi-device mode.

1
Enables the multi-device mode.

Example: `INSTrument:MDMode 1`
Enables the multi-device mode.

Manual operation: See "Enabled" on page 106

9.5.2 Safety limit setting

The `SOURce:ALIMit` subsystem contains the commands for setting the safety limits of the output channels.

Example: Configuring the safety limit

This example contains all commands to configure and query the voltage and current safety limit.

```
// ***********************************************
// Select the channel
// ***********************************************
// selects channel 1
INST OUT1
// ***********************************************
// Set upper or lower voltage safety limit
// ***********************************************
// sets the safety limits to enable
ALIM 1
// queries the safety limits state
ALIM?
// response: "1"
// sets the safety limits for the upper voltage
VOLT:ALIM 15
// queries the safety limits for the upper voltage
VOLT:ALIM?
// response: "15.000"
// sets the safety limits for the lower voltage
VOLT:ALIM:LOW 5
// queries the safety limits for the lower voltage
VOLT:ALIM:LOW?
// response: "5.000"
***********************************************
// Set upper or lower current safety limit
// ***********************************************
// sets the safety limits for the upper current
CURR:ALIM 3
// queries the safety limits for the upper current
CURR:ALIM?
// response: "3.0000"
// sets the safety limits for the lower current
CURR:ALIM:LOW 0.005
// queries the safety limits for the lower current
CURR:ALIM:LOW?
// response: "0.005"
```

[SOURce:]ALIMit[:STATe] <arg0>[, <Channel list>]
[SOURce:]ALIMit[:STATe]? [<Channel list>]

Sets or queries the amplitude limits (target limits) mode.

Parameters:
<state>
0
Disables the amplitude limit.
1
Enables the amplitude limit.

Parameters for setting and query:
<Channel list> <list>

Example: `ALIMit 1, (@1)`
Activates the amplitude limit state at channel 1.

Example: See Example "Configuring the safety limit" on page 169.

Manual operation: See "Enabled" on page 87

[SOURce:]VOLTage[:LEVel][:IMMediate]:ALIMit:LOWer <arg0>[, <Channel list>]
[SOURce:]VOLTage[:LEVel][:IMMediate]:ALIMit:LOWer? [<Channel list>]

Sets or queries the lower voltage limit.

Setting parameters:
<voltage>
<numeric>
Numeric value for lower voltage limit.
MIN | MINimum
Minimum lower voltage limit at 0.0 V.
MAX | MAXimum
Maximum lower voltage limit at 80.25 V.
DEF | DEFault
Default lower voltage limit at 0.0 V.
Increment: 0.001

Parameters for setting and query:
<Channel list> <list>

Example: `VOLTage:ALIMit:LOWer? (@1)`
Queries the lower amplitude limit for voltage at channel 1.

Example: See Section 9.5.2, "Safety limit setting", on page 168.

Manual operation: See "Voltage Lower Limit / Voltage Upper Limit" on page 88

[SOURce:]VOLTage[:LEVel][:IMMediate]:ALIMit[:UPPer] <arg0>[, <Channel list>]
[SOURce:]VOLTage[:LEVel][:IMMediate]:ALIMit[:UPPer]? [<Channel list>]

Sets or queries the upper voltage limit.

Setting parameters:

<voltage>

<numeric>
Numeric value for upper voltage limit.

MIN | MINimum
Minimum upper voltage limit at 0.0 V.

MAX | MAXimum
Maximum upper voltage limit at 80.25 V.

DEF | DEFault
Default upper voltage limit at 80.25 V.

Increment: 0.001

Parameters for setting and query:

<Channel list> <list>

Example: `VOLTage:ALIMit:UPPer? (@1)`
Queries the upper amplitude limit for voltage at channel 1.

Example: See Example "Configuring the safety limit" on page 169.

Manual operation: See "Voltage Lower Limit / Voltage Upper Limit" on page 88

[SOURce:]CURRent[:LEVel][:IMMediate]:ALIMit:LOWer <arg0>[, <Channel list>]
[SOURce:]CURRent[:LEVel][:IMMediate]:ALIMit:LOWer? [<Channel list>]

Sets or queries the lower current limit.

Setting parameters:

<current>

<numeric>
Numeric value for lower current limit.

MIN | MINimum
Minimum lower current limit at -2.50 A.

MAX | MAXimum
Maximum lower current limit at 50.10 A.

DEF | DEFault
Default lower current limit at 0.001 A.

Increment: 0.001

Parameters for setting and query:

<Channel list> <list>

Example: `CURRent:ALIMit:LOWer? (@1)`
Queries the lower current limit at channel 1.

Example: See Example "Configuring the safety limit" on page 169.

[SOURce:]CURRent[:LEVel][:IMMediate]:ALIMit[:UPPer] <arg0>[, <Channel list>]
[SOURce:]CURRent[:LEVel][:IMMediate]:ALIMit[:UPPer]? [<Channel list>]

Sets or queries the upper current limit.

Setting parameters:

<current>

<numeric>
Numeric value for upper current limit.

MIN | MINimum
Minimum upper current limit at -2.50 A.

MAX | MAXimum
Maximum upper current limit at 50.10 A.

DEF | DEFault
Default upper current limit at 50.10 A.

Increment: 0.001

Parameters for setting and query:

<Channel list> <list>

Example: `CURRent:ALIMit:UPPer? (@1)`
Queries the upper current limit at channel 1.

Example: See Example "Configuring the safety limit" on page 169.

9.5.3 Remote sense setting

The `VOLTage:SENSe` subsystem contains the command for setting the remote sense for the instrument.

[SOURce:]VOLTage:SENSe[:SOURce] <arg0>[, <Channel list>]
[SOURce:]VOLTage:SENSe[:SOURce]? [<Channel list>]

Sets or queries the remote sense state of the selected channel.

Parameters:

<state> INT | EXT

INT
If remote sense detection is set to "INT", the voltage sense relay is disabled.
For query returns:
INT - Remote sense is disabled.

EXT
If remote sense detection is set to "EXT", internal voltage sense relay in the instrument is switched on and the connection of remote sense wires (S+, S-) to the input of the load become necessary. Failure to connect remote sense can cause overvoltage or unregulated voltage output from the R&S NGT3600.
For query returns:
EXT - External, remote sense is activated manually.

Parameters for setting and query:

<Channel list> <list>

`VOLTage:SENSe? (@1)` -> EXT
Queries the remote sense detection at channel 1.

Manual operation: See "Remote sensing" on page 77

[SOURce:]VOLTage:SENSe:TRIPped? [<Channel list>]

Queries the remote sense tripped state of the selected channel.

Parameters:

<Channel list> <list>

Example: `VOLTage:SENSe:TRIPped? (@1)`
Queries remote sense tripped status at channel 1.

Usage: Query only

Manual operation: See "Remote sensing" on page 77

9.5.4 Voltage setting

The `SOURce:VOLTage` subsystem contains the commands for setting the voltage of the output channels. The default unit is V.

Example: Configuring the output voltage

This example contains all commands to configure and query the output voltage.

```
// ***********************************************
// Select the channel
// ***********************************************
INST OUT1
// ***********************************************
// Set upper or lower voltage safety limit
// ***********************************************
// sets the safety limits to enable
ALIM 1
//queries the safety limits state
ALIM?
// response: "1"
// sets the safety limits for the upper voltage
VOLT:ALIM 15
// queries the safety limits for the upper voltage
VOLT:ALIM?
// response: "15.000"
// sets the safety limits for the lower voltage
VOLT:ALIM:LOW 2
// queries the safety limits for the lower voltage
VOLT:ALIM:LOW?
//response: "2.000"
// ***********************************************
// Set the voltage value
// ***********************************************
// sets voltage value for the selected channel
VOLT 10
// queries the output voltage of a channel
VOLT?
// response: "10.000"
// sets the voltage to maximum or minimum respectively
VOLT MAX
VOLT MIN
// ***********************************************
// Query the range of the voltage values
// ***********************************************
// queries the upper and lower limit of the output voltage
VOLT? MIN
// response: "2.000"
VOLT? MAX
// response: "80.250"
// ***********************************************
// Increase or decrease the voltage stepsize
// ***********************************************
// selects the output channel, sets the step width
// and increases the voltage in the selected channel
// by 4 volts
```

```
INST OUT1
VOLT:STEP 4
VOLT UP
// decreases the voltage in the selected channel
// by 4 volts
VOLT DOWN
// queries the voltage step size
VOLT:STEP?
// response: "4.000"
```

[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude] <arg0>[, <Channel list>]
[SOURce:]VOLTage[:LEVel][:IMMediate][:AMPLitude]? [<Channel list>]

Sets or queries the voltage value of the selected channel.

Parameters:

<voltage>

<numeric>
Numeric value in V.

MINimum
Minimum voltage at 2.0 V.

MAXimum
Maximum voltage at 80.250 V.

DEFault
Maximum voltage at 2.0 V.

UP
Increases voltage by a defined step size. See `[SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement]` on page 176.

DOWN
Decreases voltage by a defined step size. See `[SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement]` on page 176.

Parameters for setting and query:

<Channel list> <list>

Example: `VOLTage? (@1)`
Queries the voltage at channel 1.

Example: See Example "Configuring the output voltage" on page 174.

Manual operation: See "Voltage and current" on page 71

[SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement] <arg0>
[SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement]? [<arg0>]

Sets or queries the incremental voltage step size for the `VOLT UP | VOLT DOWN` commands.

Parameters:

<stepsize>

<numeric>
Numeric value in V.

MINimum
Minimum step size at 0.001.

MAXimum
Maximum step size at 5.001.

DEFault
Default step size at 0.001.

Range: 0.001 to 5.001
Increment: 0.001

Example:

```
INSTrument OUT1
VOLTage:STEP? MAXimum -> 5.001
```

Returns the maximum voltage stepsize at channel 1.

Example: See Example "Configuring the output voltage" on page 174.

Manual operation: See "Voltage and current" on page 71

9.5.5 Current setting

The `SOURce:CURRent` subsystem contains the commands for setting the current limit of the output channels. The default unit is A.

Example: Configuring the current output

```
// ***********************************************
// Select the channel
// ***********************************************
INST OUT1
// ***********************************************
// Set upper or lower current safety limit
// ***********************************************
//sets the safety limits to enable
ALIM 1
//queries the safety limits state
ALIM?
//response: "1"
//sets the safety limits for the upper current
CURR:ALIM 3
//queries the safety limits for the upper current
CURR:ALIM?
//response: "3.000"
//sets the safety limits for the lower current
CURR:ALIM:LOW 0.005
//queries the safety limits for the lower current
CURR:ALIM:LOW?
//response: "0.005"
// ***********************************************
// Set the current value
// ***********************************************
// sets current value for the selected channel
CURR 2
// queries the current of the selected channel
CURR?
// response: "2.000E+00" or "2.000"
// ***********************************************
// Query the range of the current values
// ***********************************************
// queries the upper and lower limit of the current
CURR? MIN
// response: "0.005"
CURR? MAX
// response: "50.100"
// ***********************************************
// Set negative current value
// ***********************************************
// sets output to sink mode
OUTPut:MODE SINK
// sets current value for the selected channel
CURR:NEG -2
// queries the current of the selected channel
CURR:NEG?
// response: "-2.000"
// ***********************************************
```

```
// Increase or decrease the current stepsize
// ******************************************
// selects the output channel, sets the step width
// and decreases the current in the selected channel
// by the set 1 ampere
INST OUT1
CURR:STEP 1
CURR DOWN
// increases the current in the selected channel
// by the set 1 ampere
CURR UP
// queries the current step size
CURR:STEP?
// response: "1.000"
```

[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude] <arg0>[, <Channel list>]
[SOURce:]CURRent[:LEVel][:IMMediate][:AMPLitude]? [<Channel list>]

Sets or queries the current value of the selected channel.

Parameters:

<current>

<numeric>
Numeric value in A.

MINimum
Minimum current at 0.005 A.

MAXimum
Depending on the set voltage level, the maximum set current is 50.100 A.

DEFault
Default current at 0.005 A.

UP
Increases current by a defined step size. See `[SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement]` on page 179.

DOWN
Decreases current by a defined step size. See `[SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement]` on page 179.

Parameters for setting and query:

<Channel list> <list>

Example: `CURRent? (@1)`
Queries the current at channel 1.

Example: See Example "Configuring the current output" on page 177.

Manual operation: See "Voltage and current" on page 71

[SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement] <arg0>
[SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement]? [<arg0>]

Sets or queries the incremental step size for the `CURR UP | CURR DOWN` command.

Parameters:

<stepsize>

<numeric>
Step value in A.

MINimum
Minimum step size at 0.001.

MAXimum
Maximum step size at 5.001.

DEFault
Default step size at 0.001.

Increment: 0.001

Example:
```
INSTrument OUT1
CURRent:STEP? DEFault -> 1.000000E-03
```
Returns the default step size for current at channel 1.

Example: See Example "Configuring the current output" on page 177.

Manual operation: See "Voltage and current" on page 71

[SOURce:]CURRent:NEGative[:LEVel][:IMMediate][:AMPLitude] <arg0>[, <Channel list>]
[SOURce:]CURRent:NEGative[:LEVel][:IMMediate][:AMPLitude]? [<Channel list>]

Sets or queries the negative current.

Parameters:

<current>

<numeric>
Numeric value in A.

MIN | MINimum
Minimum current at -2.5 A.

MAX | MAXimum
Maximum current at -0.001 A.

DEF | DEFault
Default current at -0.001 A.

Parameters for setting and query:

<Channel list> <list>

Example:
```
CURRent:NEGative? (@1)
```
Queries the negative current at channel 1.

Example: See Example "Configuring the current output" on page 177.

9.5.6 Combined setting of voltage and current settings

The APPLy subsystem provides a command that enables you to set the current and voltage of a channel in one step.

The combined voltage and current setting command takes approximately 100 ms, i.e. longer than the setting of a single value.

[SOURce:]APPLy <arg0>[,<arg1>, <Channel list>]
[SOURce:]APPLy? [<Channel list>]

Sets or queries the voltage and current value for each channel.

Parameters:

<voltage>

numeric
Numeric value for voltage in V.

MINimum
Minimum voltage at 2.0 V.

MAXimum
Maximum voltage at 80.250 V.

DEFault
Default voltage at 2.0 V.

UP
Increases voltage by a defined step size. See [SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement] on page 176.

DOWN
Decreases voltage by a defined step size. See [SOURce:]VOLTage[:LEVel][:IMMediate]:STEP[:INCRement] on page 176.

<current>

numeric
Numeric value for current in A.

MINimum
Minimum current at 0.005 A.

MAXimum
Maximum current at 50.10 A.

DEFault
Default current at 0.005 A.

UP
Increases current by a defined step size. See [SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement] on page 179.

DOWN
Decreases current by a defined step size. See [SOURce:]CURRent[:LEVel][:IMMediate]:STEP[:INCRement] on page 179.

Parameters for setting and query:
<Channel list> <list>

Example: `APPLy 6,2, (@1)`
Sets 6 V and 2 A to output at channel 1.
`APPLy?` -> 6.000, 2.000
Queries the voltage and current of the selected channel.

Manual operation: See "Voltage and current" on page 71

9.5.7 Output setting

The `OUTPut` subsystem contains the commands for activating the output channels.

Example: Activating the channels

You can activate a selected channel and turn on or off the outputs either individually or all outputs simultaneously. This example lists all ways how you can activate and query the outputs.

```
// ***********************************************
// Activate a channel
// ***********************************************
INST OUT1
// activates the selected channel
OUTP:SEL 1
// activates channel 1 and its output
OUTP 1
// queries the output state
OUTP?
// response: "1"
// ***********************************************
// Turn on all selected channels simultaneously
// ***********************************************
// selects channels 1 and 2
// sets the voltage and current values for both channels
// activates both channels
INST OUT1
VOLT 12
CURR 0.1
OUTP:SEL 1
INST OUT2
VOLT 12
CURR 0.2
OUTP:SEL 1
// turns on the output of both channels
OUTP:GEN 1
```

OUTPut:DELay[:ON]:DURation <arg0>[, <Channel list>]
OUTPut:DELay[:ON]:DURation? [<Channel list>]

Sets or queries the duration for output on delay.

Parameters:

<duration>

<numeric>
Numeric value of the duration in seconds.

MIN | MINimum
Minimum duration at 0.001 s.

MAX | MAXimum
Maximum duration at 10 s.

DEF | DEFault
Default duration at 0.001 s.

Parameters for setting and query:

<Channel list> <list>

Example:
```
OUTPut:DELay:DURation 1
OUTPut:DELay:DURation? -> 1
```
Returns output delay of 1 s.

Example:
```
OUTPut:DELay:DURation? (@1)
```
Returns output delay at channel 1.

Manual operation: See "Delay" on page 76

OUTPut:DELay[:STATe] <arg0>[, <Channel list>]
OUTPut:DELay[:STATe]? [<Channel list>]

Sets or queries the output delay for the selected channel.

Parameters:

<state>

0
Disables output delay for the selected channel.

1
Enables output delay for the selected channel.

Parameters for setting and query:

<Channel list> <list>

Example: `OUTPut:DELay 1`
`OUTPut:DELay?` -> 1
Returns output delay state as on.

Example: `OUTPut:DELay? (@1)`
Returns output delay state at channel 1.

Manual operation: See "Enabled" on page 75

OUTPut:FUSion <arg0>...
OUTPut:FUSion? <arg0>...

Sets or queries channel fusion configuration.

Parameters for setting and query:
<configuration> OFF,OUT1 | SER,OUT1,OUT2 | PAR,OUT1,OUT2

OFF,OUT1
Disable channel fusion. Use this only with the first channel indicated in the list, e.g. `OUT1`.

SER,OUT1,OUT2
Series connection for channel 1 and channel 2.

PAR,OUT1,OUT2
Parallel connection for channel 1 and channel 2.

Example: `OUTPut:FUSion SER,OUT1,OUT2`
Channel fusion with series connection on channel 1 and channel 2. Note that `OUT1` is the first channel in the list.

Example: `OUTPut:FUSion OFF,OUT1`
Channel fusion is disable.

Manual operation: See "Fused Channels" on page 80
See "Connection Mode" on page 80
See "Enabled" on page 81

OUTPut:GENeral[:STATe] <arg0>
OUTPut:GENeral[:STATe]?

Sets or queries the general output.

Parameters:
<state> **0**
Disables the general output.

1
Enables the general output.

Example: See Example "Activating the channels" on page 181.

Manual operation: See "[Output]" on page 67
See "[Output]" on page 72

OUTPut:HIMPedance[:STATe] <arg0>[, <Channel list>]
OUTPut:HIMPedance[:STATe]? [<Channel list>]

Sets or queries the high impedance mode for the selected channel.

Parameters:
<state> **0**
Disables high impedance for the selected channel.
1
Enables high impedance for the selected channel.

Parameters for setting and query:
<Channel list> <list>

Example: `OUTPut:HIMPedance 1`
`OUTPut:HIMPedance:STATe?` -> 1
Returns high impedance state as on.

Example: `OUTPut:HIMPedance? (@1)`
Returns high impedance state at channel 1.

Manual operation: See "High Impedance Mode" on page 78

OUTPut:IMPedance:STATe <arg0>[, <Channel list>]
OUTPut:IMPedance:STATe? [<Channel list>]

Sets or queries the output impedance state for the selected channel.

Parameters:
<state> **0**
Disables output impedance for the selected channel.
1
Enables output impedance for the selected channel.

Parameters for setting and query:
<Channel list> <list>

Example: `OUTPut:IMPedance 1`
`OUTPut:IMPedance:STATe?` -> 1
Returns output impedance state as on.

Example: `OUTPut:IMPedance? (@1)`
Returns output impedance state at channel 1.

Manual operation: See "Enabled" on page 74

OUTPut:IMPedance <arg0>[, <Channel list>]
OUTPut:IMPedance? [<Channel list>]

Output source impedance for the signal specified in ohms.

Parameters:
<impedance> **<numeric>**
Numeric value for output source impedance in ohms.

MIN | MINimum
Minimum output source impedance at 0 ohms.

MAX | MAXimum
Maximum output source impedance at 3.6 ohms.

DEF | DEFault
Default output source impedance at 0 ohms.

Parameters for setting and query:
<Channel list> <list>

Example: `OUTPut:IMPedance 2, (@1)`
Sets output source impedance at channel 1.

Manual operation: See "Output Impedance" on page 74

OUTPut[:STATe] <arg0>[, <Channel list>]
OUTPut[:STATe]? [<Channel list>]

Sets or queries the output state of the currently selected channels.

Parameters:
<state> **0**
Disables the output state of the currently selected channel.

1
Enables the output state of the currently selected channel.

Parameters for setting and query:
<Channel list> <list>

Example: `OUTPut? (@1)`
Queries the output state at channel 1.

Example: See Example "Activating the channels" on page 181.

Manual operation: See "[Output]" on page 67
See "[Output]" on page 72

OUTPut:MODE <arg0>[, <Channel list>]
OUTPut:MODE? [<arg1>, <Channel list>]

Sets or queries output mode.

Setting parameters:
<mode> SOURce | SINK | DEFault

SOURce
Output set to source mode.

SINK
Output set to sink mode.

DEFault
Output set to source mode.

Query parameters:
<mode> DEFault

Parameters for setting and query:
<Channel list> <list>

Example: `OUTPut:MODE? (@1)`
Queries output mode at channel 1.

Manual operation: See "Output Mode" on page 76

OUTPut:RELay[:LOCK][:STATe] <arg0>[, <Channel list>]
OUTPut:RELay[:LOCK][:STATe]? [<Channel list>]

Sets or queries output relay locking for the selected channel.

Parameters:
<state> **0**
Disables the output relay locking.

1
Enables the output relay locking.

Parameters for setting and query:
<Channel list> <list>

Example: `OUTPut:RELay 1 (@1)`
Enables output relay locking at channel 1.

Manual operation: See "Output Relay Lock" on page 77

OUTPut:SELect <arg0>[, <Channel list>]
OUTPut:SELect? [<Channel list>]

Sets or queries the output state of the selected channel.

Parameters:
<state> **0**
Deactivates the selected channel.

1
Activates the selected channel.

Parameters for setting and query:
<Channel list> <list>

Example: `OUTPut:SELect? (@1)`
Queries output state at channel 1.

Example: See Example "Activating the channels" on page 181.

Manual operation: See "[Output]" on page 67
See "[Output]" on page 72

9.5.8 OCP setting

The CURRent:PROTection subsystem contains the commands for overcurrent protection parameters such as activating fuses and setting fuse parameters of the output channels. The default unit is A.

The delay function of the fuses takes effect when the corresponding channel is activated (output on).

Example: Configuring OCP

This example contains all commands to configure and query the fuse states and settings.

```
// ***********************************************
// Activate a fuse
// ***********************************************
// selects a channel and activates the overcurrent protection
INST OUT1
CURR:PROT 1
// queries the state of the overcurrent protection in the selected channel
CURR:PROT?
// response: "1"
// ***********************************************
// Set a delay time for the overcurrent protection. The delay time
// takes effect when the channel output is turned on.
// ***********************************************
// sets 0.05 s delay for the overcurrent protection
CURR:PROT:DEL 0.05
// queries the currently set delay time of the overcurrent protection
// in the selected channel
CURR:PROT:DEL?
// response: "0.05"
// sets the delay time to maximum, minimum respectively
CURR:PROT:DEL MAX
CURR:PROT:DEL MIN
// ***********************************************
// Query the range of the overcurrent protection delay time
// ***********************************************
// queries the upper and lower limit of the
// overcurrent protection delay time in ms
CURR:PROT:DEL? MIN
// response: "0"
CURR:PROT:DEL? MAX
// response: "10"
// ***********************************************
// Set a initial delay time for the overcurrent protection. During
// the timeframe, overcurrent protection tripping is inhibited.
// ***********************************************
// sets 0.1 s for the initial overcurrent protection delay
```

```
CURR:PROT:DEL:INIT 0.1
// queries the currently set initial overcurrent protection delay
// in the selected channel
CURR:PROT:DEL:INIT?
// response: "0.1"
// sets the initial overcurrent protection delay to maximum, minimum respectively
CURR:PROT:DEL:INIT MAX
CURR:PROT:DEL:INIT MIN
// ********************************************
// Query a tripped overcurrent protection
// ********************************************
INST OUT1
// queries whether the OCP in channel 1 has tripped
CURR:PROT:TRIP?
// response: "1" - OCP is tripped
// response: "0" - OCP is not tripped
// resets a tripped OCP in the selected channel
CURR:PROT:CLE
```

[SOURce:]CURRent:PROTection:CLEar [<Channel list>]

Resets the OCP tripped state of the selected channel. If an OCP event has occurred before, the reset will also remove the blinking OCP icon on the channel status bar.

Parameters:

<Channel list> <list>

Example: `CURRent:PROTection:CLEar (@1)`
Resets OCP tripped state at channel 1.

Example: See Example "Configuring OCP" on page 187.

Usage: Setting only

Manual operation: See "Enabled" on page 82

[SOURce:]CURRent:PROTection:DELay:INITial <arg0>[, <Channel list>]
[SOURce:]CURRent:PROTection:DELay:INITial? [<Channel list>]

Sets or queries the delay time for the OCP to take effect directly after enabling channel output

Parameters:

<duration> **<numeric>**
Numeric value for initial fuse delay in seconds.

MIN | MINimum
Minimum initial fuse delay at 0 s.

MAX | MAXimum
Maximum initial fuse delay at 10 s.

DEF | DEFault
Default initial fuse delay at 0 s.

Parameters for setting and query:
<Channel list> <list>

Example: `CURRent:PROTection:DELay:INITial? (@1)`
Queries initial fuse delay time at channel 1.

Example: See Example "Configuring OCP" on page 187.

Manual operation: See "Fuse Delay At Output-On" on page 83

[SOURce:]CURRent:PROTection:DELay[:BLOWing] <arg0>[, <Channel list>]
[SOURce:]CURRent:PROTection:DELay[:BLOWing]? [<Channel list>]

Sets or queries the delay time for the OCP to take effect.

Parameters:
<duration> **<numeric>**
Numeric value for fuse delay.

MIN | MINimum
Minimum fuse delay at 0 s.

MAX | MAXimum
Maximum fuse delay at 10 s.

DEF | DEFault
Default fuse delay at 0 s.

Parameters for setting and query:
<Channel list> <list>

Example: `CURRent:PROTection:DELay? (@1)`
Queries fuse delay time at channel 1.

Example: See Example "Configuring OCP" on page 187.

Manual operation: See "Fuse Delay Time" on page 83

[SOURce:]CURRent:PROTection:TRIPped? [<Channel list>]

Queries the OCP tripped state of the selected channel.

Parameters:
<Channel list> <list>

Example: `CURRent:PROTection:TRIPped? (@1)`
Queries OCP tripped status at channel 1.

Example: See Example "Configuring OCP" on page 187.

Usage: Query only

Manual operation: See "Enabled" on page 82

[SOURce:]CURRent:PROTection[:STATe] <arg0>[, <Channel list>]
[SOURce:]CURRent:PROTection[:STATe]? [<Channel list>]

Sets or queries the state for OCP.

Parameters:

<state>
0
Disables OCP state.
1
Enables OCP state.

Parameters for setting and query:

<Channel list> <list>

Example: `CURRent:PROTection 1`
Enables OCP state.
`CURRent:PROTection? (@1)`
Queries OCP state at channel 1.

Example: See Example "Configuring OCP" on page 187.

Manual operation: See "Overcurrent Protection (OCP)" on page 65
See "Enabled" on page 82

9.5.9 OVP setting

The `VOLTage:PROTection` subsystem contains the commands for setting the overvoltage protection parameters for the output channels. The default unit is V.

Example: Configuring the overvoltage protection

```
// ***********************************************
// Set the overvoltage protection value
// ***********************************************
INST OUT1
//activates the OVP of the selected channel
VOLT:PROT 1
// queries the OVP state of the selected channel
VOLT:PROT?
// response: "1"
// sets the OVP level
VOLT:PROT:LEV 5
// queries the OVP level of a channel
VOLT:PROT:LEV?
// response: "5"

// sets the overvoltage protection to maximum,
// or minimum respectively
VOLT:PROT:LEV MAX
VOLT:PROT:LEV MIN
// ***********************************************
// Query the range of the overvoltage protection values
// ***********************************************
// queries the upper and lower limit
VOLT:PROT:LEV? MIN
// response: "0"
VOLT:PROT:LEV? MAX
// response: "80.250"
// ***********************************************
// Query a tripped overvoltage protection
// ***********************************************
INST OUT1
// queries whether the OVP in channel 1 has tripped
VOLT:PROT:TRIP?
// response: "1" - OVP is tripped
// response: "0" - OVP is not tripped
// resets a tripped OVP in the selected channel
VOLT:PROT:CLE
```

[SOURce:]VOLTage:PROTection[:STATe] <arg0>[, <Channel list>]
[SOURce:]VOLTage:PROTection[:STATe]? [<Channel list>]

Sets or queries the OVP state.

Parameters:
<state>
0
Disables OVP state.
1
Enables OVP state.

Parameters for setting and query:
<Channel list> <list>

Example: `VOLTage:PROTection? (@1)`
Queries OVP state at channel 1.

Example: See Example "Configuring the overvoltage protection" on page 191.

Manual operation: See "Overvoltage Protection (OVP)" on page 65
See "Enabled" on page 84

[SOURce:]VOLTage:PROTection:CLEar [<Channel list>]

Resets the OVP tripped state of the selected channel. If an OVP event has occurred before, the reset will also remove the blinking OVP icon on the channel status bar.

Parameters:
<Channel list> <list>

Example: `VOLTage:PROTection:CLEar (@1)`
Resets OVP tripped state at channel 1.

Example: See Example "Configuring the overvoltage protection" on page 191.

Usage: Setting only

Manual operation: See "Enabled" on page 84

[SOURce:]VOLTage:PROTection:LEVel <arg0>[, <Channel list>]
[SOURce:]VOLTage:PROTection:LEVel? [<Channel list>]

Sets or queries the OVP level of the selected channel.

Parameters:
<voltage>
<numeric>
Numeric value for OVP level in V.
MIN | MINimum
Minimum OVP level at 0.000 V.
MAX | MAXimum
Maximum OVP level at 80.250 V.

DEF | DEFault
Default OVP level at 80.250 V.

Parameters for setting and query:
<Channel list> <list>

Example: `VOLTage:PROTection:LEVel? (@1)`
Queries OVP level at channel 1.

Example: See Example "Configuring the overvoltage protection" on page 191.

Manual operation: See "Level" on page 84

[SOURce:]VOLTage:PROTection:TRIPped? [<Channel list>]

Queries the OVP tripped state of the selected channel.

Parameters:
<Channel list> <list>

Example: `VOLTage:PROTection:TRIPped? (@1)`
Queries the OVP tripped state at channel 1.

Example: See Example "Configuring the overvoltage protection" on page 191.

Usage: Query only

Manual operation: See "Enabled" on page 84

9.5.10 OPP setting

The `POWer:PROTection` subsystem contains the commands for setting the over-power protection parameters for the output channels. The default unit is W.

Example: Configuring the overpower protection

```
// ***********************************************
// Set the overpower protection value
// ***********************************************
INST OUT1
//activates the OPP of the selected channel
POW:PROT 1
// queries the OPP state of the selected channel
POW:PROT?
// response: "1"
// sets the OPP level
POW:PROT:LEV 5
// queries the OPP level of a channel
POW:PROT:LEV?
// response: "5"
// queries the OPP state of the previous selected channel
POW:PROT?
// response: "1"
// sets the overvoltage protection to maximum,
// or minimum respectively
POW:PROT:LEV MAX
POW:PROT:LEV MIN
// ***********************************************
// Query the range of the overpower protection values
// ***********************************************
// queries the upper and lower limit
POW:PROT:LEV? MIN
// response: "1"
POW:PROT:LEV? MAX
// response: "1800"
// ***********************************************
// Query a tripped overpower protection
// ***********************************************
INST OUT1
// queries whether the OPP in channel 1 has tripped
POW:PROT:TRIP?
// response: "1" - OPP is tripped
// response: "0" - OPP is not tripped
// resets a tripped OPP in the selected channel
POW:PROT:CLE
```

[SOURce:]POWer:PROTection[:STATe] <arg0>[, <Channel list>]
[SOURce:]POWer:PROTection[:STATe]? [<Channel list>]

Sets or queries the OPP state of the selected channel.

Parameters:
<state>
0
Disables the OPP state.
1
Enables the OPP state.

Parameters for setting and query:
<Channel list>
<list>

Example:
`POWer:PROTection? (@1)`
Queries OPP state at channel 1.

Example:
See Example "Configuring the overpower protection" on page 194.

Manual operation:
See "Overpower Protection (OPP)" on page 65
See "Enabled" on page 85

[SOURce:]POWer:PROTection:CLEar [<Channel list>]

Resets the OPP tripped state of the selected channel. If an OPP event has occurred before, the reset will also remove the blinking OPP icon on the channel status bar.

Parameters:
<Channel list>
<list>

Example:
`POWer:PROTection:CLEar (@1)`
Resets OPP tripped state at channel 1.

Example:
See Example "Configuring the overpower protection" on page 194.

Usage:
Setting only

Manual operation:
See "Enabled" on page 85

[SOURce:]POWer:PROTection:LEVel [<arg0>, <Channel list>]
[SOURce:]POWer:PROTection:LEVel? [<Channel list>]

Sets or queries the OPP level of the selected channel.

Parameters:
<power>
<numeric>
Numeric value of OPP level in watts.
MIN | MINimum
Minimum OPP level at 0 W.
MAX | MAXimum
Maximum OPP level at 1800 W.

DEF | DEFault
Default OPP level at 1800 W.

Parameters for setting and query:
<Channel list> <list>

Example: `POWer:PROTection:LEVel? (@1)`
Queries OPP level at channel 1.

Example: See Example "Configuring the overpower protection" on page 194.

Manual operation: See "Level" on page 85

[SOURce:]POWer:PROTection:TRIPped? [<Channel list>]

Queries the OPP tripped state of the selected channel.

Parameters:
<Channel list> <list>

Example: `POWer:PROTection:TRIPped? (@1)`
Queries OPP tripped state at channel 1.

Example: See Example "Configuring the overpower protection" on page 194.

Usage: Query only

Manual operation: See "Enabled" on page 85

9.5.11 Protection

The `PROTection` subsystem contains the command to configure linking/unlinking of channels due to protection tripped status and reset protection tripped state.

[SOURce:]PROTection:CLEar [<Channel list>]

Resets all protection tripped states.

Parameters:
<Channel list> <list>

Example: `PROTection:CLEar (@1)`
Reset all protection tripped states at channel 1.

Usage: Setting only

Manual operation: See "Remote sensing" on page 77
See "Enabled" on page 82
See "Enabled" on page 84
See "Enabled" on page 85

[SOURce:]PROTection:LINK <arg0>[, <Channel list>]
[SOURce:]PROTection:LINK?

Sets or queries protection linked channels.

Setting parameters:

<channel> 1 | 2

The linked channels are turned off if there is an OCP, OVP, OPP or OTP event triggered.

<Channel list> <list>

Example: `PROTection:LINK 2 (@1)`
Turn off channel 2 output if there is an OCP, OVP, OPP or OTP event triggered on channel 1.

Manual operation: See "Link to Channel 2/Link to Channel 1" on page 86

[SOURce:]PROTection:UNLink <arg0>[, <Channel list>]

Unlinks protection linked channels.

Setting parameters:

<channel> 1 | 2

Linked channels for unlink.

<Channel list> <list>

Example: `PROTection:UNLink 2 (@1)`
Unlinks channel 2 from channel 1.

Usage: Setting only

Manual operation: See "Link to Channel 2/Link to Channel 1" on page 86

9.5.12 Interface setting

The `INTerface` subsystem contains the commands for changes made on the USB class.

INTerfaces:USB:CLASs <arg0>
INTerfaces:USB:CLASs?

Sets or queries the USB class.

Parameters:

<interface> CDC | TMC

CDC
USB CDC connection.

TMC
USB TMC connection.

Example: `INTerfaces:USB:CLASs CDC`
Set USB interface to USB CDC connection.

Manual operation: See "USB Class" on page 143

9.6 Measurement commands

The `MEASure` subsystem provides commands to query the voltage and current values of a channel.

MEASure[:SCALar]:ENERgy? [<Channel list>]

Queries the amount of emitted energy of the selected channel since counter reset (if energy counter is enabled)

Parameters:
<Channel list> <list>

Example: `MEASure:ENERgy?` -> 5.382E+00 (value in Wh)

Example: `MEASure:ENERgy? (@1)`
Queries the measured accumulated energy value at channel 1.

Usage: Query only

Manual operation: See "E" on page 95

MEASure[:SCALar]:STATistic:COUNt? [<Channel list>]

Returns the number of samples measured in the statistics for voltage, current, and power.

Parameters:
<Channel list> <list>

Example: `MEASure:STATistic:COUNt? (@1)`
Queries the number of measurements at channel 1.

Usage: Query only

Manual operation: See "Reset, ↩" on page 95

MEASure[:SCALar]:STATistic:RESet [<Channel list>]

Resets the minimum, maximum and average statistic values for voltage, current and power.

Additionally, this command resets the measured energy.

Parameters:
<Channel list> <list>

Example: `MEASure:STATistics:RESet (@1)`
Resets all the statistic values at channel 1.

Usage: Setting only

Manual operation: See "Reset Statistics" on page 94
See "Reset, ↩" on page 95

MEASure[:SCALar]:CURRent[:DC]? [<Channel list>]

Queries the currently measured output current of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:CURRent?` -> 1.000E +00

Example: `MEASure:CURRent? (@1)`
Queries the currently measured current at channel 1.

Usage: Query only

MEASure[:SCALar]:CURRent[:DC]:AVG? [<Channel list>]

Queries the average measured output current of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:CURRent:DC:AVG? (@1)`
Queries the average measured current at channel 1.

Usage: Query only

Manual operation: See "Avg" on page 95

MEASure[:SCALar]:CURRent[:DC]:MAX? [<Channel list>]

Queries the maximum measured output current of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:CURRent:DC:MAX? (@1)`
Queries the maximum measured output current at channel 1.

Usage: Query only

Manual operation: See "Max" on page 95

MEASure[:SCALar]:CURRent[:DC]:MIN? [<Channel list>]

Queries the minimum measured output power of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:CURRent:DC:MIN? (@1)`
Queries the minimum measured output current at channel 1.

Usage: Query only

Manual operation: See "Min" on page 95

MEASure[:SCALar]:CURRent[:DC]:STAT? [<Channel list>]

Queries the current statistics of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:CURRent:DC:STAT? (@1)`
Queries the current statistics at channel 1.

Usage: Query only

Manual operation: See "Reset, " on page 95

MEASure[:SCALar]:POWer? [<Channel list>]

Queries the currently measured output power of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:POWer?` -> 3.00E+00

Example: `MEASure:POWer? (@1)`
Queries the currently supplied power at channel 1.

Usage: Query only

MEASure[:SCALar]:POWer:AVG? [<Channel list>]

Queries the average measured output power of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:POWer:AVG? (@1)`
Queries the average measured output power at channel 1.

Usage: Query only

Manual operation: See "Avg" on page 95

MEASure[:SCALar]:POWer:MAX? [<Channel list>]

Queries the maximum measured output power of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:POWer:MAX? (@1)`
Queries the maximum measured output power at channel 1.

Usage: Query only

Manual operation: See "Max" on page 95

MEASure[:SCALar]:POWer:MIN? [<Channel list>]

Queries the minimum measured output power of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:POWer:MIN? (@1)`
Queries the minimum measured output power at channel 1.

Usage: Query only

Manual operation: See "Min" on page 95

MEASure[:SCALar]:POWer:STAT? [<Channel list>]

Queries the power statistics of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:POWer:STAT? (@1)`
Queries the power statistics at channel 1.

Usage: Query only

Manual operation: See "Reset, ↻" on page 95

MEASure[:SCALar][:VOLTage][:DC]? [<Channel list>]

Queries the currently measured output voltage of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure?` -> 1.000E+00

Example: `MEASure? (@1)`
Queries the currently measured voltage at channel 1.

Usage: Query only

MEASure[:SCALar][:VOLTage][:DC]:AVG? [<Channel list>]

Queries the average measured output voltage of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:AVG? (@1)`
Queries the average measured output voltage at channel 1.

Usage: Query only

Manual operation: See "Avg" on page 95

MEASure[:SCALar][:VOLTage][:DC]:MAX? [<Channel list>]

Queries the maximum measured output voltage of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:MAX? (@1)`
Queries the maximum measured output voltage at channel 1.

Usage: Query only

Manual operation: See "Max" on page 95

MEASure[:SCALar][:VOLTage][:DC]:MIN? [<Channel list>]

Queries the minimum measured output voltage of the selected channel.

Parameters:
<Channel list> <list>

Example: `MEASure:MIN? (@1)`
Queries the minimum measured output voltage at channel 1.

Usage: Query only

Manual operation: See "Min" on page 95

MEASure[:SCALar][:VOLTage][:DC]:STAT? [<Channel list>]

Queries the voltage statistics of the selected channel.

Parameters:

<Channel list> <list>

Example: `MEASure:STAT? (@1)`
Queries the voltage statistics at channel 1.

Usage: Query only

Manual operation: See "Reset, " on page 95

9.7 Advanced operating commands

The following shows the subsystem that contains the commands for configuring the Arbitrary, Ramp and Adjustment functions.

9.7.1 Arbitrary

The `ARBitrary` subsystem contains the commands for configuring an arbitrary sequence for the output channels.

Example: Configuring an arbitrary sequence

This programming example generates an arbitrary sequence for a selected channel. The sequence starts at 1 V and 1 A for 1 s, and both values are incremented each second by 1. The generated arbitrary waveform is transferred to channel 1. When activated, the R&S NGT3600 provides the arbitrary waveform at the output of the selected channel, and repeats it 10 times.

```
// ***********************************************
// Define and start the arbitrary sequence
// ***********************************************
// selects channel 1
INST OUT1
// defines the sequence, i.e. starting at 1 V, 1 A for 1 s,
// and increments the voltage and current each second by 1
ARB:BLOC1:DATA 1,1,1,0,2,2,1,0,3,3,1,0
// queries the arb data
// ARB:BLOC1:DATA?
// sets the block repetition rate
ARB:BLOC1:REP 1
// queries the set number of repetitions
// ARB:BLOC1:REP?
// sets the sequence repetition
ARB:SEQ:REP 10
// queries the set number of sequence repetitions
// ARB:SEQ:REP?
// sets the arbitrary endpoint behavior, when the arbitrary function is finished
ARB:SEQ:BEH:END HOLD
// queries the endpoint behavior
// ARB:SEQ:BEH:END?
// Enable the arbitrary sequence
ARB ON
// queries the arb status
// ARB?
// starts the sequence in channel 1
// turns on the output
OUTP ON
```

ARBitrary:BLOCk<n>:CLEar [<Channel list>]

Clears the current block of arbitrary data.

Parameters:
<Channel list> <list>

Usage: Event

Manual operation: See "Delete, " on page 102

ARBitrary:BLOCk<n>:COUNt? [<Channel list>]

Queries the maximum number of allowed arbitrary points.

Parameters:
<Channel list> <list>

Usage: Query only

Manual operation: See "Data Points" on page 103

ARBitrary:BLOCk<n>:DATA <arg0>...

Create an arbitrary table for a block, or read the current arb block.

Parameters:
<data> voltage1, current1, time1, interpolation mode1, voltage2, current2, time2, interpolation mode2, ...

Voltage and current settings depending on the instrument type. If the interpolation mode is set to 1, it indicates that the interpolation is activated. If the interpolation mode is set to 0, it indicates that the interpolation is not activated.

Example:
```
INSTrument OUT1
ARBitrary:BLOCk1:DATA 1,1,1,0,2,2,1,0,3,3,1,0
```
3 data points in the order of voltage, current, time, interpolation are written to data block 1 for channel 1.

Manual operation: See "File" on page 103

ARBitrary:BLOCk<n>:ENDPoint? [<Channel list>]

Queries the number of points of the block of arbitrary data

Parameters:
<Channel list> <list>

Example:
```
INSTrument OUT1
ARBitrary:BLOCk1:ENDPoint?
```
Returns the number of data points for block 1 of channel 1.

Usage: Query only

Manual operation: See "Data Points" on page 103

ARBitrary:BLOCk<n>:REPetitions <arg0>[, <Channel list>]
ARBitrary:BLOCk<n>:REPetitions? [<Channel list>]

Sets or queries the number of repetitions of the block of arbitrary data.

Parameters:
<repetition> Repetition of the block of arbitrary data.

Parameters for setting and query:
<Channel list> <list>

Example:
```
INSTrument OUT1
ARBitrary:BLOCk1:REPetitions 0
```
Set repetition of infinity to block 1 for channel 1.

Manual operation: See "Repetitions" on page 103

ARBitrary[:STATe] <arg0>[, <Channel list>]
ARBitrary[:STATe]? [<Channel list>]

Sets or queries the arbitrary function for the selected channel.

Parameters:
<state> **0**
Arbitrary function is deactivated.

1
Arbitrary function is activated.

Parameters for setting and query:
<Channel list> <list>

Example:
```
ARBitrary 1
ARBitrary? -> 1
```
Arbitrary function is activated.
See Example "Configuring an arbitrary sequence" on page 204.

Manual operation: See "Arbitrary" on page 65

ARBitrary:SEQuence:ENDPoint? [<Channel list>]

Queries the total number of points of the arbitrary sequence.

Parameters:
<Channel list> <list>

Example: See Example "Configuring an arbitrary sequence" on page 204.

Usage: Query only

Manual operation: See "Data Points" on page 103

ARBitrary:SEQuence:BEHavior:END <arg0>[, <Channel list>]
ARBitrary:SEQuence:BEHavior:END? [<Channel list>]

Sets or queries the arbitrary endpoint behavior, when the arbitrary function is finished.

Parameters:
<state> OFF | HOLD

OFF
If the arbitrary function is finished, the respective channel is deactivated automatically.

HOLD
If the arbitrary function is finished, the last arbitrary point of the user-defined arbitrary list is held.

Parameters for setting and query:
<Channel list> <list>

Example: See Example "Configuring an arbitrary sequence" on page 204.

Manual operation: See "End Behavior" on page 102

ARBitrary:SEQuence:CLEar [<Channel list>]

Clears the arbitrary sequence.

Parameters:
<Channel list> <list>

Usage: Event

Manual operation: See "Delete, 🗑" on page 102

ARBitrary:SEQuence:REPetitions <arg0>[, <Channel list>]
ARBitrary:SEQuence:REPetitions? [<Channel list>]

Sets or queries the number of repetitions of the arbitrary sequence.

Parameters:
<repetition> Range: 0 to 65535
The "0" indicates infinite repetition.

Parameters for setting and query:
<Channel list> <list>

Manual operation: See "Seq. Rep." on page 102

9.7.2 Ramp

The `VOLTage:RAMP` subsystem contains the commands for configuring the Ramp function for the output channels.

[SOURce:]VOLTage:RAMP[:STATe] <arg0>[, <Channel list>]
[SOURce:]VOLTage:RAMP[:STATe]? [<Channel list>]

Sets or queries the state of ramp function for the selected channel.

Parameters:
<state>
0
Disables the ramp function.
1
Enables ramp function.

Parameters for setting and query:
<Channel list>
<list>

Example:
```
INSTrument OUT1
VOLTage:RAMP 1
VOLTage:RAMP? -> 1
```
Ramp function of channel 1 is activated.

Example:
```
VOLTage:RAMP 1, (@1)
VOLTage:RAMP? (@1)
```
Sets and queries the state of ramp function at channel 1.

Manual operation: See "Ramp" on page 65
See "Enable" on page 104

[SOURce:]VOLTage:RAMP[:UP]:DURation <Ramp up duration>[, <Channel list>]
[SOURce:]VOLTage:RAMP[:UP]:DURation? [<Channel list>]

Sets or queries the duration of the ramp up function.

Parameters:
<duration>
<numeric>
Duration of the ramp up function in seconds.
MIN | MINimum
Minimum duration of the ramp up function at 0.01 s.
MAX | MAXimum
Maximum duration of the ramp up function at 10 s.
DEF | DEFault
Default duration of the ramp up function at 0.01 s.
Range: 0.01 to 10
*RST: 0.01
Default unit: s

Parameters for setting and query:
<Channel list>
<list>

Example:
```
VOLTage:RAMP:DURation 4
VOLTage:RAMP:DURation? -> 4
```
Duration of the ramp up function is set at 4 s.

Manual operation: See "Ramp Time" on page 104

9.7.3 Adjustment

The CALibration subsystem contains the commands for channel adjustment. For the channel adjustment setup, see Section 5.10.1, "Channel adjustment", on page 107.

Example: Channel adjustment

This example contains all commands to configure and start the channel adjustment.

```
// ***********************************************
// Channel adjustment
// ***********************************************
// voltage adjustment
// reset device to default settings, select ch1
*RST
INST OUT1
// start channel adjustment
CAL:BEG
// check calibration status
CAL:STAT?
// response: "1"
// start voltage adjustment
CAL:VOLT 80
// verify number of calibration points
CAL:LEV:COUNT?
// response: "2"
// repeat CAL:LEV and CAL:INP until all points are completed,
// calibration points for CAL:LEV are in ascending order
// set output to the calibration point 1
CAL:LEV 1
// read 1st DMM measurement and send it to DUT
CAL:INP <DMM reading>
// set output to the calibration point 2
CAL:LEV 2
// read 2nd DMM measurement and send it to DUT
CAL:INP <DMM reading>
// verify that no error occurred during calibration
CAL:STAT?
// response: "1"
// set calibration date, e.g July 14, 2025
CAL:DATE 2025,07,14
// Save the data
CAL:SAVE
// Verify no error occurred during saving process
CAL:STAT?
// response: "1"
// end channel adjustment
CAL:END
CAL:STAT?
// response: "0"
```

CALibration:BEGin

Begins the calibration process.

Example: See Example "Channel adjustment" on page 209.

Usage: Event

Manual operation: See "User Adjustment" on page 112

CALibration:COUNt?

Queries the count of channel calibration done.

Usage: Query only

Manual operation: See "User Adjustment" on page 112

CALibration:CURRent <arg0>
CALibration:CURRent?

Sets or queries current adjustment type.

Parameters:

<type> -2.5 | 2.5 | 50

-2.5
Sink current adjustment.

2.5
Low current adjustment.

50
High current adjustment.

Example:
```
INSTrument OUT2
CALibration:CURRent -2.5
CALibration:CURRent? -> -2.5
```
Returns current adjustment type at channel 2.

Example: See Example "Channel adjustment" on page 209.

Manual operation: See "User Adjustment" on page 112

CALibration:DATE <arg0>, <arg1>, <arg2>
CALibration:DATE?

Sets or queries the channel calibration date.

Parameters:

<year> Year of the calibration date.

<month> Month of the calibration date.

<day> Day of the calibration date.

Example: See Example "Channel adjustment" on page 209.

Manual operation: See "User Adjustment" on page 112

CALibration:END

Ends the channel calibration process.

Example: See Example "Channel adjustment" on page 209.

Usage: Event

Manual operation: See "User Adjustment" on page 112

CALibration:FACTory:RESTore

Restores the factory channel calibration.

Usage: Event

Manual operation: See "User Adjustment" on page 112
See "Restore Factory Adjustment" on page 112

CALibration:INPut <arg0>
CALibration:INPut?

Sets or queries the measured value for the current calibration level.

Parameters:

<current> Measured value from DMM.

Example: See Example "Channel adjustment" on page 209.

Manual operation: See "User Adjustment" on page 112

CALibration:LEVel <arg0>
CALibration:LEVel?

Sets or queries the level of the current adjustment type which is to be calibrated.

Parameters:
<level> Current level.

Example: See Example "Channel adjustment" on page 209.

Manual operation: See "User Adjustment" on page 112

CALibration:LEVel:COUNt?

Queries the total number of points for the current adjustment type.

Example: See Example "Channel adjustment" on page 209.

Usage: Query only

Manual operation: See "User Adjustment" on page 112

CALibration:RESet

Resets channel calibration.

Usage: Event

Manual operation: See "User Adjustment" on page 112

CALibration:SAVE

Saves the channel calibration.

Example: See Example "Channel adjustment" on page 209.

Usage: Event

Manual operation: See "User Adjustment" on page 112

CALibration:STATus?

Returns the current status of the calibration.

State	Descriptions
0	Off
1	Ready
2	Busy
3	Error

Example: `CALibration:STATus?` -> `1`
Calibration is ready.

Example: See Example "Channel adjustment" on page 209.

Usage: Query only

Manual operation: See "User Adjustment" on page 112

CALibration:VOLTage <arg0>
CALibration:VOLTage?

Sets or queries voltage adjustment type.

Parameters:

<type> 80
Voltage adjustment.

Example:
```
INSTrument OUT2
CALibration:VOLTage 80
CALibration:VOLTage? -> 80
```
Returns voltage adjustment type at channel 2.

Example: See Example "Channel adjustment" on page 209.

Manual operation: See "User Adjustment" on page 112

9.8 Data and file management commands

The MMEMory and HCOPy subsystems contain commands for managing the file delimiter and screenshots files respectively.

The LOGGing subsystem contains the commands for managing the data logging of the instrument.

HCOPy:DATA?

Returns the actual display content (screenshot).

Usage: Query only

HCOPy:SIZE:X?

Returns the horizontal dimension of the screenshots.

Usage: Query only

HCOPy:SIZE:Y?

Returns the vertical dimension of the screenshots.

Usage: Query only

LOGGing[:STATe] <arg0>
LOGGing[:STATe]?

Sets or queries the data logging state.

Parameters:

<state>

0
Data logging function is disabled.

1
Data logging function is enabled.

Example: `LOGGing?` -> 1
Data logging function is activated.

Manual operation: See "Logging" on page 62
See "Logging" on page 94
See "Enabled" on page 97

LOGGing:COUNt <arg0>[, <Return min or max>]
LOGGing:COUNt? [<Return min or max>]

Sets or queries the number of samples in "Count" mode.

Setting parameters:

<samples>

<numeric>
Numeric value of samples in "Count" mode in the range of 1 to 10000000.

MIN | MINimum
Minimum samples in "Count" mode at 1.

MAX | MAXimum
Maximum samples in "Count" mode at 10000000.

DEF | DEFault
Default samples in "Count" mode at 10.

Parameters for setting and query:
<samples> MINimum | MAXimum | DEFault
Returns the number of samples in "Count" mode.

Example:
```
LOGGing:COUNt MAXimum
LOGGing:COUNt? MAXimum
```
-> 10000000

Manual operation: See "Mode" on page 98

LOGGing:DURation <arg0>[, <Return min or max>]
LOGGing:DURation? [<Return min or max>]

Sets or queries the logging duration in "Duration" and "Span" mode.

Setting parameters:
<duration> **<numeric>**
Numeric value for logging duration in milliseconds

MIN | MINimum
Minimum logging duration at 1 ms.

MAX | MAXimum
Maximum logging duration at 10000000 ms.

DEF | DEFault
Default logging duration at 1000 ms.

Parameters for setting and query:
<duration> MINimum | MAXimum | DEFault
Returns the logging duration.

Example:
```
LOGGing:DURation MAXimum
LOGGing:DURation? MAXimum
```
-> 10000000

Manual operation: See "Mode" on page 98

LOGGing:INTerval <arg0>[, <Return min or max>]
LOGGing:INTerval? [<Return min or max>]

Sets or queries the data logging interval. The interval describes the time between the recorded measurements.

Setting parameters:
<interval> **<numeric>**
Numeric value for logging interval in the range of 10 ms to 600000 ms.

MIN | MINimum
Minimum logging interval is set at 10 ms.

MAX | MAXimum
Maximum logging interval is set at 600000 ms.

DEF | DEFault
Default logging interval is set at 250 ms.

Parameters for setting and query:
<Return min or max> MINimum | MAXimum | DEFault
Returns the logging interval.

Example: `LOGGing:INTerval? MINimum` -> 10

Manual operation: See "Interval" on page 98

LOGGing:LOCation:FNAMe?

Queries the recent logging location path.

Example: `LOGGing:LOCation:FNAMe?` -> "/int/logging/log-20250726T134812.csv"
Returns the logging location and data log filename.

Usage: Query only

Manual operation: See "Folder" on page 98

LOGGing:LOCation:MODE <arg0>
LOGGing:LOCation:MODE?

Sets or queries the logging location mode.

Parameters for setting and query:
<mode> AUTO | MANual

AUTO
Auto selection of the location for data logging.
If USB flash drive is connected to device, the location path is directed to the "USB1A" partition else it is directed to "int" partition.

MANual
Manual selection of the location path.

Manual operation: See "Save Location" on page 98

LOGGing:LOCation:PARTition <arg0>
LOGGing:LOCation:PARTition?

Sets or queries the logging location partition.

Parameters for setting and query:
<location> Logging location partition ("USB1A" or "int").

Example: `LOGGing:LOCation:PARTition "USB1A"`
`LOGGing:LOCation:PARTition?` -> "USB1A"

Manual operation: See "Folder" on page 98

LOGGing:LOCation:PARTition:CATalog?

Queries the lists of logging location partition.

Example: `LOGGing:LOCation:PARTition:CATalog?` -> "int","USB1A"

Usage: Query only

Manual operation: See "Folder" on page 98

MMEMory:CATalog?

Queries all filenames in internal memory ('/int/') and external memory ('/USB').

Example: `MMEMory:CATalog?` -> "/USB1A/NGT3622/logging/log-20250909T101025.829.csv","/int/arb/newWaveform.csv","/int/logging/log-20250909T101129.818.csv"

Usage: Query only

MMEMory:DATA? <arg0>

Returns the logging file data of the selected file.

Query parameters:

<filepath> Filepath of the logging file data.

Example:
```
MMEMory:DATA? "/int/logging/log-20250909T095013.965.csv" ->
#Device,NGT3621
#Calibration Ch1,factory
Timestamp,U1[V],I1[A],P1[W]
09:50:14.078,2.0003,0.00007,0.00013
09:50:14.177,2.0003,0.00007,0.00014
09:50:14.278,2.0003,0.00007,0.00014
09:50:14.376,2.0003,0.00008,0.00016
09:50:14.477,2.0003,0.00008,0.00015
09:50:14.575,2.0003,0.00008,0.00017
```

MMEMory:DELete <arg0>

Deletes the specified file from memory.

Setting parameters:

<filepath> Filepath of the file.

Example:
```
MMEMory:DEL "/int/logging/log-20250909T095013.965.csv"
```
Deletes internal logging file 'log-20250909T095013.965.csv'.

Usage: Event

Manual operation: See "Delete, Delete" on page 115

LOGGing:MODE <arg0>
LOGGing:MODE?

Sets or queries the logging mode.

Parameters for setting and query:

<mode> UNLimited | COUNt | DURation | SPAN

UNLimited
Infinite data captured.

COUNt
Number of data captured.

DURation
Duration of the data captured.

SPAN
Interval of the data captured.

Example: `LOGGing:MODE DURation`
`LOGGing:MODE?` -> DURation
Returns the logging mode.

Manual operation: See "Mode" on page 98

LOGGing:STIMe <arg0>, <arg1>, <arg2>, <arg3>, <arg4>, <arg5>

Sets or queries the start time of the data logging function.

Setting parameters:

<Year> Sets the year for the data logging function.

<Month> Sets the month for the data logging function.

<Day> Sets the day for the data logging function.

<Hour> Sets the hour for the data logging function.

<Minute> Sets the minute for the data logging function.

<Second> Sets the second for the data logging function.

Example: `LOGGing:STIMe 2025,07,18,08,18,18`
`LOGGing:STIMe?` -> 2025,07,18,08,18,18

Manual operation: See "Mode" on page 98

MMEMory:STORe:CSV:DSEParator <arg0>
MMEMory:STORe:CSV:DSEParator?

Sets or queries the CSV decimal separator setting.

Parameters:

<seperator> DOT | COMMa

DOT
Sets dot as CSV decimal separator.

COMMa
Sets comma as CSV decimal separator.

Example: `MMEMory:STORe:CSV:DSEParator COMMa`
`MMEMory:STORe:CSV:DSEParator?` -> COMMa
Returns CSV decimal separator as comma.

Manual operation: See "Decimal Separator" on page 99

MMEMory:STORe:CSV:EDESignator <arg0>
MMEMory:STORe:CSV:EDESignator?

Sets or queries the CSV error designator setting.

Parameters:
<error_designator> NAN | EMPTy

NAN
Sets NAN as CSV error designator.

EMPTy
Sets empty value as CSV error designator.

Example: `MMEMory:STORe:CSV:EDESignator NAN`
`MMEMory:STORe:CSV:EDESignator?` -> NAN
Returns CSV error designator as NAN.

Manual operation: See "Error Designator" on page 100

MMEMory:STORe:CSV:FDELimiter <arg0>
MMEMory:STORe:CSV:FDELimiter?

Sets or queries the CSV field delimiter setting.

Parameters:
<delimiter> COMMa | SEMicolon

COMMa
Sets comma as CSV field delimiter.

SEMicolon
Sets semicolon as CSV field delimiter.

Example: `MMEMory:STORe:CSV:FDELimiter COMMa`
`MMEMory:STORe:CSV:FDELimiter?` -> COMMa
Returns CSV field delimiter as comma.

Manual operation: See "Field Delimiter" on page 99

MMEMory:STORe:CSV:LEMarker <arg0>
MMEMory:STORe:CSV:LEMarker?

Sets or queries the CSV line end marker setting.

Parameters:
<line_end_marker> CRLF | LF

CRLF
Sets carriage return/line feed as CSV line end marker.

LF
Sets line feed as CSV line end marker.

Example: `MMEMory:STORe:CSV:LEMarker LF`
`MMEMory:STORe:CSV:LEMarker?` -> LF
Returns CSV line end marker as line feed.

Manual operation: See "Line End Marker" on page 100

9.9 Status reporting commands

The status reporting system stores all information on the present operating state of the instrument, and on errors which have occurred. This information is stored in the status registers and in the error queue. The `STATus:OPERation` and `STATus:QUEStionable` subsystems contain commands to control the status reporting structure of the instrument.

See Section 8.3.1, "Structure of a SCPI status register", on page 146.

9.9.1 STATus:OPERation registers

The commands of the `STATus:OPERation` subsystem control the status reporting structures of the `STATus:OPERation` register.

The suffix at <Channel> selects the instrument channel. Depending on the instrument models, the range is <1...2>.

STATus:OPERation:INSTrument:CONDition?
STATus:OPERation:INSTrument:ISUMmary<Channel>:CONDition?

Returns the contents of the CONDition part of the status register to check for operation instrument or measurement states. Reading the CONDition registers does not delete the contents.

Suffix:
<Channel> 1..n

Return values:
<Condition> Condition bits in decimal representation.
Range: 1 to 65535

Usage: Query only

STATus:OPERation:INSTrument:ENABle <arg0>
STATus:OPERation:INSTrument:ENABle?
STATus:OPERation:INSTrument:ISUMmary<Channel>:ENABle <arg0>

Controls or queries the ENABle part of the STATus:OPERation register. The ENABle defines which events in the EVENt part of the status register are forwarded to the OPERation summary bit (bit 7) of the status byte. The status byte can be used to create a service request.

Suffix:
<Channel> 1..n

Parameters:
<Enable> Range: 1 to 65535
Increment: 1

Example: `STATus:OPERation:INSTrument:ISUMmary1:ENABle?`
Reads the enable register for the Standard Operation Register group.

STATus:OPERation:INSTrument[:EVENt]?
STATus:OPERation:INSTrument:ISUMmary<Channel>[:EVENt]?

Returns 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.

Suffix:
<Channel> 1..n

Return values:
<Event> Range: 1 to 65535

Usage: Query only

STATus:OPERation:INSTrument:NTRansition <arg0>
STATus:OPERation:INSTrument:NTRansition?
STATus:OPERation:INSTrument:ISUMmary<Channel>:NTRansition <arg0>
STATus:OPERation:INSTrument:ISUMmary<Channel>:NTRansition?

Sets or queries the negative transition filter. Setting a bit in the negative transition filter shall cause a 1 to 0 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Suffix:
<Channel> 1..n

Parameters:
<NegativeTransition> Range: 1 to 65535

Example: `STATus:OPERation:INSTrument:ISUMmary1:NTRansition?`
Query for negative transition.

STATus:OPERation:INSTrument:PTRansition <arg0>
STATus:OPERation:INSTrument:PTRansition?
STATus:OPERation:INSTrument:ISUMmary<Channel>:PTRansition <arg0>
STATus:OPERation:INSTrument:ISUMmary<Channel>:PTRansition?

Sets or queries the positive transition filter. Setting a bit in the positive transition filter shall cause a 0 to 1 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Suffix:
<Channel> 1..n

Parameters:
<PositiveTransition> Range: 1 to 65535

Example: `STATus:OPERation:INSTrument:ISUMmary1:PTRansition?`
Query for positive transition.

9.9.2 STATus:QUEStionable registers

The commands of the `STATus:QUEStionable` subsystem control the status reporting structures of the `STATus:QUEStionable` registers.

The suffix at <Channel> selects the instrument channel. Depending on the instrument models, the range is <1...2>.

STATus:QUEStionable:INSTrument:CONDition?
STATus:QUEStionable:INSTrument:ISUMmary<Channel>: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.

Suffix:
<Channel> 1..n

Return values:
<Condition> Condition bits in decimal representation.
Range: 0 to 65535

Usage: Query only

STATus:QUEStionable:INSTrument:ENABle <arg0>
STATus:QUEStionable:INSTrument:ENABle?
STATus:QUEStionable:INSTrument:ISUMmary<Channel>:ENABle <arg0>
STATus:QUEStionable:INSTrument:ISUMmary<Channel>:ENABle?

Sets or queries 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 1, and the corresponding EVENt bit is true, a positive transition occurs in the summary bit. This transition is reported to the next higher level.

Suffix:
<Channel> 1..n

Parameters:
<Enable_Value> Bit mask in decimal representation.
Range: 0 to 65535

Example: `STATus:QUEStionable:INSTrument:ISUMmary1:ENABle?`
Queries the event register for the Standard QUEStionable Register group.

STATus:QUEStionable:INSTrument[:EVENt]?
STATus:QUEStionable:INSTrument:ISUMmary<Channel>[:EVENt]?

Returns 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.

Suffix:
<Channel> 1..n

Return values:
<Event> Event bits in decimal representation
Range: 0 to 65535

Usage: Query only

STATus:QUEStionable:INSTrument:NTRansition <arg0>
STATus:QUEStionable:INSTrument:NTRansition?
STATus:QUEStionable:INSTrument:ISUMmary<Channel>:NTRansition <arg0>
STATus:QUEStionable:INSTrument:ISUMmary<Channel>:NTRansition?

Sets or queries the negative transition filter. Setting a bit in the negative transition filter shall cause a 1 to 0 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Suffix:
<Channel> 1..n

Parameters:
<NegativeTransition> Range: 1 to 65535

Example: `STATus:QUEStionable:INSTrument:ISUMmary1:NTRansition?`
Query for negative transition.

STATus:QUEStionable:INSTrument:PTRansition <arg0>
STATus:QUEStionable:INSTrument:PTRansition?
STATus:QUEStionable:INSTrument:ISUMmary<Channel>:PTRansition <arg0>
STATus:QUEStionable:INSTrument:ISUMmary<Channel>:PTRansition?

Sets or queries the positive transition filter. Setting a bit in the positive transition filter shall cause a 0 to 1 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Suffix:
<Channel> 1..n

Parameters:
<PositiveTransition> Range: 1 to 65535

Example: `STATus:QUEStionable:INSTrument:ISUMmary1:PTRansition?`
Query for positive transition.

10 Troubleshooting

10.1 Displaying status information

The R&S NGT3600 displays notifications to inform you on current settings and states. It distinguishes between status, information, warning and error notifications.

Some information and messages are entered in the error/event queue of the status reporting system, see Section 8.3, "Status reporting system", on page 146.

10.2 Problems during firmware update

The firmware update is described in Section 7.6, "Update device", on page 133.

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 happens during the firmware update, problems can occur.

1. Perform the firmware update again. Sometimes, repeating the update fixes the problems.
2. If the R&S NGT3600 still cannot be updated, contact your local service representative, see Section 10.4, "Contacting customer support", on page 226.

Firmware update was aborted

If there is not enough free memory space, the firmware update will be aborted. The instrument will display 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 establishing a LAN connection as described in Section 3.1.9, "Connecting to LAN", on page 31:

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.

10.3.2 Cannot communicate over LAN

If you have problems establishing a 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 Transport

Lifting and carrying

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.

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 specifications document, 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 product does not start, it is possible that a blown fuse is the cause. The fuse is located in the socket of the power supply.

For details on changing fuses, see "To replace the power fuse" on page 27.

12.3 Internal battery replacement

An internal CR2032 coin cell battery powers the real-time clock circuit which provides continuous time stamp for the instrument. If the battery fails, the system clock and time stamp for the logging function are not available but other instrument functions are not affected.

Under normal usage at room temperature, the battery is expected to last up to 10 years. However, the battery life expectancy is reduced if the device is stored at temperature above 40°C for an extended period of time.

If the instrument cannot retain the date and time settings after turning off the AC input, the battery is discharged.

Contact your local service partner for battery replacement.

12.4 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.

12.5 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.

13 Applications

For safety information, see Section 3.1.6, "Connecting to power", on page 23.

With either the channel fusion or multi-device mode feature, the R&S NGT3600 can be connected in series mode or parallel mode to increase output voltage or current. In general, the output voltages of R&S NGT3600 to be combined are independent.

For further information, see Section 5.4, "Channel fusion", on page 78 and Section 5.9.3, "Multi-device mode", on page 105.

13.1 Series mode

This type of interconnection adds the individual output voltages. The same current flows through all outputs. The current limits for the outputs wired in series should be set to the identical value. If one of the outputs exceeded the current limit, the total voltage will naturally collapse. See Section 4.4, "Modes of operation", on page 68.

It is recommended to set the voltages of all connected channels to a similar value in order to distribute the loads evenly (not absolutely necessary). When output channels are connected in a series mode and if a (low resistance) load is connected; there is a chance of damaging a channel when that channel is switched off. This is due to the protection diode working as a bypass to connect the other channel in a series mode. Once the protection diode is shorted, the channel is defective.

Therefore, it is necessary to always have all channels or no channel switched on at all.

If the instrument switches to constant current (CC) mode during a series connection, the voltage display becomes inaccurate.

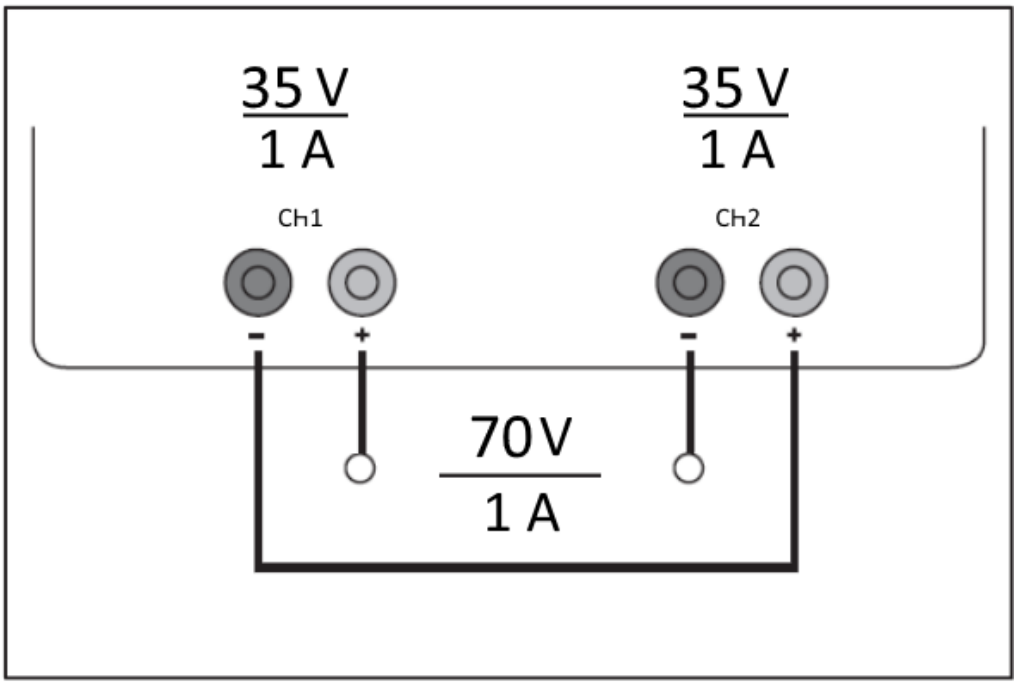


Figure 13-1: Example of series connection

13.2 Parallel mode

If it is necessary to increase the total current, the power supply outputs must be wired in parallel. The maximum total current is the sum of the individual currents of all sources connected in parallel.

The output voltages for the individual outputs should be set to the same voltage value as precisely as possible, but this is not necessary if Channel Fusion is enabled. For slight voltage differences, it is common in a parallel operating mode to first charge a voltage output up to the current limit; the other voltage output provides the remaining current. See "Principles of operation in parallel mode" on page 233.

For power supplies that are connected in parallel, it is possible that compensating currents flow within the power supplies. The use of power supplies by other manufacturers, which are potentially not overload proof, can cause destruction of these units as currents may be distributed unevenly.

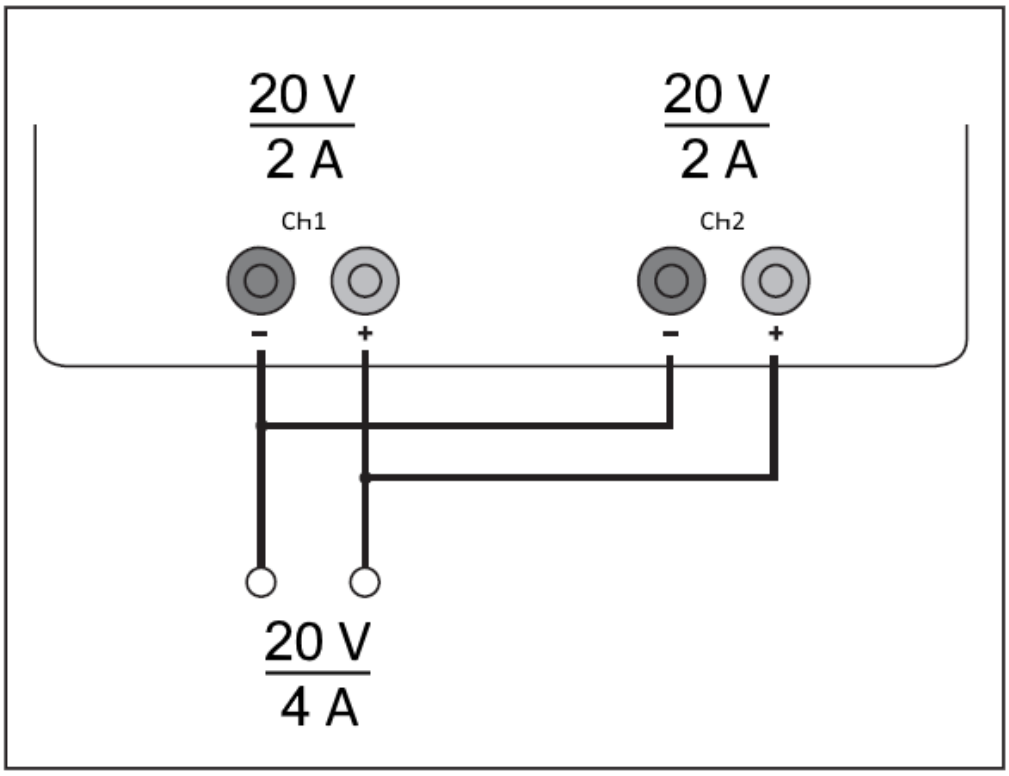


Figure 13-2: Example of parallel connection

Principles of operation in parallel mode

Generally, a higher current is first supplied from the channel with the higher output voltage. Once this channel reaches its power limit, the remaining current is made available by the channel that is connected in parallel. In this scenario, it is unpredictable which channel supplies the higher current because it is also possible for channels with identical voltage values to display a low voltage difference.

By increasing the voltage slightly, the load distribution can be manipulated. If the voltage for a channel is to be increased by 50 mV, for instance (by a set of identical cables), the current will initially be provided by this channel.

If you wish to distribute the load to multiple channels, it is recommended to set the current limit of the channel that is to supply the main current to a fraction of the current. This approach handles the semiconductor with care and improves the heat dissipation, as the power loss is distributed more evenly. However, with Channel Fusion, the load-bearing mechanism is handled seamlessly at the output.

Glossary

C

CDC: USB communications device class. A composite universal serial bus device class.

D

DHCP: Dynamic host configuration protocol. A type of network management protocol used for automatically assigning IP addresses and other communication parameters to devices connected to the network.

F

FTP: File transfer protocol. A network protocol for file transfer between computers over TCP/IP.

G

GPIB: General purpose interface bus, also known as IEEE 488. It is a short-range digital communications 8-bit parallel multi-master interface bus.

O

OCP: Overcurrent protection refers to a type of protection circuit that shuts down the instrument when the current exceeds the rated ampere capacity of a circuit or the connected equipment on that circuit.

OPP: Overpower protection refers to a type of protection circuit that shuts down the instrument when the output power exceeds its maximum rating.

OVP: Overvoltage protection refers to a type of protection circuit that shuts down the instrument when the voltage exceeds a preset level.

T

TCP/IP: Transmission control protocol/internet protocol connection. An internet protocol suite that allows devices in a network to communicate.

TMC: USB test and measurement class. Supports communications with test and measurement equipment.

V

VNC: Virtual network computing. A graphical desktop sharing system that uses the remote frame buffer protocol to remotely control another computer.

List of commands

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