

# R&S®NTSxT/TWG

## RF Power Transfer Standard

### Manual



1179706202  
Version 04

**ROHDE & SCHWARZ**  
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This document describes the following R&S®NTSxTWG thermal waveguide transfer standard models:

- R&S®NTS170TWG (1175.1301K02)

This document describes the following R&S®NTSxT thermal transfer standard models:

- R&S®NTS18T (1700.1339K02)
- R&S®NTS33T (1700.1439K02)
- R&S®NTS40T (1700.1539K02)
- R&S®NTS50T 50  $\Omega$ , base model (1700.1639K02)
- R&S®NTS50T open, special model (1700.1639K03)
- R&S®NTS50T short, special model (1700.1639K04)
- R&S®NTS50T mismatch, special model (1700.1639K05)
- R&S®NTS67T (1700.1739K02)

This document describes the following accessories:

- R&S®NTS-ZKL laboratory cable (1175.1618K02/04)

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1179.7062.02 | Version 04 | R&S®NTSxT/TWG

Throughout this document, R&S® is indicated as R&S.

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# 1 Welcome

## 1.1 Intended use

The R&S NTSxT/TWG thermoelectric RF power transfer standards from Rohde & Schwarz are measurement standards for RF power. Typical application is as a primary measurement standard in microcalorimeters at NMIs and as secondary reference standards at NMIs and calibration laboratories for the transfer of RF power calibration. The R&S NTSxT/TWG RF power transfer standards are intended to be operated in a controlled electromagnetic environment.

## 1.2 Target audience

The target audience is developers and technicians working in a national metrology institute (NMI) or calibration laboratories.

## 1.3 Functional principle

The R&S NTSxT/TWG RF power transfer standards convert RF power into DC voltage. The sensitivity is given in the specifications document. The frequency ranges of the RF power transfer standards are also specified in the specifications document.

In principle, an RF power transfer standard consists of a thermoelectrical transducer and a negative temperature coefficient (NTC) resistor for temperature determination. Both heaters of the thermoelectrical transducer are connected to the RF input port and the DC connector.

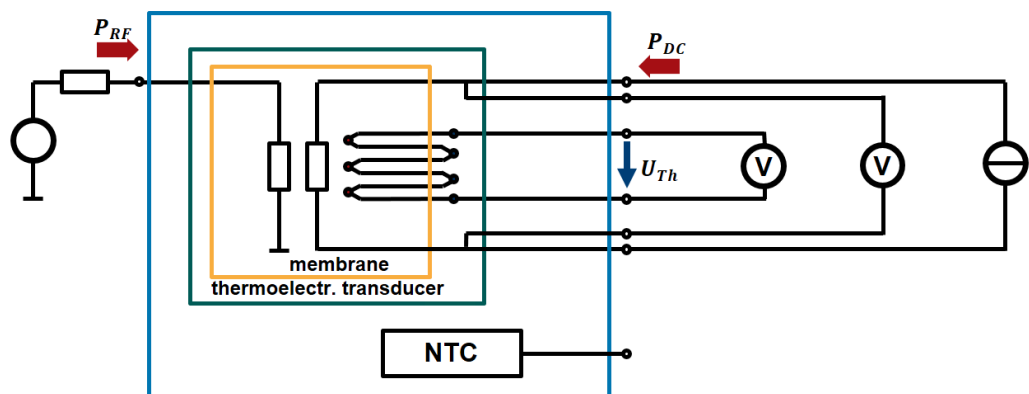


Figure 1-1: Functional diagram of the RF power transfer standard

For a schematic diagram of the inputs and outputs and the assigned pins of the DC connector, refer to [Section 2.4.3, "Connecting to the DC power source and measuring equipment"](#), on page 12.

## 1.4 Documentation overview

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

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

Further documents are available at:

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

### 1.4.1 Manual

Introduces the transfer standard and describes how to set up and work with the product. Describes the measurement equipment, setups and procedures. Gives information on the whole lifecycle of the transfer standard.

The manual is also available for download or for immediate display on the internet.

### 1.4.2 R&S NTS Direct Comparison help

Helps to use the R&S NTS Direct Comparison application, also called R&S NTS in the user documentation. Describes the functionality of the R&S NTS Direct Comparison application and its usage. For details on measurement equipment, setups and background information, refer to the manual of the transfer standard.

The help is integrated into the R&S NTS Direct Comparison application.

### 1.4.3 Release notes and open source acknowledgment (OSA)

The release notes of the R&S NTS Direct Comparison application list new features, improvements and known issues of the current version, and describe the system requirements and 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. The open source acknowledgment document is integrated in the R&S NTS Direct Comparison application.

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

## 2 Getting started

• <a href="#">Unpacking and checking</a> .....	7
• <a href="#">Overview of transfer standards</a> .....	7
• <a href="#">Labels on the product</a> .....	8
• <a href="#">Connecting the transfer standard</a> .....	9

### 2.1 Unpacking and checking

1. Unpack the product carefully.
2. Retain the original packing material. Use it when transporting or shipping the product later.
3. Using the delivery notes, check the equipment for completeness.
4. Check the equipment for damage.

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

### 2.2 Overview of transfer standards



**Figure 2-1: R&S NTS170TWG**

1 = Waveguide flange; see also [Figure 2-3](#)

2 = DC connector; see also [Figure 2-4](#)



**Figure 2-2: R&S NTS18/33/40/50/67T (example)**

1 = Coax connector

2 = DC connector; see also [Figure 2-4](#)

### RF connector

Used to connect the transfer standard to the RF signal source. The connector type and size depends on the transfer standard model.

How to connect to the RF signal source:

- [Section 2.4.2.1, "R&S NTS170TWG models"](#), on page 10
- [Section 2.4.2.2, "R&S NTS18/33/40/50/67T models"](#), on page 11

Further information:

- Specifications document
- [Section 6.3, "Cleaning"](#), on page 26

### DC connector and cable

The DC connector and the R&S NTS-ZKL laboratory cable are custom-made.

Further information:

- [Section 2.4.3, "Connecting to the DC power source and measuring equipment"](#), on page 12
- Specifications document

## 2.3 Labels on the product

Labels on the product inform about:

- Potential product damage  
See [Table 2-1](#).
- Environment safety



See [Table 2-2](#).

- Identification of the product  
A label on the product shows the device ID, a combination of the device name and the serial number of the product. The serial number identifies the product uniquely.
- Sensitive components  
See [Table 2-3](#).

**Table 2-1: Labels regarding potential product damage**

	<p>Potential product damage</p> <p>Read the product documentation to avoid product damage.</p>
--	--

**Table 2-2: Labels regarding environment safety**

	<p>Labeling in line with EN 50419 for disposal of electrical and electronic equipment after the product has come to the end of its life.</p>
	<p>For more information, see "<a href="#">Disposing of electrical and electronic equipment</a>" on page 28.</p>

**Table 2-3: Labels regarding sensitive components**

	<p>Electrostatically sensitive components</p> <p>Indicates sensitivity to touch. Follow the instructions in the product documentation to avoid product damage.</p>
	<p>See "<a href="#">Preventing electrostatic discharge (ESD)</a>" on page 9.</p>

## 2.4 Connecting the transfer standard

Further information:

- [Section 3.1, "Measurement equipment and setup"](#), on page 16
- [Section 2.2, "Overview of transfer standards"](#), on page 7

### 2.4.1 Considerations for measurement setup

#### Input levels

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

#### Preventing electrostatic discharge (ESD)

Electrostatic discharge is most likely to occur when you connect or disconnect a device under test (DUT). It can damage the electronic components of the product and the DUT.

When handling coaxial connectors, do not touch the inner conductor of the RF connector to prevent electrostatic discharge damage.

## 2.4.2 Connecting to the RF signal source

How to connect the transfer standard to the RF signal source depends on the transfer standard model.

### 2.4.2.1 R&S NTS170TWG models

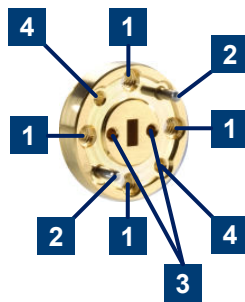
Use the waveguide flange to connect the R&S NTSxTWG to an RF signal source.

#### To connect to the RF signal source

1. Ensure that the waveguide flange of the RF signal source is compatible with the waveguide flange of the R&S NTSxTWG model. See [Table 2-4](#).
2. Remove the protective covers from the waveguide flanges, if mounted.
3. Inspect both waveguide flanges carefully. Look for metal particles, contaminants and defects.  
If either waveguide flange is damaged, do not proceed, because the risk of damaging the mating connector is too high.
4. If you want to use precision alignment dowels, insert them into the holes intended for them.  
See (3) in [Figure 2-3](#).
5. Align the pins, dowels and corresponding receiving holes of R&S NTSxTWG and RF signal source carefully.  
See also [Figure 2-3](#). Avoid scratching the contact surfaces of the waveguide flanges.
6. Insert the pins and dowels straight into the receiving holes. Take care not to tilt the R&S NTSxTWG.



7. Tighten the screws of the waveguide flange manually.
8. Tighten the screws of the waveguide flange using a torque wrench with the nominal torque of 0.58 Nm (5" lbs) to ensure maximum measurement accuracy.  
We recommend the usage of the R&S ZCTW torque wrench, part number 1175.2014.02.



**Figure 2-3: Waveguide flange**

- 1 = four holes for screws
- 2 = two alignment pins
- 3 = two holes for precision alignment dowels
- 4 = two holes for DUT pins

**Table 2-4: RF waveguide flange characteristics**

RF power transfer standard	Waveguide size
R&S NTS170TWG	WR-6.5

#### To disconnect from the RF signal source

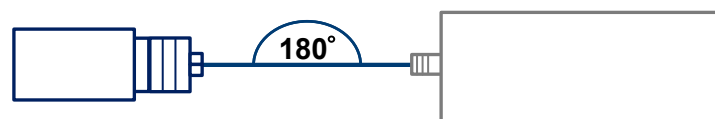
1. Loosen the screws of the waveguide flange.
2. Remove the transfer standard.

#### 2.4.2.2 R&S NTS18/33/40/50/67T models

Use the RF connector to connect the R&S NTSxT to an RF signal source.

#### To connect to the DUT

1. Ensure that the RF connector of your DUT is compatible with the RF connector of the R&S NTSxT model. See [Table 2-5](#).
2. **NOTICE!** Do not touch the inner conductor of the RF connector. See "[Preventing electrostatic discharge \(ESD\)](#)" on page 9.  
Inspect both RF connectors carefully. Look for metal particles, contaminants and defects.  
If either RF connector is damaged, do not proceed, because the risk of damaging the mating connector is too high.  
See also [Section 6.1, "Regular checks"](#), on page 25.
3. Insert the RF connector straight into the RF output of your DUT. Take care not to tilt it.



4. **NOTICE!** Risk of damaging the center pin of the RF connector. Only rotate the union nut of the RF connector. Never rotate the R&S NTSxT itself.  
Tighten the union nut manually.
5. Tighten the union nut using a torque wrench with the nominal torque recommended in [Table 2-5](#) to ensure maximum measurement accuracy.

**Table 2-5: RF connector characteristics**

RF power transfer standard	Male connector	Matching female connector	Tightening torque
R&S NTS18T	N	N	1.36 Nm (12" lbs)
R&S NTS33T	3.50 mm	3.50 mm/2.92 mm/SMA	0.90 Nm (8" lbs)
R&S NTS40T	2.92 mm		
R&S NTS50T	2.4 mm	2.4 mm/1.85 mm	
R&S NTS67T	1.85 mm		

**To disconnect from the DUT**

1. **NOTICE!** Risk of damaging the center pin of the RF connector. Only rotate the union nut of the RF connector. Never rotate the R&S NTSxT itself.  
Carefully loosen the union nut at the front of the RF connector of the RF power transfer standard.
2. Remove the RF power transfer standard.

**2.4.3 Connecting to the DC power source and measuring equipment**

Use a R&S NTS-ZKL laboratory cable to connect the transfer standard to the DC power source and the measuring equipment.

**R&S NTS-ZKL laboratory cable**

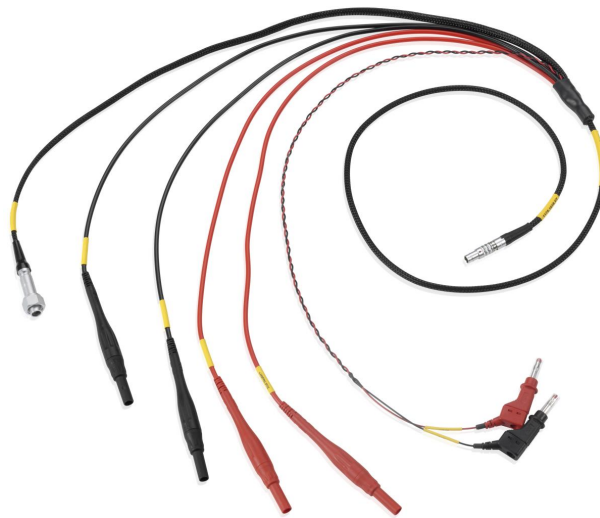
In the manual, the name of the cable is shortened to R&S NTS-ZKL cable.

The R&S NTS-ZKL cable is available in different lengths. All connectors for the DC power source and the measuring equipment are labeled, see [Table 2-6](#).

- LEMO connector for the thermopile.
- Six banana plugs for second heater, second heater sense lines and NTC.  
The minus and plus plugs are twisted in pairs. The red plug is for plus, the black plug is for minus.  
The banana plugs for the second heater and second heater sense lines contain fuses.



Do not exceed the permissible voltage range and the maximum voltage for the DC power feed. The values are given on the cable labels and in the specifications document.

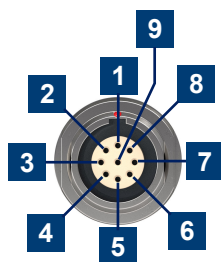


Further information:

- Specifications document
- [Section 6.6, "Changing the fuses"](#), on page 27
- [Section 4.1, "DC power feed does not work"](#), on page 23

#### To connect to the DC power source and measuring equipment

1. Connect the matching DC socket of the R&S NTS-ZKL cable to the DC connector of the transfer standard.
2. Connect the plugs at the other end of the R&S NTS-ZKL cable according to their labels. For the exact names, see [Table 2-6](#).
  - a) Connect the four banana plugs for the second heater to the source measure unit.
  - b) Connect the two NTC banana plugs to the multimeter.
  - c) Connect the LEMO connector to the nanovoltmeter.



**Figure 2-4: DC connector**

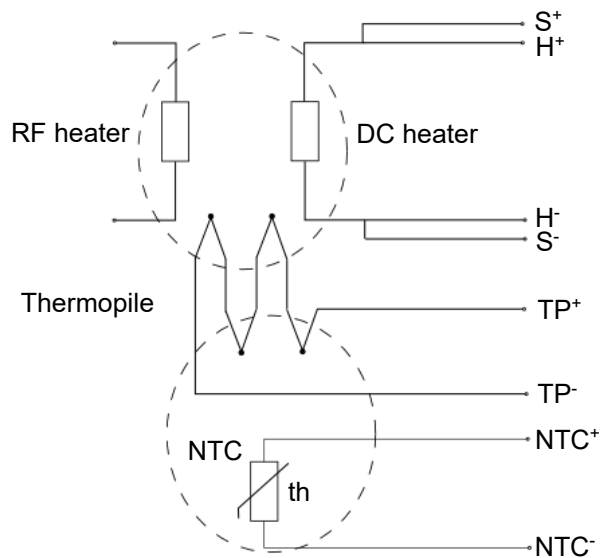
Pin 1 is marked by a red dot.

Table 2-6: Pin allocation

Pin	Signal name	Label at connector	Description	Connect to
1	H+	2nd Heater+	Input of the DC power source for the DC heater	Source measure unit
2	Sense H+	Sense 2nd Heater+	Measured input voltage for the DC heater	Source measure unit
3	NTC+	NTC+	Output of the negative temperature coefficient (NTC) resistor	Multimeter
4	H-	2nd Heater-	Input of the DC power source for the DC heater	Source measure unit
5	TP-	Thermopile	Output voltage of the thermopile, $U_{Th}$ In the R&S NTS-ZKL cable, this pin is connected to the LEMO connector, together with pin 7.	Nanovoltmeter
6	GND/NTC-	NTC-	Grounding and output of the negative temperature coefficient (NTC) resistor	Multimeter
7	TP+	Thermopile	Output voltage of the thermopile, $U_{Th}$ In the R&S NTS-ZKL cable, this pin is connected to the LEMO connector, together with pin 5.	Nanovoltmeter
8	Sense H-	Sense 2nd Heater-	Measured input voltage for the DC heater	Source measure unit
9			Reserved	
Shield	GND/NTC-		Connected to pin 6.	

Table 2-7: Recommended DC measuring equipment

Equipment type	Equipment name	Manufactured by	Restrictions
Source measure unit (SMU)	R&S NGU201	Rohde & Schwarz	
	R&S NGU401	Rohde & Schwarz	Does not support synchronous triggering of measurements.
	R&S NGU411	Rohde & Schwarz	
	2961A	Keysight	
	2961B	Keysight	
	2450	Keithley	
Multimeter	34401A	Keysight	
	34465A	Keysight	
Nanovoltmeter	2182A	Keithley	We recommend using only channel 1, because channel 2 has a lower sensitivity.
	34420A	Keysight	



**Figure 2-5: Inputs and outputs**

A first absorbing resistor absorbs RF power, see RF heater in [Figure 2-5](#). Another resistor absorbs DC power, see DC heater in [Figure 2-5](#). The increase in temperature is measured using a thermopile that generates a thermopile output voltage  $U_{Th}$ .

## 3 Measuring

Rohde & Schwarz provides the R&S NTS Direct Comparison application to conduct direct comparison measurements. The latest version of the R&S NTS application is available at:

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

The R&S NTS application guides you through the necessary measurement steps. For detailed information of the R&S NTS application and its usage, refer to the help of the R&S NTS application.

### 3.1 Measurement equipment and setup

- DC measuring equipment  
See [Table 2-7](#).
- RF measuring equipment  
Depends on the frequency range required by the DUT and therefore is listed with the setup for the different models.

The recommended equipment is supported by the R&S NTS application. If listed equipment is not supported, this fact is mentioned explicitly.



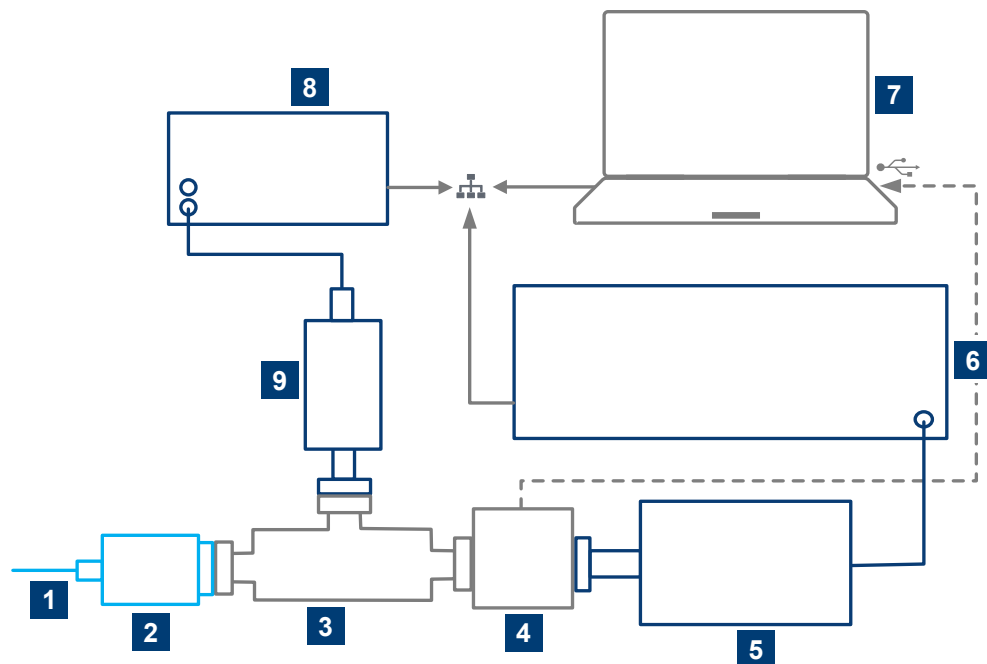
The communication between the controller and the measuring equipment can take place by Ethernet, USB or GPIB interface. In the following setup examples, an icon symbolizes the established connection type.

The communication between the controller, on which the R&S NTS application is installed, and the measuring equipment can take place by Ethernet, USB or GPIB interface. In the following setup examples, an icon symbolizes the established connection type.

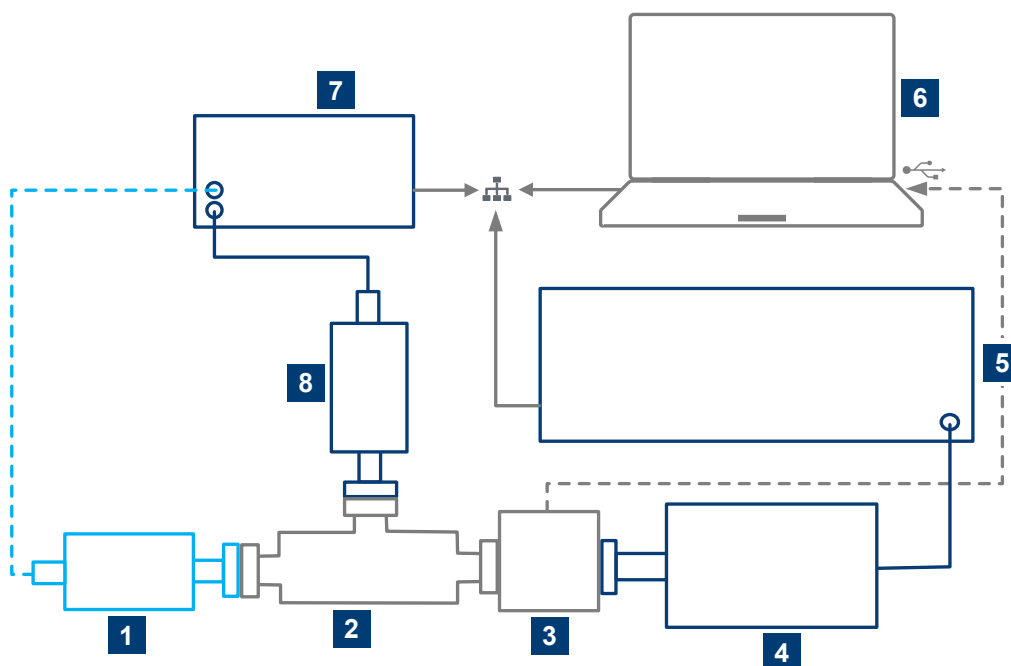
#### 3.1.1 Setup examples for R&S NTS170TWG models

For the direct comparison measurements, two sets of measurement data are required. These two data sets are collected in two separate measurement setups.



**Measurement setup with reference standard (N)****Figure 3-1: Measurement setup with R&S NTS170TWG model**

- 1 = R&S NTS-ZKL cable, see [Section 2.4.3, "Connecting to the DC power source and measuring equipment"](#), on page 12
- 2 = ["Reference standard \(N\)"](#) on page 19
- 3 = ["Directional coupler"](#) on page 19
- 4 = ["Attenuator"](#) on page 19
- 5 = ["Frequency multiplier"](#) on page 19
- 6 = ["R&S SMA100B signal generator"](#) on page 19
- 7 = ["Controller"](#) on page 20
- 8 = ["R&S NRX power meter"](#) on page 20
- 9 = ["Reference sensor"](#) on page 20

**Measurement setup with calibration target (X)****Figure 3-2: Measurement setup with calibration target (X)**

- 1 = "Calibration target (X)" on page 19  
 2 = "Directional coupler" on page 19  
 3 = "Attenuator" on page 19  
 4 = "Frequency multiplier" on page 19  
 5 = "R&S SMA100B signal generator" on page 19  
 6 = "Controller" on page 20  
 7 = "R&S NRX power meter" on page 20  
 8 = "Reference sensor" on page 20

**Table 3-1: Recommended RF measuring equipment for 110 GHz to 170 GHz**

Reference standard (N)	R&S NTS170TWG
Directional coupler	WR-6.5 directional coupler Recommended coupling loss: 3 dB to 6 dB Models from Eravant SWD-0325H-06-SB SWD-0625H-06-SB
Attenuator	WTA 110-170 from Radiometer Physics (RPG)
Frequency multiplier	R&S SZM170 with R&S SZM-B170M
R&S SMA100B signal generator and required options	R&S SMAB-B131
R&S NRX power meter and required options	R&S NRX-K2
Reference sensor	R&S NRP170TWG(N)

**Reference standard (N)**

The required RF measuring equipment is listed in [Table 3-1](#).

► Connect the R&S NTSxTWG to:

- a) Directional coupler  
See also [Section 2.4.2, "Connecting to the RF signal source"](#), on page 10.
- b) DC power source and measuring equipment

When turning on the DC power, take care not to exceed the limit printed on the R&S NTS-ZKL cable or stated in the specifications document.

See also [Section 2.4.3, "Connecting to the DC power source and measuring equipment"](#), on page 12.

**Calibration target (X)**

DUT that you want to calibrate.

► Connect the DUT to:

- a) Directional coupler
- b) If the DUT is a Rohde & Schwarz power sensor, you can connect it to one of the sensor connectors of the R&S NRX.

**Directional coupler**

Connects the reference standard (N) or the calibration target (X) and the reference sensor to the signal source. The waveguide size of the coupler is given in [Table 3-1](#).

**Attenuator**

If the attenuator supports USB, you can connect the attenuator to the USB port of the controller.

Thus, you can control the attenuation by the R&S NTS application.

**Frequency multiplier**

The required R&S SZM models and options are listed in [Table 3-1](#).

► Connect the R&S SZM to:

- a) Directional coupler
- b) R&S SMA100B signal generator. Follow the instructions in the R&S SZM frequency multiplier manual.

**R&S SMA100B signal generator**

The required options are listed in [Table 3-1](#).

- Connect the R&S SMA100B to the LAN. See also the manual of the R&S SMA100B signal generator.

**Controller**

Computer that you use to control the measurement equipment.

- Connect the controller to the LAN.

**R&S NRX power meter**

The required R&S NRX options are listed in [Table 3-1](#).

- Connect the R&S NRX to the LAN. See also the manual of the power meter.

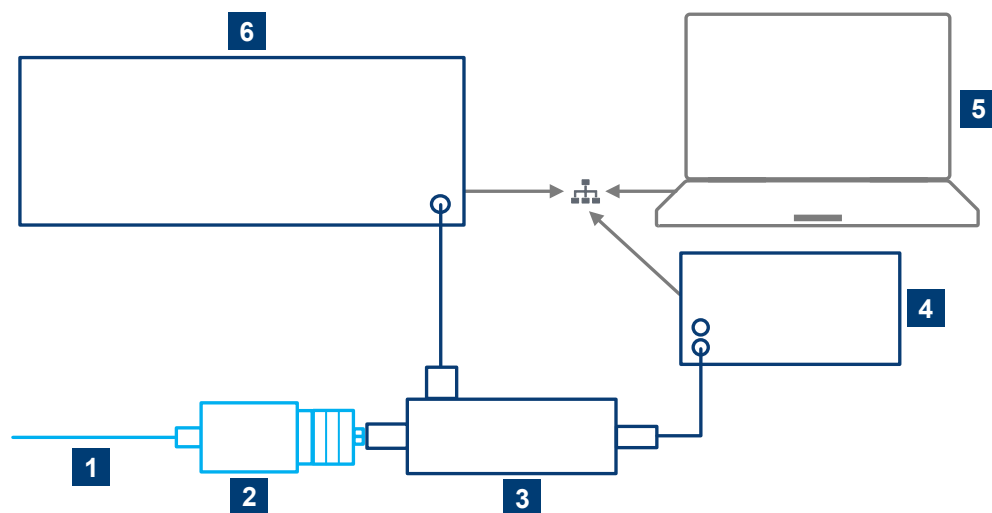
**Reference sensor**

Calibration is not required.

- Connect the reference sensor to:
  - a) Directional coupler
  - b) One of the sensor connectors of the power meter

**3.1.2 Setup examples for R&S NTS18/33/40/50/67T models**

For the direct comparison measurements, two sets of measurement data are required. These two data sets are collected in two separate measurement setups.

**Measurement setup with reference standard (N)**

**Figure 3-3: Measurement setup with R&S NTS18/33/40/50/67T model**

- 1 = R&S NTS-ZKL cable, see [Section 2.4.3, "Connecting to the DC power source and measuring equipment"](#), on page 12
- 2 = ["Reference standard \(N\)"](#) on page 21
- 3 = ["Reference sensor and splitter"](#) on page 22

- 4 = "R&S NRX power meter" on page 22  
 5 = "Controller" on page 22  
 6 = "R&S SMA100B signal generator" on page 22

### Measurement setup with calibration target (X)

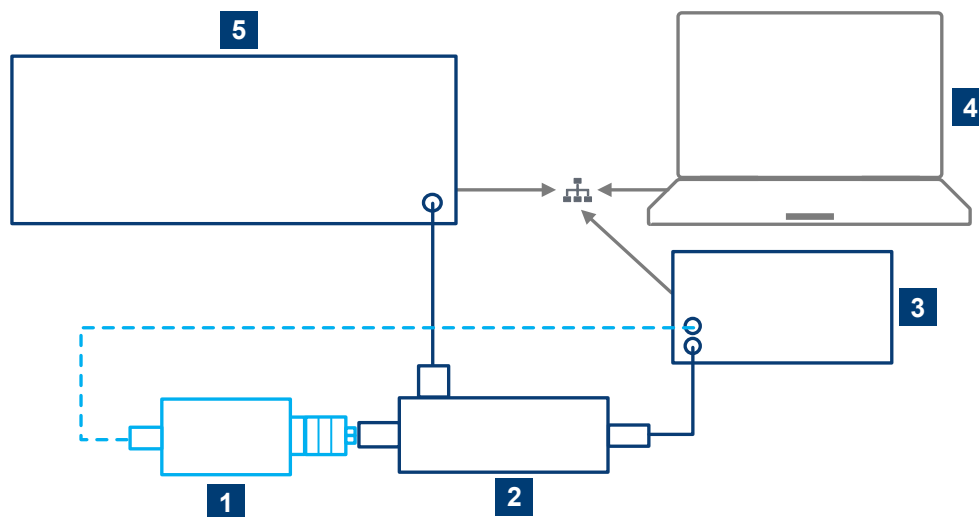


Figure 3-4: Measurement setup with calibration target (X)

- 1 = "Calibration target (X)" on page 22  
 2 = "Reference sensor and splitter" on page 22  
 3 = "R&S NRX power meter" on page 22  
 4 = "Controller" on page 22  
 5 = "R&S SMA100B signal generator" on page 22

Table 3-2: Recommended RF measuring equipment for DC to 67 GHz

Reference standard (N)	R&S NTS18T	R&S NTS33T	R&S NTS40T	R&S NTS50T	R&S NTS67T
Reference sensor and splitter	R&S NRPC18	R&S NRPC33	R&S NRPC40	R&S NRPC50	R&S NRPC67
R&S NRX power meter and required options	R&S NRX-K2				
R&S SMA100B signal generator and required options	R&S SMAB-B120	R&S SMAB-B140(N)	R&S SMAB-B140(N)	R&S SMAB-B150(N)	R&S SMAB-B167(N)

### Reference standard (N)

See the specifications document to find out which R&S NTSxT/TWG fits the frequency range required by the calibration target (X), the DUT.

The required RF measuring equipment is listed in [Table 3-2](#).

- Connect the R&S NTSxT to:

- a) R&S NRPC power standard  
Follow the instructions in the R&S NRPC manual.
- b) DC power source and measuring equipment  
When turning on the DC power, take care not to exceed the limit printed on the R&S NTS-ZKL cable or stated in the specifications document.

See also [Section 2.4.3, "Connecting to the DC power source and measuring equipment"](#), on page 12.

### Calibration target (X)

DUT that you want to calibrate.

- Connect the DUT to:
  - a) R&S NRPC power standard  
Follow the instructions in the R&S NRPC manual.
  - b) If the DUT is a Rohde & Schwarz power sensor, you can connect it to one of the sensor connectors of the R&S NRX.

### Reference sensor and splitter

The R&S NRPC power standard works as a reference sensor and splitter. Follow the instructions in the R&S NRPC manual.

- Connect the R&S NRPC also to:
  - a) One of the sensor connectors of the R&S NRX power meter
  - b) RF 50  $\Omega$  output of the R&S SMA100B signal generator

### R&S NRX power meter

The required options are listed in [Table 3-2](#).

- Connect the R&S NRX to the LAN. See also the manual of the power meter.

### Controller

Computer that you use to control the measurement equipment.

- Connect the controller to the LAN.

### R&S SMA100B signal generator

The required options are listed in [Table 3-2](#).

- Connect the R&S SMA100B to the LAN. See also the manual of the R&S SMA100B signal generator.

## 4 Troubleshooting

### 4.1 DC power feed does not work

1. Check the fuses of the banana plugs for second heater and second heater sense lines. See [Section 6.6, "Changing the fuses"](#), on page 27.
2. If a fuse is blown, replace it. See [Section 6.6, "Changing the fuses"](#), on page 27.
3. If all four fuses are intact, the DC heater of the R&S NTSxT/TWG is defect. Contact the customer support center to clarify how to proceed. See [Section 4.2, "Contacting customer support"](#), on page 23.

If you need to transport or ship the product, see [Section 5, "Transporting"](#), on page 24.

### 4.2 Contacting customer support

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

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

#### Contact information

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



*Figure 4-1: QR code to the Rohde & Schwarz support page*

## 5 Transporting

### **Packing**

Use the original packaging material. It consists of antistatic wrap for electrostatic protection and packing material designed for the product.

If you do not have the original packaging, use similar materials that provide the same level of protection. You can also contact your local Rohde & Schwarz service center for advice.

### **Securing**

When moving the product in a vehicle or using transporting equipment, make sure that the product is properly secured. Only use items intended for securing objects.

### **Transport altitude**

The maximum transport altitude without pressure compensation is specified in the specifications document.



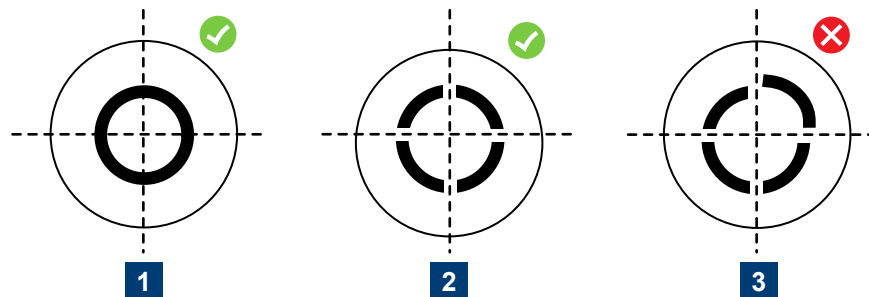
## 6 Maintenance, storage and disposal

Check the nominal data from time to time.

### 6.1 Regular checks

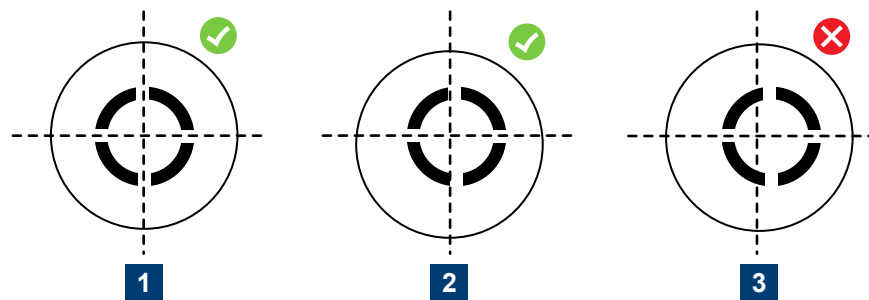
If the product is used frequently, check the RF connectors for visible damage - bent inner conductors, broken contact springs and so on. If the RF connectors are damaged, stop using the product. Contact Rohde & Schwarz customer support, see [Section 4.2, "Contacting customer support"](#), on page 23.

#### Checking the integrity of the RF connector



- 1 = Perfectly formed contacts
- 2 = Normal wear
- 3 = Damaged contacts

#### Checking the concentricity of the RF connector



- 1 = Perfectly concentric
- 2 = Slightly off-center
- 3 = Excessively off-center

## 6.2 Calibration interval

The R&S NTSxT/TWG requires calibration in regular intervals. See the specifications document for details.

## 6.3 Cleaning

1. Disconnect the R&S NTSxT/TWG from all sources and the measuring equipment.
2. Clean the outside of the product using a lint-free cloth. You can dampen the cloth with water but keep in mind that the casing is not waterproof. If you use 70% isopropyl alcohol instead of water, be careful not to damage the labeling. Do not use cleaning agents that can damage the instrument such as acetone, acids or alkalis.
3. Clean the coaxial RF connector as follows:
  - a) Dislodge any particles using solvent-free compressed air.
  - b) Clean the inside and the connector threads using a foam swab or lint-free cloth dampened with isopropyl alcohol or ethanol.
4. Clean the waveguide flanges using a foam swab or lint-free cloth dampened with isopropyl alcohol or ethanol. Avoid scratching the contact surfaces of the waveguide flanges.

Further information:

- ["To disconnect from the RF signal source"](#) on page 11
- Application note [1MA99](#): "Guidance on Selecting and Handling Coaxial RF Connectors used with Rohde & Schwarz Test Equipment"

## 6.4 Checking the DC connector

You can check the DC connector quickly by measuring the resistance.

For the pin allocation, see [Section 2.4.3, "Connecting to the DC power source and measuring equipment"](#), on page 12.

Signal names	Required measurement value	
	R&S NTS170TWG	All other models
H+ to H-	700 $\Omega$ to 800 $\Omega$	500 $\Omega$ to 550 $\Omega$
H+ to Sense H+	smaller than 0.5 $\Omega$	
NTC+ to GND	approximately 30 k $\Omega$	
TP+ to TP-	700 $\Omega$ to 1100 $\Omega$	1700 $\Omega$ to 2700 $\Omega$

TP, heater and NTC are isolated against each other.

## 6.5 Checking the fuses

The banana plugs for the second heater and second heater sense lines contain fuses.

### To check the fuses

1. Connect the R&S NTS-ZKL cable to the DC connector of the R&S NTSxT/TWG.  
See ["To connect to the DC power source and measuring equipment"](#) on page 13.
2. Disconnect the R&S NTS-ZKL cable from the DC power source and the measuring equipment.
3. With a multimeter, measure the resistance between the banana plugs labeled as "2nd Heater+" and "Sense 2nd Heater+".
  - a) If the resistance is small, the fuse of both banana plugs is intact.
  - b) If the resistance is high, at least one of the fuses is blown. Proceed as described in [Section 6.6, "Changing the fuses"](#), on page 27.
4. With a multimeter, measure the resistance between the banana plugs labeled as "2nd Heater-" and "Sense 2nd Heater-".
  - a) If the resistance is small, the fuse of both banana plugs is intact.
  - b) If the resistance is high, at least one of the fuses is blown. Proceed as described in [Section 6.6, "Changing the fuses"](#), on page 27.

## 6.6 Changing the fuses

The cables of R&S NTS-ZKL cable that are leading to the DC heater are fuse-protected. The fuses are located in the banana plugs. In sum, there are four cartridge fuses. The specifications of the fuses are given in [Table 6-1](#).

**Table 6-1: Fuse specifications**

Dimension	6.3 mm x 32 mm
Rated voltage	500 V AC, 500 V DC
Rated current	0.5 A
Breaking capacity	1500 A @500 V DC
Characteristic	Quick-acting F

1. Disconnect the R&S NTS-ZKL cable from the R&S NTSxT/TWG, the DC power source and the measuring equipment.
2. Screw the banana plug open.
3. Pull out the fuse.

4. Check the resistance of the fuse.
5. If the fuse is blown, replace it. Only use a fuse of the specifications given in [Table 6-1](#).
6. Screw the banana plug shut.

## 6.7 Storage

Put plastic end caps on the RF connectors to protect them from damage. 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.

## 6.8 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 6-1: 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.

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