R&S®NTS
RF POWER TRANSFER STANDARDS

Specifications

Specifications
Version 03.00

ROHDE&SCHWARZ

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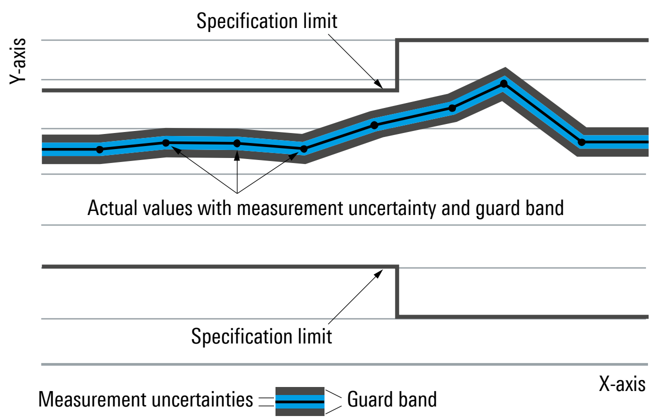
Definitions

Product data applies under the following conditions:

- Three hours of storage at the expected operating temperature followed by 30 minutes of warm-up, unless otherwise stated
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ± or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value, e.g. dimensions or resolution of a setting parameter. Compliance is ensured by design.

Typical values (typ.)
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter, e.g. nominal impedance. In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: “parameter: value”.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bit per second (Gbps), million bit per second (Mbps), thousand bit per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

R&S®NTS RF power transfer standards

R&S®NTS18T/33T/40T/50T/67T RF power transfer standards

Sensor type		thermoelectric power sensor
Frequency range	R&S®NTS18T	DC to 18 GHz
	R&S®NTS33T	DC to 33 GHz
	R&S®NTS40T	DC to 40 GHz
	R&S®NTS50T	DC to 50 GHz
	R&S®NTS67T	DC to 67 GHz
Power measurement range		300 nW to 100 mW (–35 dBm to +20 dBm)
Connector type (compatible with IEEE P287.1)	R&S®NTS18T	N (male)
	R&S®NTS33T	3.50 mm (male)
	R&S®NTS40T	2.92 mm (male)
	R&S®NTS50T	2.40 mm (male)
	R&S®NTS67T	1.85 mm (male)
RF input	max. input power	0.1 W (+20 dBm)
	resistance, at DC	50 Ω (nom.)
	sensitivity, at DC	0.21 V/W (nom.)
Impedance matching SWR (reflection coefficient)	DC to 100 MHz	< 1.03 (< 0.015)
	> 100 MHz to 2.4 GHz	< 1.06 (< 0.029)
	> 2.4 GHz to 12.4 GHz	< 1.13 (< 0.061)
	> 12.4 GHz to 18.0 GHz	< 1.16 (< 0.074)
	> 18.0 GHz to 26.5 GHz	< 1.22 (< 0.099)
	> 26.5 GHz to 40.0 GHz	< 1.28 (< 0.123)
	> 40.0 GHz to 50.0 GHz	< 1.30 (< 0.130)
	> 50.0 GHz to 67.0 GHz	< 1.35 (< 0.149)
DC input	max. input power	0.1 W (+20 dBm)
	sensitivity, at DC	0.21 V/W (nom.)
	resistance	520 Ω (nom.)
Thermopile	resistance	2400 Ω (nom.)
Calibration factor [1]	calibration factor, at DC	1.0 (nom.)
Calibration uncertainty [2]	R&S®NTS18T	
	DC to 100 MHz	*0.80 %*
	> 100 MHz to 2.4 GHz	*0.90 %*
	> 2.4 GHz to 8.0 GHz	*1.00 %*
	> 8.0 GHz to 12.4 GHz	*1.10 %*
	> 12.4 GHz to 18.0 GHz	*1.35 %*
	R&S®NTS33T/40T/50T/67T	
	DC to 100 MHz	*0.92 %*
	> 100 MHz to 2.4 GHz	*1.08 %*
	> 2.4 GHz to 8.0 GHz	*1.24 %*
	> 8.0 GHz to 12.4 GHz	*1.45 %*
	> 12.4 GHz to 18.0 GHz	*1.89 %*
	> 18.0 GHz to 26.5 GHz	*1.96 %*
	> 26.5 GHz to 33.0 GHz	*2.33 %*
	> 33.0 GHz to 40.0 GHz	*2.49 %*
	> 40.0 GHz to 44.0 GHz	*3.18 %*
	> 44.0 GHz to 50.0 GHz	*3.29 %*
	> 50.0 GHz to 59.0 GHz	*4.37 %*
	> 59.0 GHz to 67.0 GHz	*4.44 %*
Dimensions (W × H × L)	R&S®NTS18T	23.3 mm × 23.3 mm × 80.5 mm (0.92 in × 0.92 in × 3.17 in)
	R&S®NTS33T/40T/50T/67T	23.3 mm × 23.3 mm × 69.3 mm (0.92 in × 0.92 in × 2.73 in)
Weight	R&S®NTS18T	< 140 g (0.31 lb)
	R&S®NTS33T/40T/50T/67T	< 110 g (0.24 lb)

R&S®NTS170TWG RF power transfer standard, WR 6.5, 110 GHz to 170 GHz

Sensor type		thermoelectric power sensor
Frequency range		110 GHz to 170 GHz
Power measurement range		300 nW to 100 mW (–35 dBm to +20 dBm)
Waveguide designator		WM-1651 (WR 6.5)
Connector type	anti-cocking flange	Rohde & Schwarz precision waveguide flange, compatible with flange types UG-387/U-M and IEEE 1785.2
RF input	max. input power	0.1 W (+20 dBm)
	sensitivity, at 110 GHz	0.095 V/W (nom.)
Impedance matching SWR (reflection coefficient)		< 1.35 (< 0.149)
DC input	max. input power	0.1 W (+20 dBm)
	sensitivity	0.125 V/W (nom.)
	resistance	740 Ω (nom.)
Thermopile	resistance	840 Ω (nom.)
Calibration factor [1]	calibration factor, at 110 GHz	0.76 (typ.)
Calibration uncertainty [2]	110 GHz to 140 GHz	*5.3 %*
	> 140 GHz to 170 GHz	*5.8 %*
Dimensions (W × H × L)		23.3 mm × 23.3 mm × 55.9 mm (0.92 in × 0.92 in × 2.20 in)
Weight		< 100 g (0.22 lb)

R&S®NTS50T RF power transfer standard, special models

For calibration purposes, Rohde & Schwarz offers transfer standards with open, short and mismatch as RF input. The open, short and mismatch transfer standards have the same design as the impedance-matched transfer standards, with the exception that the absorbing element is replaced with an open, a short or a mismatched absorber.
For special models with another connector type than 2.4 mm, please contact your local Rohde & Schwarz sales representative.

Sensor type		thermoelectric power sensor
Frequency range		DC to 50 GHz
Connector type	compatible with IEEE P287.1	2.40 mm (male)
RF input	R&S®NTS50T-Open	
	resistance, at DC	> 1 MΩ (nom.)
	R&S®NTS50T-Short	
	resistance, at DC	0 Ω (nom.)
	R&S®NTS50T-Mismatch	
	resistance, at DC	100 Ω (nom.)
	sensitivity, at DC	0.21 V/W (nom.)
	max. input power	0.1 W (+20 dBm)
Impedance matching SWR (reflection coefficient)	R&S®NTS50T-Open	
	DC to 100 MHz	> 39.00 (> 0.95)
	> 100 MHz to 2.4 GHz	> 39.00 (> 0.95)
	> 2.4 GHz to 12.4 GHz	> 9.00 (> 0.80)
	> 12.4 GHz to 18.0 GHz	> 7.00 (> 0.75)
	> 18.0 GHz to 26.5 GHz	> 7.00 (> 0.75)
	> 26.5 GHz to 40.0 GHz	> 6.14 (> 0.72)
	> 40.0 GHz to 50.0 GHz	> 5.67 (> 0.70)
	R&S®NTS50T-Short	
	DC to 100 MHz	> 19.00 (> 0.90)
	> 100 MHz to 2.4 GHz	> 14.38 (> 0.87)
	> 2.4 GHz to 12.4 GHz	> 9.00 (> 0.80)
	> 12.4 GHz to 18.0 GHz	> 7.00 (> 0.75)
	> 18.0 GHz to 26.5 GHz	> 7.00 (> 0.75)
	> 26.5 GHz to 40.0 GHz	> 6.14 (> 0.72)
	> 40.0 GHz to 50.0 GHz	> 5.67 (> 0.70)
	R&S®NTS50T-Mismatch	
	DC to 100 MHz	> 1.50, < 2.17 (> 0.20, < 0.37)
	> 100 MHz to 2.4 GHz	> 1.50, < 2.17 (> 0.20, < 0.37)
	> 2.4 GHz to 12.4 GHz	> 1.50, < 2.17 (> 0.20, < 0.37)
	> 12.4 GHz to 18.0 GHz	> 1.50, < 2.17 (> 0.20, < 0.37)
	> 18.0 GHz to 26.5 GHz	> 1.27, < 2.33 (> 0.12, < 0.40)
	> 26.5 GHz to 40.0 GHz	> 1.27, < 2.33 (> 0.12, < 0.40)
	> 40.0 GHz to 50.0 GHz	> 1.30, < 2.77 (> 0.10, < 0.47)
DC input	max. input power	0.1 W (+20 dBm)
	sensitivity, at DC	0.21 V/W (nom.)
	resistance	520 Ω (nom.)
Thermopile	resistance	2400 Ω (nom.)
Dimensions (W × H × L)		23.3 mm × 23.3 mm × 69.3 mm (0.92 in × 0.92 in × 2.73 in)
Weight		< 110 g (0.24 lb)

General data

Temperature	operating temperature range	0 °C to +50 °C
	storage temperature range	–40 °C to +70 °C
Climatic resistance	damp heat	+25 °C/+55 °C cyclic at 95 % relative humidity with restrictions: noncondensing, in line with EN 60068-2-30
Mechanical resistance	vibration	
	sinusoidal	5 Hz to 55 Hz, 0.3 mm (peak-to-peak), 1.8 g at 55 Hz, 55 Hz to 150 Hz, 0.5 g constant, in line with EN 60068-2-6
	random	8 Hz to 650 Hz, 1.9 g (RMS), in line with EN 60068-2-64
	shock	45 Hz to 2 kHz, max. 40 g shock spectrum, in line with MIL-STD-810G, method 516.6, procedure I
Altitude	operating	max. 3000 m (10000 ft)
	transport	max. 15000 m (50000 ft)
Electromagnetic compatibility		applied harmonized standards: • EN 61326-1 • EN 61326-2-1 • EN 61000-4-2 • EN 61000-4-3
RoHS	EU: in line with Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment	applied harmonized standard: EN IEC 63000:2018
Calibration interval	recommended	2 years

Ordering information

Designation	Type	Order No.
RF power transfer standards		
RF power transfer standard, N, DC to 18 GHz	R&S®NTS18T	1700.1339.02
RF power transfer standard, 3.50 mm, DC to 33 GHz	R&S®NTS33T	1700.1439.02
RF power transfer standard, 2.92 mm, DC to 40 GHz	R&S®NTS40T	1700.1539.02
RF power transfer standard, 2.40 mm, DC to 50 GHz	R&S®NTS50T	1700.1639.02
RF power transfer standard, 1.85 mm, DC to 67 GHz	R&S®NTS67T	1700.1739.02
RF power transfer standard, WR 6.5, 110 GHz to 170 GHz	R&S®NTS170TWG	1175.1301.02
RF power transfer standards, special models		
RF power transfer standard, 2.40 mm, DC to 50 GHz, open	R&S®NTS50T-Open	1700.1639.03
RF power transfer standard, 2.40 mm, DC to 50 GHz, short	R&S®NTS50T-Short	1700.1639.04
RF power transfer standard, 2.40 mm, DC to 50 GHz, mismatch	R&S®NTS50T-Mismatch	1700.1639.05
Recommended extras for R&S®NTS		
Laboratory cable, length: 1.5 m	R&S®NTS-ZKL	1175.1618.02
Laboratory cable, length: 2.8 m	R&S®NTS-ZKL	1175.1618.04
Torque wrench for waveguide flanges 0.58 Nm	R&S®ZCTW	1175.2014.02
Torque wrench for waveguide flanges 0.20 Nm	R&S®ZCTW	1175.2014.03

Warranty and service

Warranty		
Base unit		3 years
All other items		1 year
Service options		
	Service plans	**On demand**
Calibration	up to five years [3]	pay per calibration
Warranty and repair	up to five years [3]	standard price repair
Contact your Rohde & Schwarz sales office for further details.		

Endnotes

[1] The calibration factor CF represents the ratio between the direct power at the DC input P_{DC} and the incident power P_{inc} at the calibration port of the R&S®NTS at the same thermal voltage U_{Th}:

$$CF = \left.\frac{P_{DC}}{P_{inc}}\right|_{U_{Th}=const.}$$

[2] Expanded uncertainty (k = 2) for the calibration factor at the calibration level (0 dBm) within a temperature range from +20 °C to +25 °C and at the calibration frequencies. The uncertainty denotes the relative uncertainty of the calibration factor.

[3] For extended periods, contact your Rohde & Schwarz sales office.

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