R&S®NGT3600 Power Supply Series Getting Started

5602440002
Version 03

ROHDE&SCHWARZ
Make ideas real

This manual describes the following R&S®NGT3600 models with firmware version 1.00 and 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)

5602.4400.02 | Version 03 | R&S®NGT3600

Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol, e.g. R&S®NGT3600 is indicated as R&S NGT3600.

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 6 and the additional information provided during setup or operation procedures.

Where do I find safety information?

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

- In Section 1.1, "Safety instructions", on page 6. The same information is provided in many languages as printed "Safety Instructions". The printed "Safety Instructions" are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

1.1 Safety instructions

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

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

Only people skilled in electrical work should connect, set up and use the product. Such persons have the education and experience needed to recognize risks and avoid hazards of working with electricity. These users also need sound knowledge of at least one of the languages in which the user interfaces and the product documentation are available.

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

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

Lifting and carrying the product

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

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

Choosing the operating site

Only use the product indoors. The product casing is not waterproof. Water that enters can electrically connect the casing to live parts, which can lead to electric shock, serious personal injury or death if you touch the casing.

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

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

Setting up the product

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

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

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

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

Connecting to power

The product is an overvoltage category II product. Connect the product to a fixed installation used to supply energy-consuming equipment such as household appliances and similar loads. Keep in mind that electrically powered products have risks, such as electric shock, fire, personal injury or even death. Replace parts that are relevant to safety only by original parts, e.g. power cables or fuses.

Take the following measures for your safety:

- Before switching on the product, ensure that the voltage and frequency indicated on the product match the available power source. If the power adapter does not adjust automatically, set the correct value and check the rating of the fuse.
- 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.

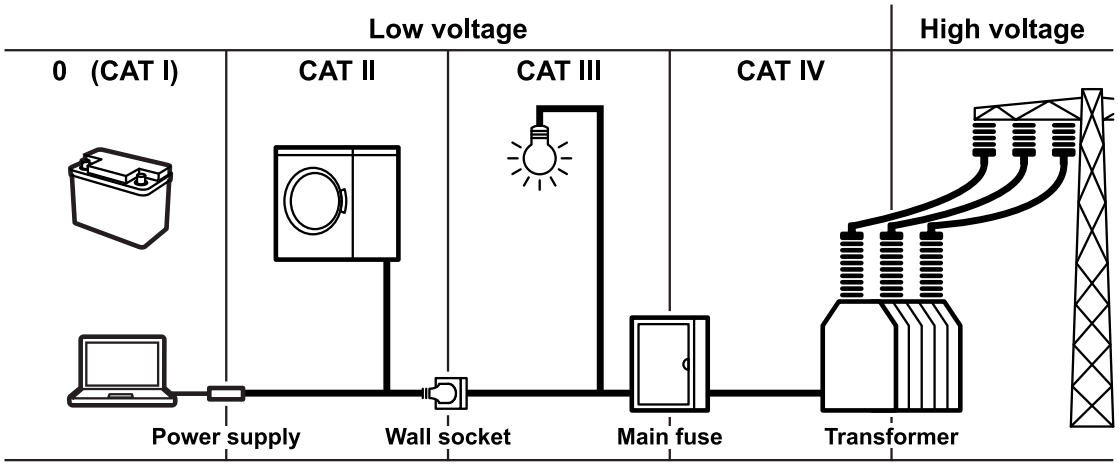
In series or parallel setups, protect yourself against electric shock before connecting access ports such as the Ethernet port or the USB port using one of the following measures:

- 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 10.
- 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 the product user manual, section "Disposal".
	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 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 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.

2.2 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.

2.3 Instrument security procedures

Deals with security issues when working with the R&S NGT3600 in secure areas. It is available for download on the internet.

2.4 Printed safety instructions

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

2.5 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

2.6 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.

2.7 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

2.8 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

2.9 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 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.

4 Preparing for use

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

4.1 Lifting and carrying

See "Lifting and carrying the product" on page 6.

4.2 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.

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

4.3 Choosing the operating site

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

For safety information, see "Choosing the operating site" on page 6.

Electromagnetic compatibility classes

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

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

4.4 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 7
- "Intended use" on page 5

4.4.1 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 7.
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.

4.5 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 9.

General instrument specifications

See Table 4-1 for the general data on the instrument specifications. Refer to the specifications document for details.

Table 4-1: 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 28.
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 touchscreen
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 4-2 for protection limits of the R&S NGT3600.

Table 4-2: 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 40.

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 4-1.

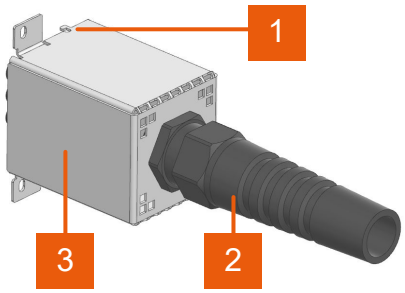


Figure 4-1: Cable cover assembly

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.

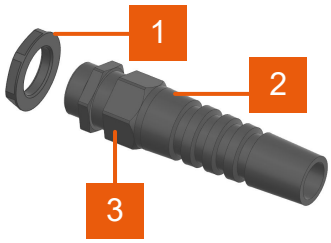


Figure 4-2: Cable gland assembly

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.

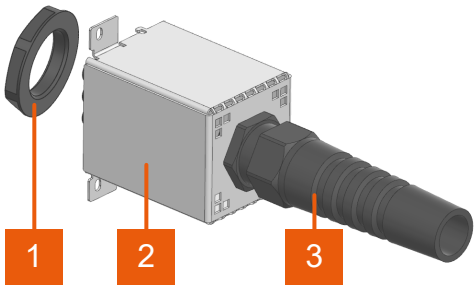


Figure 4-3: Components of cable cover assembly

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 4.6, "Connecting to power", on page 24.
Note: The gland nut provides a clamping range for cable diameters from 9 mm to 17 mm.

4.6 Connecting to power

For safety information, see "Connecting to power" on page 7 and "Working with hazardous voltages" on page 8.

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 4-1 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 28.
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 41 and Figure 4-5.

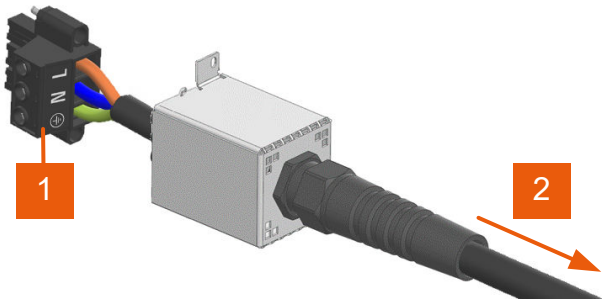


Figure 4-4: Wiring power cable line connection

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.

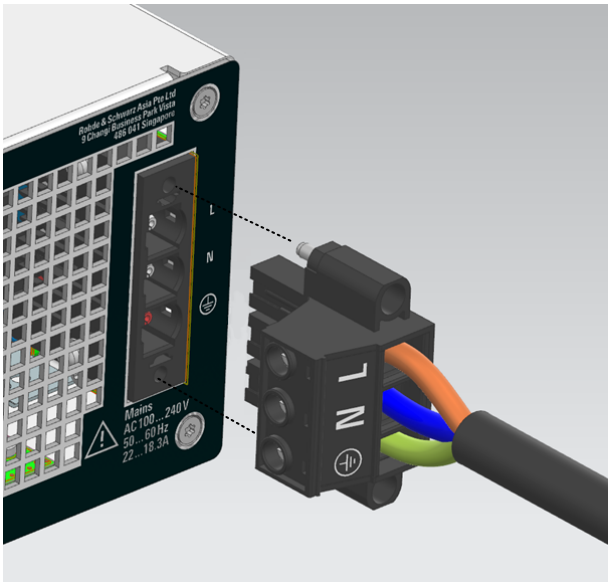


Figure 4-5: Connect AC terminal plug to R&S NGT3600

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 4-5.
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 4-5) and align the cable cover assembly over the screw points. See Figure 4-6.
   Note: The latching point on the cover must engage with the latching hole on the R&S NGT3600. See Figure 4-1.
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 4-2,

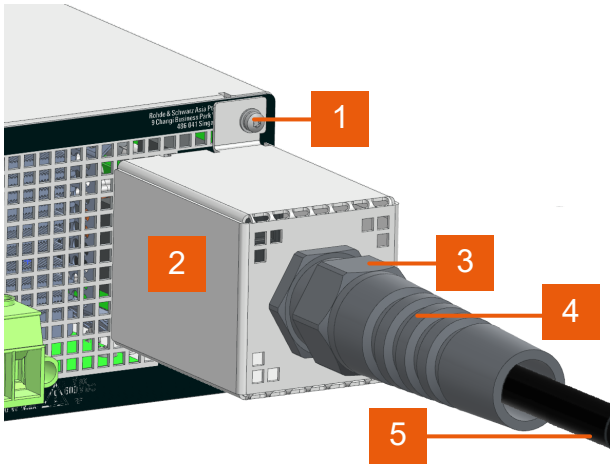


Figure 4-6: Power connection to R&S NGT3600

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.

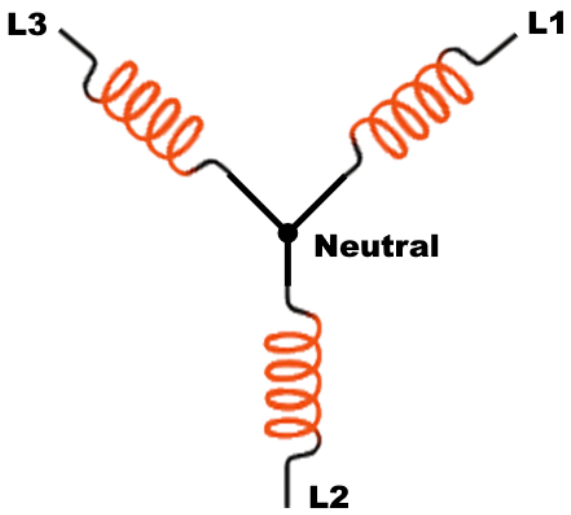
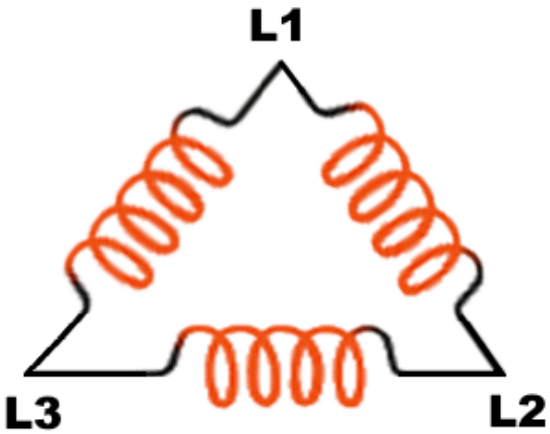
Ground the R&S NGT3600 using the Earth wire of the 3-phase power line system. See "Meaning of safety labels" on page 10.

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 4-4.

Table 4-3: 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 4-4: 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.

4.7 Connecting the load

For safety information, see "Connecting to power" on page 7 and "Working with hazardous voltages" on page 8.

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 4-7.

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 4-7. Ensure that the output terminal block is plugged into the rear panel output connector before powering up the R&S NGT3600.

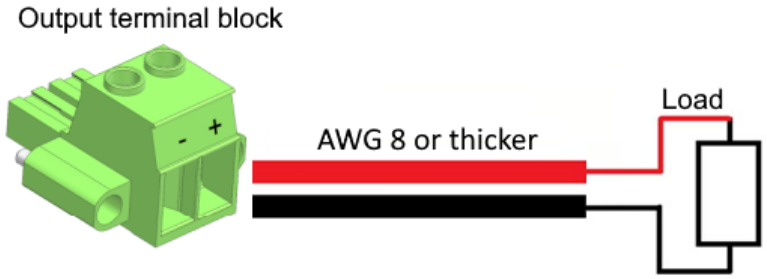


Figure 4-7: Connection to load

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.

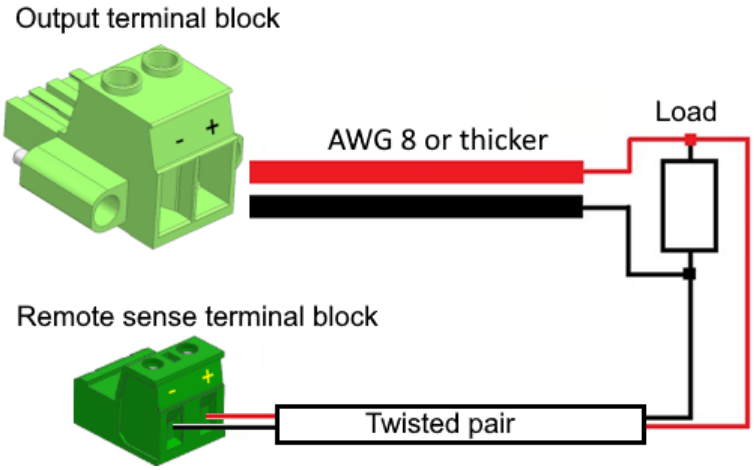


Figure 4-8: Connection to load with remote sense

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 4-9.

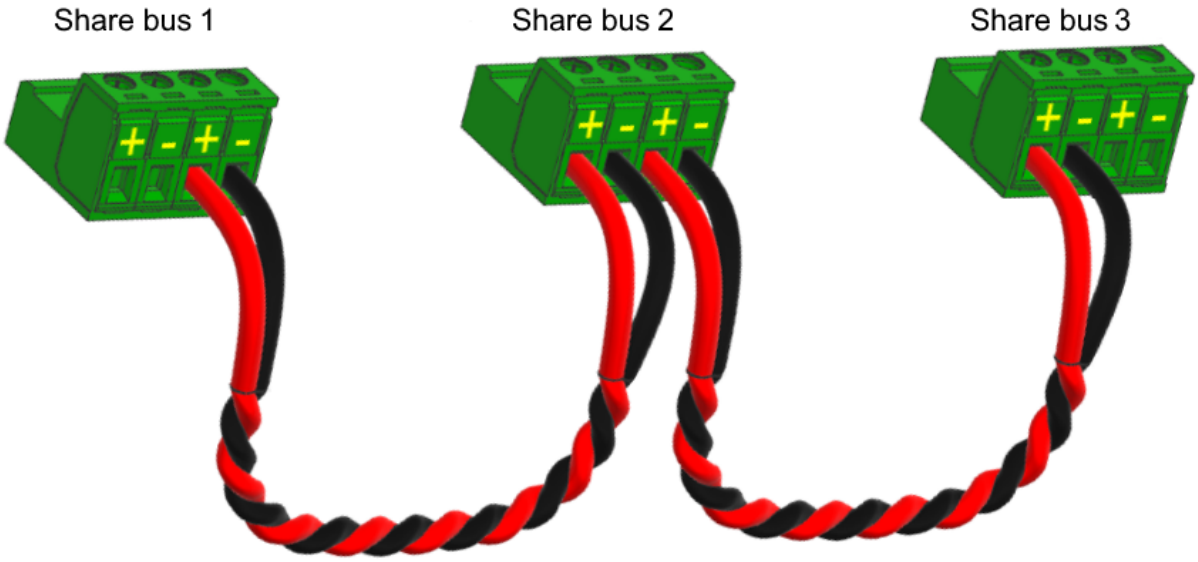


Figure 4-9: Daisy chain connection of share bus port for parallel operation

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 4-10.

Attach two cable ties on both sides of the ferrite core to secure the position on the cable.

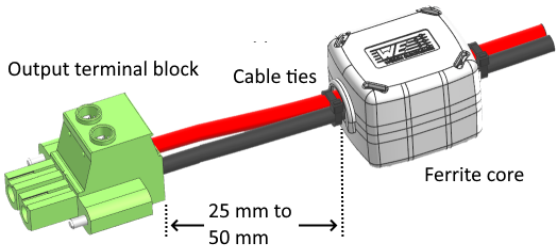


Figure 4-10: Clamp ferrite core on cable

4.8 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 4.6, "Connecting to power", on page 24.

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 5.1, "Front panel", on page 34.

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 "Save and recall" 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.

4.9 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 "LAN interface" in the user manual.

If switched on and connected, the R&S NGT3600 indicates the address information and LAN parameters in the LAN settings dialog. See Figure 4-11.

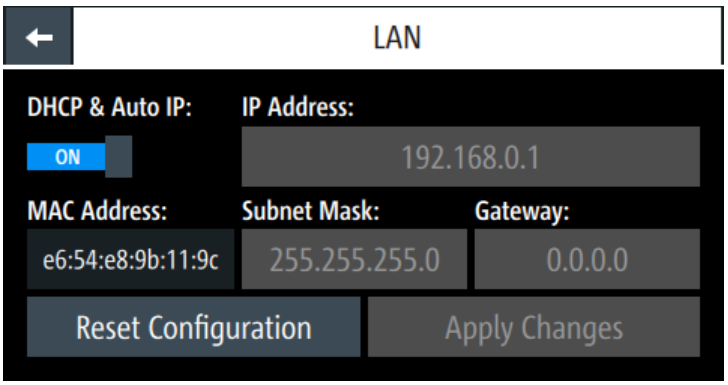


Figure 4-11: LAN settings dialog

4.10 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.

5 Instrument tour

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

- Section 5.1, "Front panel", on page 34
- Section 5.2, "Rear panel", on page 37

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 10.

5.1 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 5-1: 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)

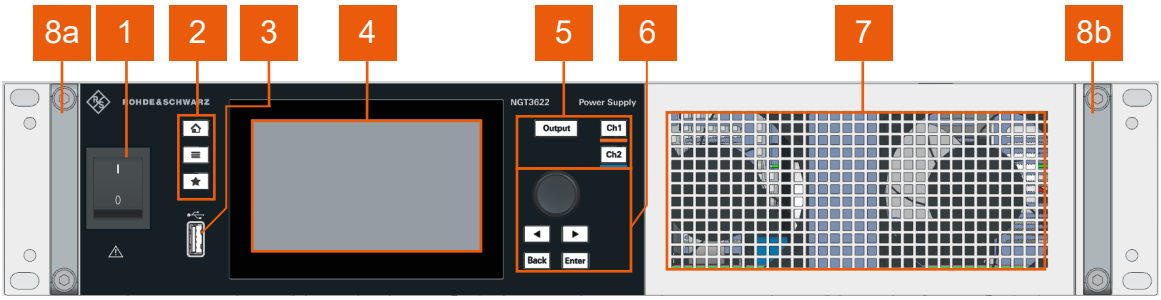


Figure 5-1: R&S NGT3600 front panel for two-channel model

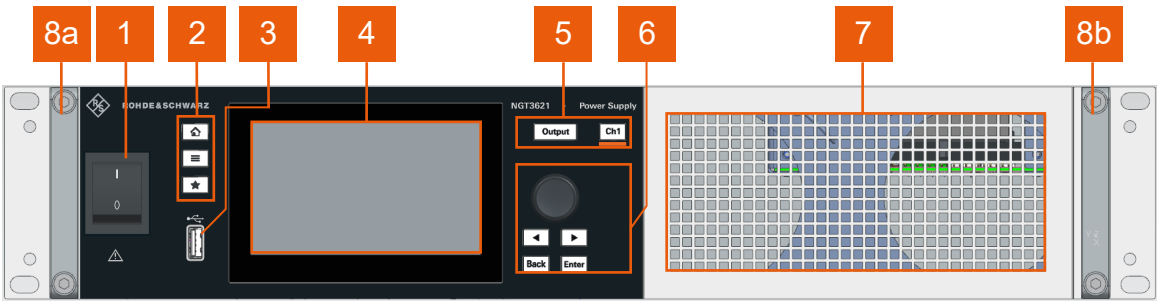


Figure 5-2: R&S NGT3600 front panel for one-channel model

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 4.8, "Switching on or off", on page 31.

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 "Menu controls" in the user manual.

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 4.10, "Connecting USB devices", on page 33.

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 7.2.1, "Understanding the display information", on page 48.

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 7.2, "Means of manual interaction", on page 46.

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 4.4, "Setting up the R&S NGT3600", on page 18.

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 4.4, "Setting up the R&S NGT3600", on page 18.

5.2 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.

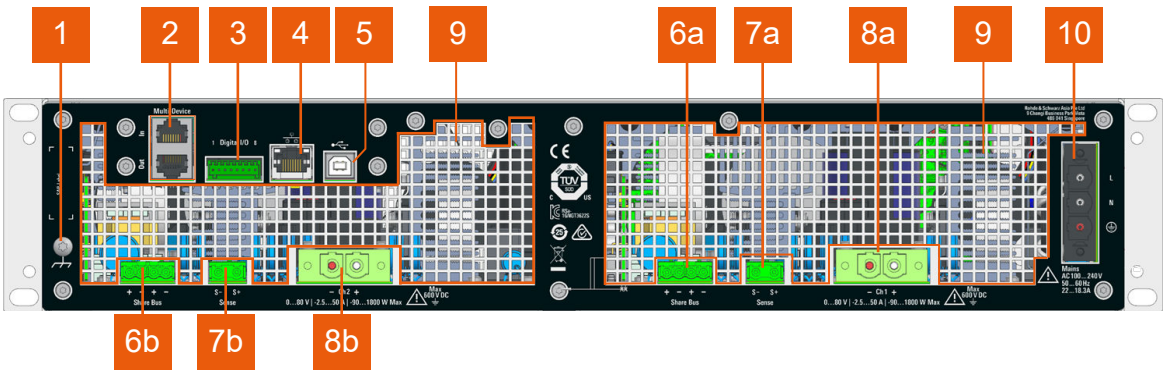


Figure 5-3: R&S NGT3600 rear panel for two-channel model

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 10.

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

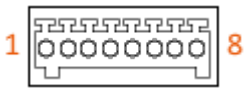
Do not exceed the maximum voltage rating of the digital I/O pins (0 V to 24 V max) when supplying voltages to the pins.

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 5-2.

Table 5-2: 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 connector	Signal name	Value range	Pin number
	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 "LAN interface" in the user manual.

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 "USB interface" in the user manual.

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 4.7, "Connecting the load", on page 28.

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 4.7, "Connecting the load", on page 28.

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 39 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 4.7, "Connecting the load", on page 28.

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 4.4, "Setting up the R&S NGT3600", on page 18.

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.

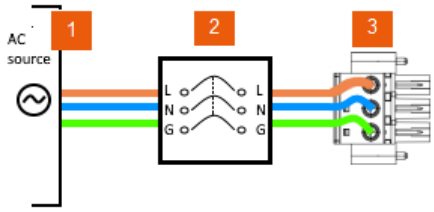


Figure 5-4: Example of a circuit breaker connection block diagram

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 4.6, "Connecting to power", on page 24.

6 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 "Output mode" in the user manual.

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

For more information, see section "Modes of operation" in the user manual.

6.1 Selecting the channels

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

6.2 Setting the output voltage and current limit

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

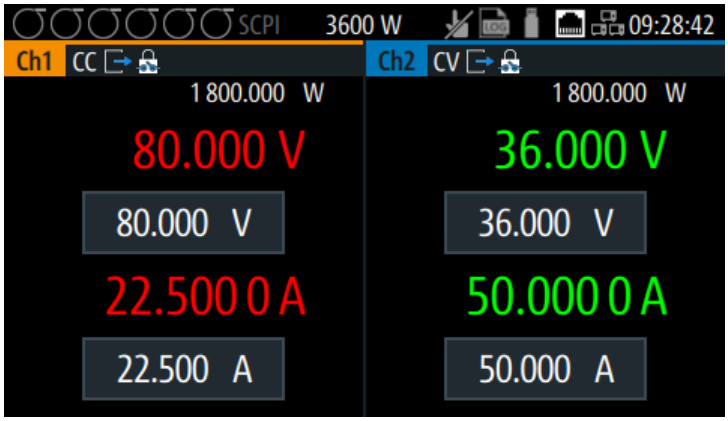


Figure 6-1: Home window of a two-channel model

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

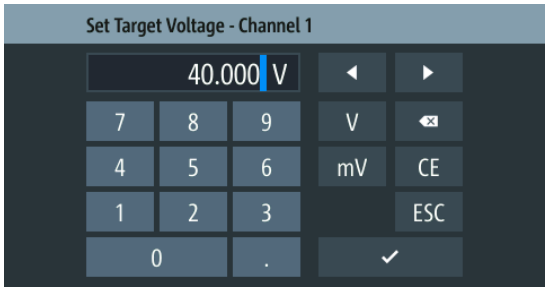


Figure 6-2: On-screen keyboard

3. Enter the required value.
   For more information on the source and sink current, see "Source and sink current" on page 42.

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").

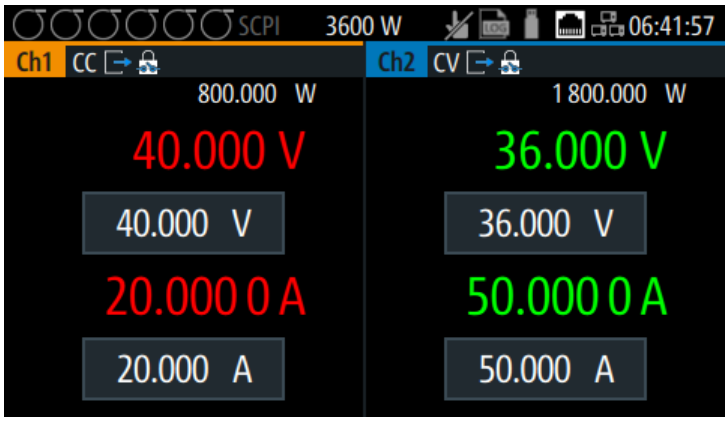


Figure 6-3: Updated voltage and current settings

5. Repeat for another channel, if desired.

6.3 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 6-4.

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

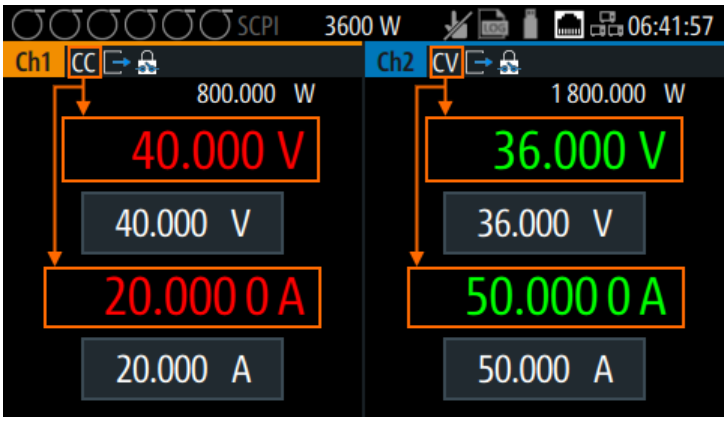


Figure 6-4: Font color in highlighted areas changes to green or red depending on the different operating modes of the instrument

6.4 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 "Save and recall" in the user manual.

See also section "Screenshot" in the user manual.

7 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.

7.1 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 7.2, "Means of manual interaction", on page 46 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 7.3, "Remote control", on page 62 for an overview of the interfaces provided for remote control.

7.2 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 "Using the touchscreen" 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 7.2.1, "Understanding the display information", on page 48.
  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 "Menu Controls" in the user manual.
- 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 7.2.2, "Accessing the functionality", on page 59.

7.2.1 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 7-1.

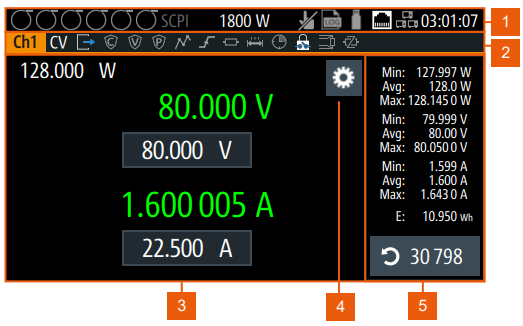
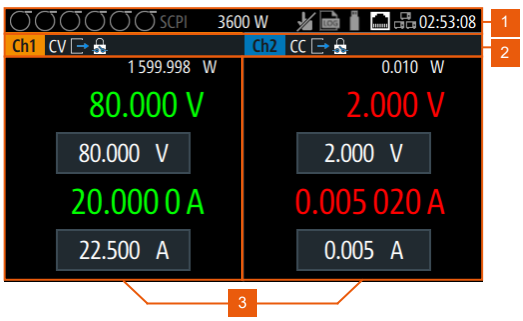
For the one-channel model, the historical channel information is displayed in the home window.

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 Section 7.2.1.4, "Alternate channel view", on page 52.

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 7-1.

For a detailed information on the output operating modes, see Section "Modes of operation" in the user manual.

Table 7-1: 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 7-1.

7.2.1.1 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 7-1: Device status bar

Table 7-2: 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 "Digital trigger I/O" in the user manual.
SCPI command SCPI	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 "Remote control commands" in the user manual.
Total output power 1800 W, 3600 W	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.

Function	Description
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 "User key" in the user manual.
Data logging	If data logging is enabled, the icon is highlighted in white. If an error is present, the icon remains gray. See Section "Data logging" in the user manual.
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 "USB interface" in the user manual.
LAN interface	If connected, the icon is highlighted in white. If not connected, the icon remains gray. See Section "LAN interface" in the user manual.
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 "Multi-device mode" in the user manual.
Time 02:57:32	Time display in "hh:mm:ss" format. See Section "Date and time" in the user manual.

Channel status

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

Figure 7-2: Channel status bar

Table 7-3: 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 "Modes of operation" in the user manual.
Output mode	The R&S NGT3600 has two output modes: • : Sink mode • : Source mode See Section "Output mode" in the user manual.
OCP	If enabled, the icon is highlighted in white. If triggered, the icon blinks. See Section "Overcurrent protection (OCP)" in the user manual.
OVP	If enabled, the icon is highlighted in white. If triggered, the icon blinks. See Section "Overvoltage protection (OVP)" in the user manual.
OPP	If enabled, the icon is highlighted in white. If triggered, the icon blinks. See Section "Overpower protection (OPP)" in the user manual.
Arbitrary mode	If enabled, the icon is highlighted in white. See Section "Arbitrary" in the user manual.
Ramp mode	If enabled, the icon is highlighted in white. See Section "Ramp" in the user manual.
Output impedance	If enabled, the icon is highlighted in white. See Section "Impedance" in the user manual.
Safety Limits	If enabled, the icon is highlighted in white. See Section "Safety limits" in the user manual.
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 "Delay" in the user manual.

Function	Description
Output relay lock	If enabled, the icon is highlighted in white. See Section "Output relay lock" in the user manual.
Sense connection	If sense connection is set to "Ext" mode, the icon is highlighted in white. See Section "Remote sensing" in the user manual.
High impedance	If enabled, the icon is highlighted in white. See Section "High impedance mode" in the user manual.

7.2.1.2 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 "Settings key" 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 "Using the touchscreen" in the user manual.

7.2.1.3 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 7-4.

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

7.2.1.4 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 7-4.

7.2.1.5 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 Section 7.2.1.7, "Operating mode", on page 55 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 7-3. 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.

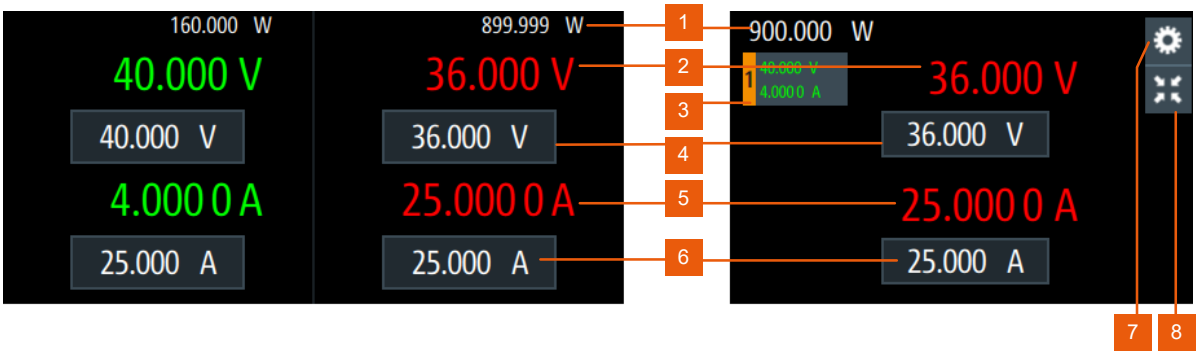


Figure 7-3: Channel display area for two-channel model in home window and detailed channel display window

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)

7.2.1.6 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 "Measurement function > Statistics" in the user manual.

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.

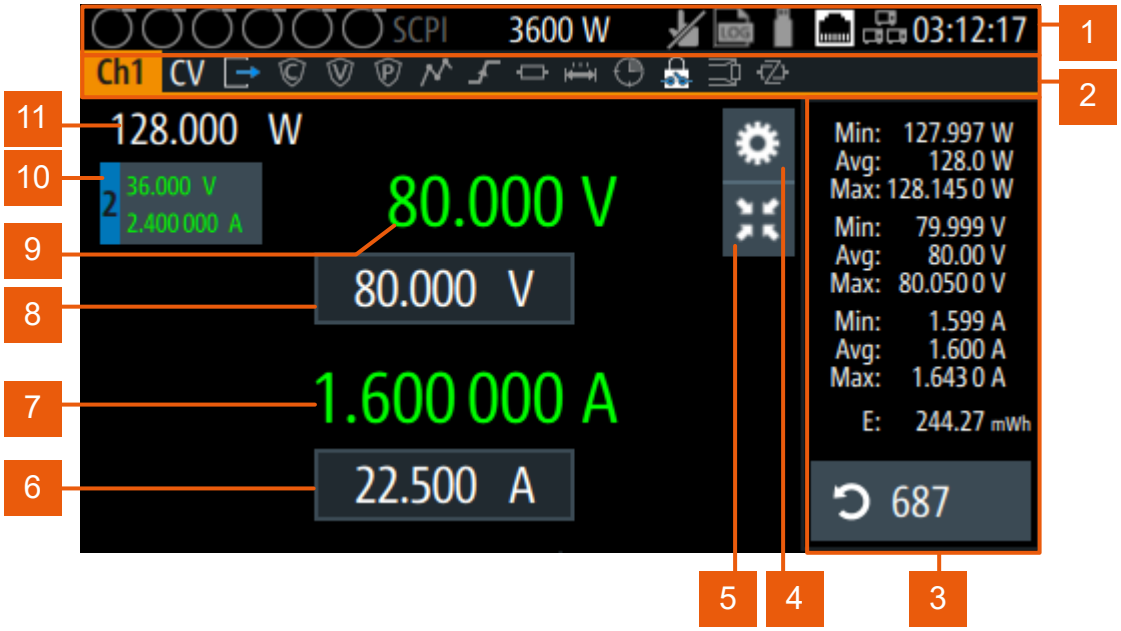


Figure 7-4: Detailed channel display window of a two-channel instrument model

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

7.2.1.7 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.

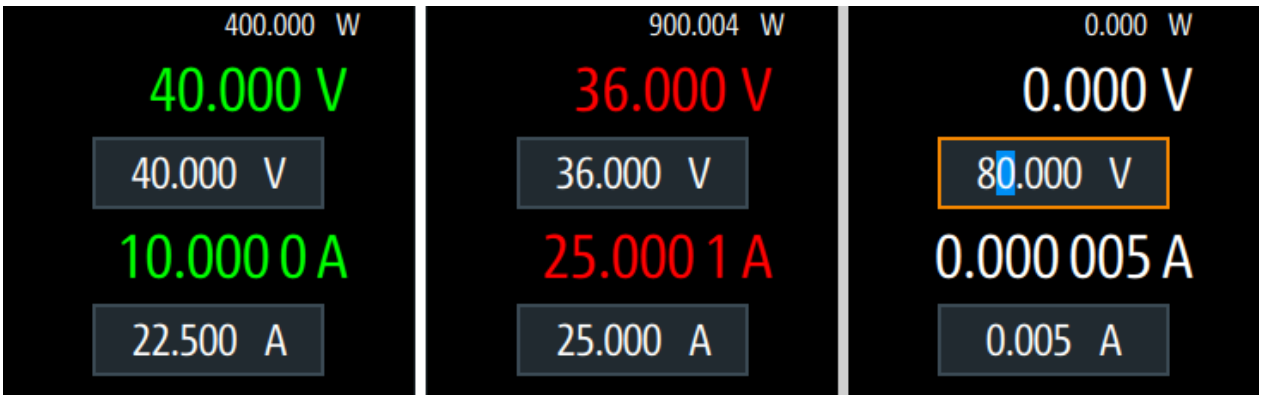


Figure 7-5: Color coding of difference operating conditions

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.

7.2.1.8 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 7-6: 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 7-7: 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.

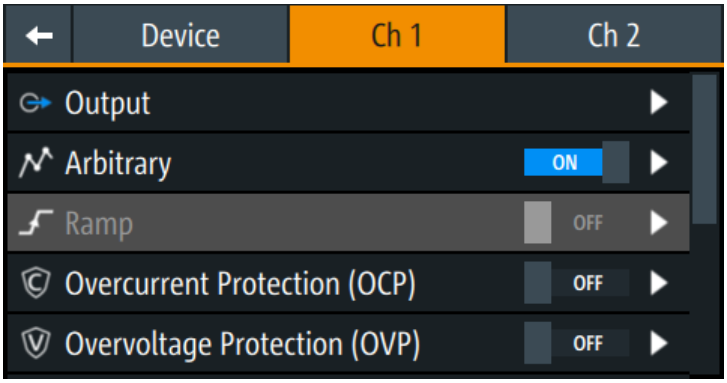


Figure 7-8: Ramp function disabled

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

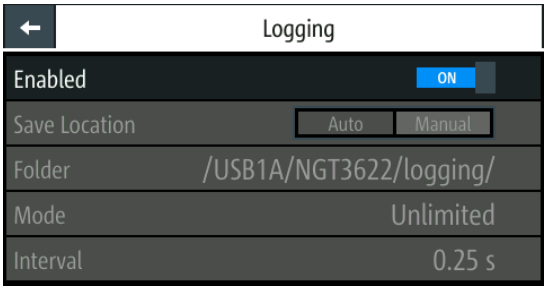


Figure 7-9: Restricting logging parameters

- 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 7-10.

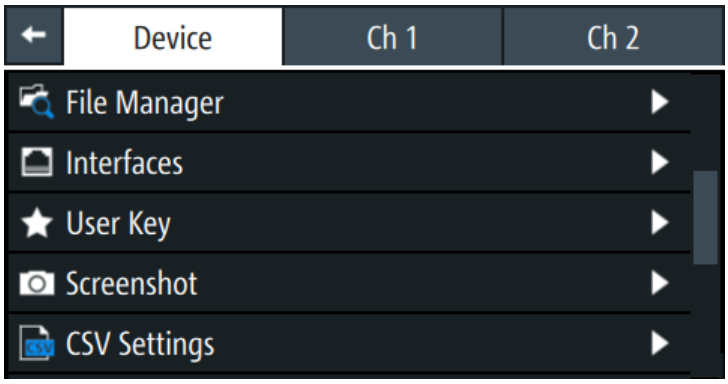


Figure 7-10: Example of a menu

The term dialog refers to the views that cover the parameters of a certain function. See Figure 7-11.

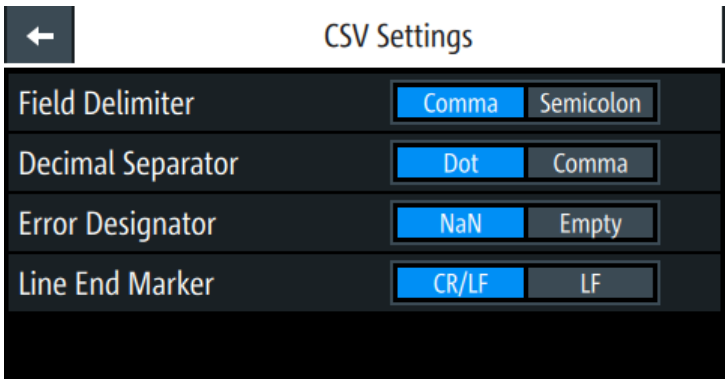


Figure 7-11: Example of a dialog

- 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 7-12.

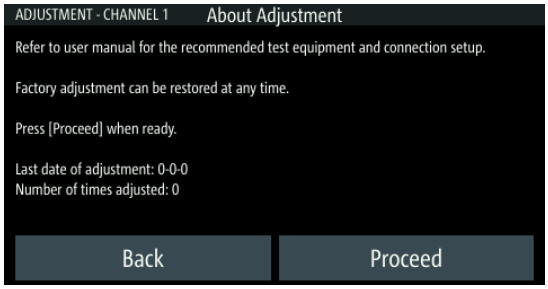


Figure 7-12: Example of an adjustment wizard

- On-screen keyboard
  The on-screen keyboard appears if alphanumeric or numeric entry is required. See Section 7.2.3.1, "Entering numeric parameters", on page 61. For alphanumeric entry, you can select "_&123" or "ABC" on the on-screen keyboard to toggle between the numeric and alphabetical entry.

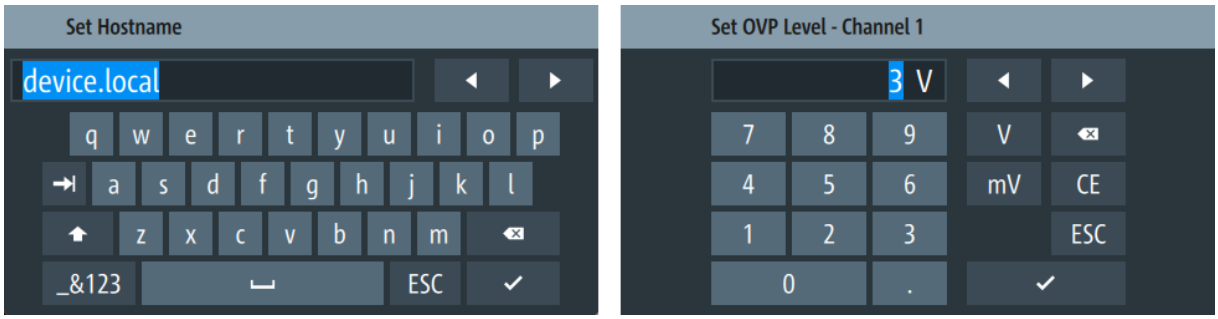


Figure 7-13: On-screen keyboard for alphanumeric and numeric entry field

- 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.

7.2.2 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 7-1 and Figure 7-3.
   - 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.

7.2.3 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 61.

Data can be entered using one of the following methods:

- "To correct an entry" on page 60
- "To confirm an entry" on page 61
- "To abort an entry" on page 61

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.

7.2.3.1 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 61.

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 "User key" 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.

7.2.3.2 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 61.

7.3 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 "Network operation and remote control" in the user manual.

See Section 4.9, "Connecting to LAN", on page 32 for an example of how to set up a LAN connection for remote control.

8 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 8-1: QR code to the Rohde & Schwarz support page

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