Frequency range		10 MHz to 18 GHz
Matching (SWR)	10 MHz to 2.4 GHz >2.4 GHz to 8.0 GHz >8.0 GHz to 12.4 GHz >12.4 GHz to 18 GHz	<**1.14** <**1.25** <**1.30** <**1.41**
Power measurement range	Continuous Average Burst Average Timeslot Scope	60 nW to 30 W (-42 dBm to +45 dBm) 60 µW to 30 W (-12 dBm to +45 dBm) 0.2 µW to 30 W (-37 dBm to +45 dBm)[3]) 3 µW to 30 W (-25 dBm to +45 dBm)[4])
Max. power	Average Peak envelope power	36 W (+45.5 dBm) continuous (see diagram) 300 W (+55 dBm) for max. 10 µs
Measurement subranges	Path 1 Path 2 Path 3	-42 dBm to +11 dBm -22 dBm to +31 dBm - 2 dBm to +45 dBm
Transition ranges	With automatic path selection, user def'd crossover[5]) set to 0 dB	(+ 6±2) dBm to (+12±2) dBm (+26±2) dBm to (+32±2) dBm
Display noise[14)]	Path 1 Path 2 Path 3	< 27 nW (13 nW typ.) < 2.6 µW (1.2 µW typ.) < 0.26 mW (0.12 mW typ.)
Display noise, relative [15)]	Measurement window 2 × 100 µs, without averaging Measurement window 2 × 20 ms, averaging factor 32 (measurement time approx. 1 s)	< 0.160 dB (0.1 dB typ.) < 0.002 dB (0.001 dB typ.)
Zero offset[17)]	Path 1 Path 2 Path 3	< 44 nW (20 nW typ.) < 4.2 µW (2 µW typ.) <0.42 mW (0.2 mW typ.)
Zero drift[18)]	Path 1 Path 2 Path 3	< 15 nW < 1.3 µW < 0.13 mW
Triggering	Source Slope (external, internal) Level Internal External Delay Holdoff Hysteresis	Bus, External, Hold, Immediate, Internal pos./neg. -14 dBm to +45 dBm See specs for R&S NRP and USB Adapter R&S NRP-Z3 -5 ms to +100 s 0 s to 10 s 0 dB to 10 dB

Power Sensor R&S NRP-Z24 (continued)

Uncertainty for absolute power measurements[31)] in dB

10 MHz to < 100 MHz

-15 [37)] to +33	+33 to +40	+40 to +43	+43 to +45	
0.199	*0.218*	*0.249*	*0.291*	(0 to 50) °C
0.098	*0.120*	*0.158*	*0.208*	(15 to 35) °C
0.078	*0.091*	*0.128*	*0.178*	(20 to 25) °C

100 MHz to < 4 GHz

-15 [37)] to +33	+33 to +40	+40 to +43	+43 to +45	
0.193	*0.212*	*0.244*	*0.287*	(0 to 50) °C
0.108	*0.128*	*0.164*	*0.213*	(15 to 35) °C
0.088	*0.102*	*0.136*	*0.184*	(20 to 25) °C

dBm

4 GHz to < 12.4 GHz

-15 [37)] to +33	+33 to +40	+40 to +43	+43 to +45	
0.214	*0.231*	*0.260*	*0.301*	(0 to 50) °C
0.135	*0.151*	*0.183*	*0.228*	(15 to 35) °C
0.118	*0.129*	*0.157*	*0.201*	(20 to 25) °C

12.4 GHz to 18 GHz

-15 [37)] to +33	+33 to +40	+40 to +43	+43 to +45	
0.242	*0.258*	*0.284*	*0.322*	(0 to 50) °C
0.167	*0.181*	*0.208*	*0.248*	(15 to 35) °C
0.151	*0.160*	*0.183*	*0.222*	(20 to 25) °C

dBm

Uncertainty for relative power measurements [32), 33), 36)] in dB

10 MHz to < 100 MHz

	-15 [37)] to +5	+5 to +13	+13 to +25	+25 to +33	+33 to +45	
+45				*0.027*	*0.022*	
+33			*0.022*	*0.022*	*0.044*	
+25			*0.022*	*0.080*	*0.229*	
+13		*0.045*	*0.083*	*0.226*		
+5	*0.023*	*0.083*	*0.226*			
-15 [37)]	*0.022*	*0.045*	*0.084*	*0.226*	*0.226*	
	0.022	*0.046*	*0.084*	*0.083*	*0.084*	(0 to 50) °C
	0.046	*0.044*	*0.080*	*0.084*	*0.229*	(15 to 35) °C
	0.084	*0.080*	*0.022*	*0.022*	*0.027*	(20 to 25) °C
	0.226	*0.229*	*0.027*			

dBm -15 [37)] +5 / +13 +25 / +33 +45

100 MHz to 4 GHz

	-15 [37)] to +5	+5 to +13	+13 to +25	+25 to +33	+33 to +45	
+45				*0.038*	*0.031*	
+33			*0.047*	*0.085*	*0.218*	
+25			*0.022*	*0.028*	*0.206*	
+13		*0.048*	*0.083*	*0.209*		
+5	*0.023*	*0.083*	*0.209*			
-15 [37)]	*0.022*	*0.048*	*0.088*	*0.206*	*0.209*	
	0.022	*0.055*	*0.088*	*0.083*	*0.088*	(0 to 50) °C
	0.055	*0.047*	*0.085*	*0.083*	*0.085*	(15 to 35) °C
	0.088	*0.085*	*0.032*	*0.022*	*0.032*	(20 to 25) °C
	0.209	*0.218*	*0.038*			

dBm -15 [37)] +5 / +13 +25 / +33 +45

> 4 GHz to 12.4 GHz

	-15 [37)] to +5	+5 to +13	+13 to +25	+25 to +33	+33 to +45	
+45				*0.064*	*0.060*	
+33			*0.060*	*0.061*	*0.077*	
+25			*0.025*	*0.034*	*0.216*	
+13		*0.063*	*0.096*	*0.224*		
+5	*0.024*	*0.096*	*0.224*			
-15 [37)]	*0.022*	*0.063*	*0.084*	*0.216*	*0.224*	
	0.022	*0.077*	*0.106*	*0.096*	*0.106*	(0 to 50) °C
	0.084	*0.106*	*0.061*	*0.027*	*0.034*	(15 to 35) °C
	0.224	*0.231*	*0.064*			(20 to 25) °C

dBm -15 [37)] +5 / +13 +25 / +33 +45

>12.4 GHz to 18 GHz

	-15 [37)] to +5	+5 to +13	+13 to +25	+25 to +33	+33 to +45	
+45				*0.086*	*0.083*	
+33			*0.102*	*0.084*	*0.128*	
+25			*0.033*	*0.040*	*0.230*	
+13		*0.079*	*0.034*	*0.245*		
+5	*0.024*	*0.112*	*0.244*			
-15 [37)]	*0.022*	*0.079*	*0.135*	*0.230*	*0.244*	
	0.022	*0.110*	*0.112*	*0.112*	*0.135*	(0 to 50) °C
	0.110	*0.102*	*0.084*	*0.034*	*0.128*	(15 to 35) °C
	0.244	*0.245*	*0.086*	*0.040*	*0.245*	(20 to 25) °C

dBm -15 [37)] +5 / +13 +25 / +33 +45

Additional characteristics of the R&S NRP-Z22/-Z23/-Z24

Sensor type		3-path diode sensor with preceding power attenuator		
Measurand		average power of incident wave average power of source into 50 Ω[1])		
RF connector		N (male)		
Power attenuator	R&S NRP-Z22 R&S NRP-Z23 R&S NRP-Z24	10 dB 20 dB 25 dB		
Calibration uncertainty[30)] in dB (20 to 25) °C		Path 1	Path 2	Path 3
	0.01 GHz to < 0.1 GHz	*0.078*	*0.072*	*0.073*
	0.1 GHz to 4.0 GHz	*0.084*	*0.077*	*0.077*
	> 4 GHz to 12.4 GHz	*0.110*	*0.095*	*0.095*
	> 12.4 GHz to 18.0 GHz	*0.139*	*0.118*	*0.18*
Measurement functions	Stationary and periodically modulated signals	Continuous Average Burst Average Timeslot Scope		
	Non-recurring waveforms	Scope		
Continuous Average function Continuous measurement of average power	Measurement window[7)]	2 × (10 µs to 300 ms)		
	Duty cycle correction[8)] Smoothing	0.001% to 100.00% See under Measurement window		
	Capacity of measurement buffer[9)]	1 to 1024 results		
Burst Average function Measurement of average burst power with automatic detection of burst (trigger settings required)	Detectable burst width	20 µs to 100 ms		
	Minimum gap between bursts	10 µs		
	Dropout tolerance[10)]	0 ms to 3 ms		
	Exclusion periods[11)] Exclude from Start Exclude from End	 0 ms to 100 ms 0 ms to 3 ms		
	Measurement window[7)]	2 × (burst width - Excl. from Start - Excl. from End)		
Timeslot function Measurement of average power in one or more equidistant, successive timeslots	Duration (nominal width)	10 µs to 100 ms		
	Number of timeslots	1 to 128 (26 in case of operation from R&S NRP basic unit)		
	Exclusion periods [11)] Excluded from Start Excluded from End	 0 ms to 100 ms 0 ms to 3 ms		
	Measurement window (per timeslot)[7)]	2 × (nom. width - Excl. from Start - Excl. from End)		
Scope function Measurement of power versus time	Modes	For recurring and non-recurring waveforms (single)		
	Measurement window Δ[12)] Recurring Non-recurring	 2 × (100 µs to 300 ms) 100 µs to 300 ms		
	Number of measurement points M Resolution Δ / M	1 to 1024 ≥10 µs		
	Beginning of time window (referenced to trigger)	-5 ms to 100 s		

Dynamic behaviour of video path	Bandwidth Rise time 10% / 90%	> 50 kHz (100 kHz) Values in ( ) for temp. < 8 µs (4 µs) range 15 °C to 35 °C
Sampling frequencies	Frequency 1 (default) Frequency 2[13)]	133.358 kHz 119.467 kHz
Zeroing (duration)	Depends on setting of averaging filter AUTO ON AUTO OFF Integration time[16)] < 4 s 4 s to 16 s >16 s	 4 s 4 s Integration time[16)] 16 s
Measurement error due to harmonics $n \times f_0$ of carrier frequency[19)] values in [ ]: typ. standard uncertainty	N = 3, 5, 7, ... [20)] -30 dBc -20 dBc -10 dBc N = 2, 4, 6, ... [20)] -30 dBc -20 dBc -10 dBc	<0.003 dB [0.0015 dB] <0.010 dB [0.005 dB] <0.040 dB [0.015 dB] <0.001 dB [0.0003 dB] <0.002 dB [0.001 dB] <0.010 dB [0.003 dB]
Modulation influence[21)] values in [ ]: User def'd crossover <-6 dB	General WCDMA (3-GPP Test Model 1-64) Worst case Typical	measurement errors in subranges are proportional to power and depend on CCDF and modulation bandwidth of test signal -0.02 dB to +0.07 dB [-0.02 dB to +0.02 dB] -0.01 dB to +0.03 dB [-0.01 dB to +0.01 dB]
Averaging filter	Modes AUTO mode Reference power Continuous Average Burst Average Timeslot Scope[22)] Normal operating mode[23)] Resolution Fixed Noise operating mode Noise content Max. measurement time[24)] Averaging factor N Result output Moving Average Repeat	AUTO OFF (fixed averaging factor) AUTO ON (continuously auto-adapted) AUTO ONCE (automatically fixed once) non-averaged result in measurement window non-averaged result in measurement window non-averaged result in reference timeslot[25)] non-averaged result at reference point[25)] setting of filter depends on power to be measured and resolution 1 (1 dB), 2 (0.1 dB), 3 (0.01 dB), 4 (0.001 dB) filter set to specified noise content 0.0001 dB to 1 dB 0.01 s to 999 s 1 to 2^{16} (number of averaged measurement windows) continuous with every newly evaluated measurement window (e.g. in case of manual operation via R&S NRP) only final result (e.g. in case of remote control of R&S NRP)
Measurement window	Duration Shape	as specified for the individual measurement functions rectangular (integrating behaviour; available for all measurement functions) Von Hann (smoothing filter, for efficient suppression of result variations due to modulation[26)]; only for Continuous Average function)

Measurement times[27)]	Continuous Average	N × (duration of measurement window[7)]+0.2ms) + t_z
	Buffered, without averaging	buffer size × (duration of measurement window[7)] + 0.5 ms) + t_z
	Burst Average	(2 to 4) × N × burst period + t_z
	Timeslot, Scope	(2 to 4) × N × trigger period + t_z[28)] t_z : <1.6 ms (0.9 ms on average)
Attenuation correction	Function	correcting the measurement result by means of a fixed factor (dB offset)
	Range	-100.000 dB to +100.000 dB
S-parameter correction **Note**: S-parameter correction is automatically switched on upon power-up of the sensor, taking into account the data of the supplied attenuator.	Function	Taking into account a component connected to the sensor input by loading its s-parameter data set into the sensor
	Number of frequencies	1 to 1000
	Parameters	s_{11}, s_{21}, s_{12} and s_{22} (in s2p format)
	Download	With R&S NRP tool kit (supplied with sensor) via USB Adapter R&S NRP-Z3 or R&S NRP-Z4
Γ correction	Function	Reducing the influence of mismatched sources[29)]
	Parameters	Magnitude and phase of reflection coefficient of source
	Download	see under S-parameter correction
Frequency response correction	Function	taking into account the calibration factors relevant for the test frequency
	Parameter	carrier frequency (center frequency)
	Permissible deviation from actual value	50 MHz (0.05 × f below 1 GHz) for specified measurement uncertainty
Interface to host	Power supply	+5 V / 200 mA typ. (USB high-power device)
	Remote control	As a USB device (function) in full-speed mode, compatible with USB 1.0/1.1/2.0 specifications
	Trigger input	differential (0 / +3.3 V)
Dimensions	W x H x L	R&S NRP-Z22: 48 mm × 31 mm × 214 mm R&S NRP-Z23: 60 mm × 54 mm × 285 mm R&S NRP-Z24: 60 mm × 54 mm × 344 mm Length incl. connecting cable: approx. 1.6 m
Weight		R&S NRP-Z22: < 0.37 kg R&S NRP-Z23: < 0.48 kg R&S NRP-Z24: < 0.63 kg