R&S®RT-Zxx
Oscilloscope Probes
Specifications

ROHDE&SCHWARZ

Test & Measurement

Data Sheet | 05.01

CONTENTS

Definitions

General
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to

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 data (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.

Typical data is not warranted by Rohde & Schwarz.

Probe/oscilloscope chart

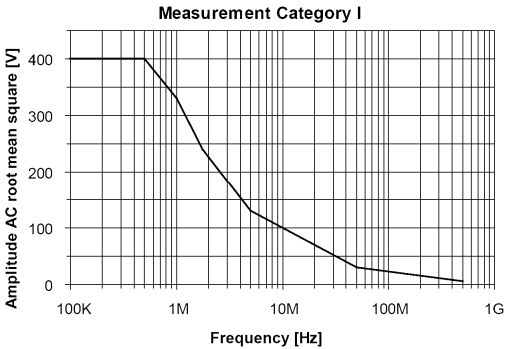
Probe R&S®	Base unit R&S® RTM1052/54	RTO1002/04	RTO1012/14	RTO1022/24	RT-ZA9	Page
Passive probes						
RT-ZP10		●	●	●		5
RTM-ZP10	●					
High-voltage probes						
RT-ZH10	●	●	●	●		8
RT-ZH11	●	●	●	●		
Active probes						
RT-ZS10E	●	●	○	○	●	11
RT-ZS10	●	●	○	○	●	
RT-ZS20	○	○	●	○	●	
RT-ZS30	○	○	○	●	●	
Differential probes						
RT-ZD20	●	●	●	○	●	16
RT-ZD30	○	○	○	●	●	
Current probes						
RT-ZC10	●	●	●	●		19
RT-ZC20	●	●	●	●		

● recommended extra
○ possible accessory, with limited functionality of probe or base unit

R&S®RT-ZP10, R&S®RTM-ZP10 passive probes

All parameters are valid when the probe is connected to an appropriate Rohde & Schwarz oscilloscope with an input impedance of 1 MΩ. See table on page 4 and Rohde & Schwarz oscilloscope operating manual for more details.

		R&S®RT-ZP10	R&S®RTM-ZP10
Step response			
Rise time	system, 10 % to 90 %	typ. 700 ps	
Frequency response			
Bandwidth	system, –3 dB, starting at DC	> 500 MHz	
Input impedance			
DC input resistance	system	10 MΩ ± 1 %	
Input capacitance	system	typ. 9.5 pF	
DC characteristics			
Attenuation	system, automatically corrected on base unit display	10:1	
Attenuation error	probe only, with ideal 1 MΩ load impedance	±2 %	
Attenuation voltage coefficient		typ. ±0.0025 %/V	
Maximum rated input voltage			
Measurement category I	root mean square (derated, see figure)	400 V	
	transient overvoltage	1250 V	
Measurement category II	root mean square	300 V	
Base unit			
Use with		R&S®RTO	R&S®RTM
Input capacitance	must be compensated by probe's LF compensation	5 pF to 20 pF	
Input coupling		1 MΩ AC/DC	



R&S®RT-ZP10, R&S®RTM-ZP10 non-destructive sine-wave root mean square voltage versus frequency.

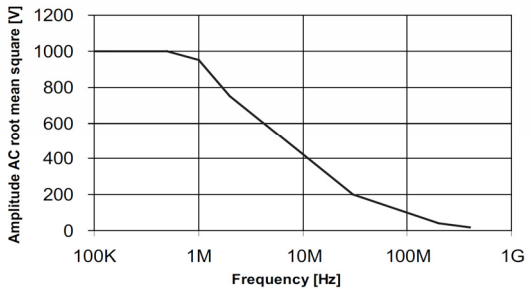
General data

Temperature		
Temperature loading	operating temperature range	0 °C to +50 °C
	storage temperature range	−40 °C to +70 °C
Climatic loading		80 % relative humidity for temperatures up to +31 °C, decreasing linearly to 40 % at +50 °C
Altitude	operation	up to 2000 m
	transport	up to 15000 m
Safety		in line with Low Voltage Directive IEC/EN 61010-31:2008 pollution degree 2
Mechanical data		
Dimensions	diameter of probe tip	2.5 mm (0.1 in)
	cable length	approx. 1.3 m (51 in)
Weight	probe only	approx. 48 g (0.1 lb)

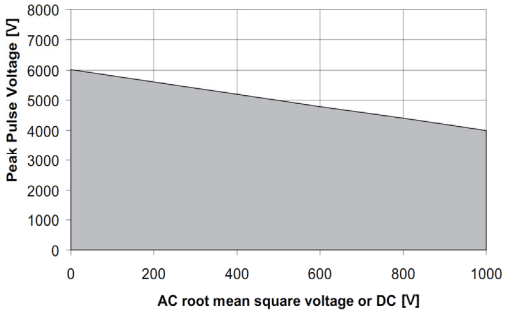
R&S®RT-ZH10/-ZH11 high-voltage probes

All parameters are valid when the probe is connected to an appropriate Rohde & Schwarz oscilloscope with an input impedance of 1 MΩ. See table on page 4 and Rohde & Schwarz oscilloscope operating manual for more details.

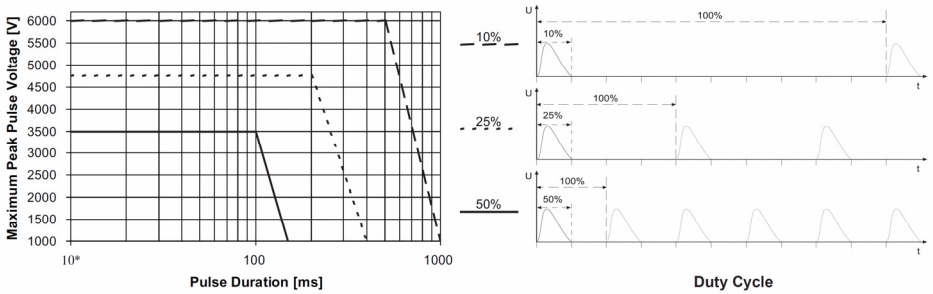
		R&S®RT-ZH10	R&S®RT-ZH11
Step response			
Rise time	system, 10 % to 90 %	typ. 900 ps	
Frequency response			
Bandwidth	system, –3 dB, starting at DC	> 400 MHz	
Input impedance			
DC input resistance	system	50 MΩ ± 1 %	
Input capacitance	system	typ. 7.5 pF	
DC characteristics			
Attenuation	system, automatically corrected on base unit display	100:1	1000:1
Attenuation error	probe only, with ideal 1 MΩ load impedance	±2 %	
Attenuation voltage coefficient		typ. ±0.0005 %/V	
Maximum rated input voltage			
Measurement category I	root mean square (derated, see figures)	1000 V	
	transient overvoltage peak	4000 V	
Measurement category II	root mean square	1000 V	
Base unit			
Input capacitance	must be compensated by probe's LF compensation	5 pF to 20 pF	
Input coupling		1 MΩ AC/DC	



R&S®RT-ZH10/-ZH11 non-destructive root mean square voltage, CAT I.



R&S®RT-ZH10/-ZH11 root mean square versus peak pulse voltage, CAT I.



R&S®RT-ZH10/-ZH11 maximum pulse derating, CAT I.

General data

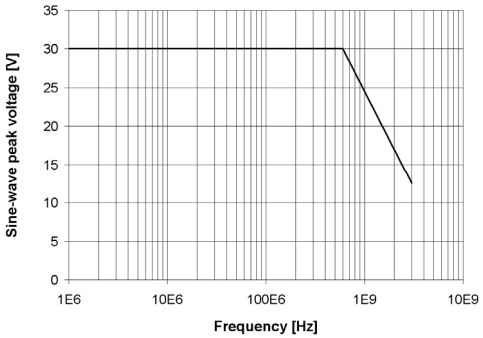
Temperature		
Temperature loading	operating temperature range	0 °C to +50 °C
	storage temperature range	−40 °C to +70 °C
Climatic loading		80 % relative humidity for temperatures up to +31 °C, decreasing linearly to 40 % at +50 °C
Altitude	operation	up to 2000 m
	transport	up to 15000 m
Safety		in line with Low Voltage Directive IEC/EN 61010-31:2008 pollution degree 2
Mechanical data		
Dimensions	diameter of probe tip	5 mm (0.2 in)
	cable length	approx. 2 m (79 in)
Weight	probe only	approx. 67 g (0.15 lb)

R&S®RT-ZS10/-ZS10E/-ZS20/-ZS30 active probes

All parameters are valid for the probe only when connected to a host instrument with an input impedance of 50 Ω.

		R&S®RT-ZS10/ R&S®RT-ZS10E	R&S®RT-ZS20	R&S®RT-ZS30
Step response				
Rise time	system, 10 % to 90 %	< 350 ps	< 250 ps	< 135 ps
Flatness	starting 2 ns after edge	typ. 2 %		
Propagation delay		typ. 5.5 ns		
Frequency response				
Bandwidth	starting at DC, calculated from 0.4/rise time	1.0 GHz	1.5 GHz	3.0 GHz
Flatness	100 kHz to 100 MHz	typ. 0.2 dB	typ. 0.2 dB	typ. 0.2 dB
	100 MHz to 500 MHz	–	typ. 0.5 dB	typ. 0.5 dB
	500 MHz to 1 GHz	–	–	typ. 0.5 dB
Input impedance				
DC input resistance		1 MΩ		
Input capacitance		typ. 0.8 pF		
DC characteristics				
Attenuation		10:1		
Attenuation error	after applying digitally stored correction factors			
	0 °C to +50 °C	±0.5 %		
Temperature drift, attenuation		±60 ppm/°C		
Zero error	after applying digitally stored correction factors, referenced to probe input			
	+15 °C to +35 °C	±2 mV		
	0 °C to +50 °C	±4 mV		

Temperature drift, zero error	referenced to probe input	±90 µV/°C
Dynamic range		
DC		±8 V (+ offset compensation setting)
Offset compensation range	not available with R&S®RT-ZS10E	±12 V
Offset compensation error	not when offset compensation setting = 0 V	typ. ±0.2 % of setting ± 2 mV
AC	with zero or compensated DC component	16 V (V_{pp})
Total harmonic distortion (THD)	16 V (V_{pp}) sine-wave input at 300 MHz for R&S®RT-ZS10/10E, 1 GHz for R&S®RT-ZS20/-ZS30	typ. –35 dB
Noise voltage	referenced to probe input	typ. 2 mV (RMS)
Maximum non-destructive input voltage		
DC peak values		±30 V
AC peak values	derated, see figure	30 V
ESD tolerance	human body model	typ. 8 kV



Non-destructive sine-wave peak voltage versus frequency.

R&S®ProbeMeter

Specifications for measurement error apply only when offset compensation setting is 0 V. Specifications for input impedance, dynamic range and maximum non-destructive input voltage apply. The R&S®RT-ZS10E probe is not equipped with an R&S®ProbeMeter.

Measurement error	+15 °C to +35 °C	±0.1 % of reading ± 750 µV
	0 °C to +50 °C	±0.2 % of reading ± 1.5 mV
Temperature drift		±50 ppm/°C of reading ± 40 µV/°C
50/60 Hz rejection		> 87 dB
Integration time		147 ms

General data

Temperature		
Temperature loading	operating temperature range	0 °C to +50 °C
	storage temperature range	−40 °C to +70 °C
Climatic loading		+25 °C/+40 °C cyclic at 95 % relative humidity without condensation, in line with IEC 60068-2-30
Altitude	operation	up to 3000 m
	transport	up to 4600 m
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz; 0.5 g from 55 Hz to 150 Hz; in line with EN 60068-2-6
	random	10 Hz to 500 Hz, acceleration 1.9 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810E
EMC		in line with EMC Directive 2004/108/EC, IEC/EN 61326-1 [1] [2], IEC/EN 61326-2-1,CISPR 11/EN 55011
Calibration interval		2 years

[1] Emission limits for class B equipment.

[2] Immunity test requirements for industrial environment (EN 61326 table 2).

Safety		in line with IEC/EN 61010-1, CAN/CSA-C22.2 No. 61010-1-04, UL 61010-1
Mechanical data		
Dimensions	probe head (L × W × H)	approx. 68 mm × 12 mm × 7.5 mm (2.68 in × 0.47 in × 0.3 in)
	cable length	approx. 1.1 m (43 in)
	overall length	approx. 1.3 m (51 in)
Weight	probe only	approx. 90 g (0.2 lb)

R&S®RT-ZD20/-ZD30 differential probes

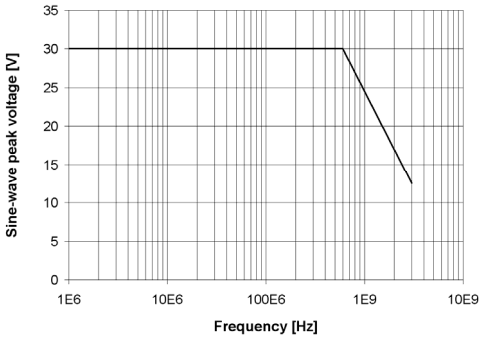
All parameters are valid for the probe only when connected to a host instrument with an input impedance of 50 Ω.

		R&S®RT-ZD20	R&S®RT-ZD30
Step response			
Rise time	10 % to 90 %	< 250 ps	< 135 ps
Flatness	starting 2 ns after edge	typ. 2 %	
Slew rate	referenced to probe input	typ. 50 V/ns	
Propagation delay		typ. 5.5 ns	
Frequency response			
Bandwidth	starting at DC, calculated from 0.4/rise time	1.5 GHz	3.0 GHz
Flatness	100 kHz to 100 MHz	typ. 0.2 dB	typ. 0.2 dB
	100 MHz to 500 MHz	typ. 0.5 dB	typ. 0.5 dB
	500 MHz to 1 GHz	–	typ. 0.5 dB
Common mode rejection	DC to 10 kHz	> 50 dB	
	10 kHz to 1 MHz	typ. 40 dB	
	1 MHz to 1 GHz	typ. 30 dB	
	> 1 GHz	typ. 20 dB	
Input impedance			
DC input resistance	differential (between signal sockets)	1 MΩ	
	single-ended (each signal socket to ground socket)	500 kΩ	
Input capacitance	differential (between signal sockets)	typ. 0.6 pF	
	single-ended (each signal socket to ground socket)	typ. 0.8 pF	

DC characteristics		
Attenuation		10:1
Attenuation error	after applying digitally stored correction factors	
	0 °C to +50 °C	±0.5 %
Temperature drift, attenuation		±50 ppm/°C
Zero error	after applying digitally stored correction factors, referenced to probe input	
	+15 °C to +35 °C	±3 mV
	0 °C to +50 °C	±6 mV
Temperature drift, zero error	referenced to probe input	±150 µV/°C
Dynamic range		
Operating voltage window	each signal socket to ground socket	±5 V
Differential input	between signal sockets	±5 V (+ offset compensation setting)
Offset compensation range	differential, between signal sockets	±5 V
Offset compensation error	not when offset compensation setting = 0 V	typ. ±0.2 % of setting ± 2 mV
Total harmonic distortion (THD)	10 V (V_{pp}) sine-wave input at 1 GHz	typ. –35 dB
Noise voltage	referenced to probe input	typ. 3 mV (RMS)
Maximum non-destructive input voltage		
DC peak values	each signal socket to ground socket	±30 V
AC peak values	each signal socket to ground socket, derated, see figure	30 V
ESD tolerance	human body model, each signal socket to ground socket	typ. 8 kV

General data

See page 14.



Non-destructive sine-wave peak voltage versus frequency.

R&S®ProbeMeter

Specifications for measurement error apply only when offset compensation setting is 0 V. Specifications for input impedance, dynamic range and maximum non-destructive input voltage apply. The R&S®ProbeMeter can be used to measure differential and common mode voltages.

Measurement error, differential mode and common mode	+15 °C to +35 °C	±0.1 % of reading ± 2 mV
	0 °C to +50 °C	±0.2 % of reading ± 4 mV
Temperature drift		±40 ppm/°C of reading ± 100 µV/°C
Common mode rejection	for differential measurement, 0 °C to +50 °C	> 50 dB
50/60 Hz rejection		> 87 dB
Integration time		147 ms

R&S®RT-ZC10/-ZC20 current probes

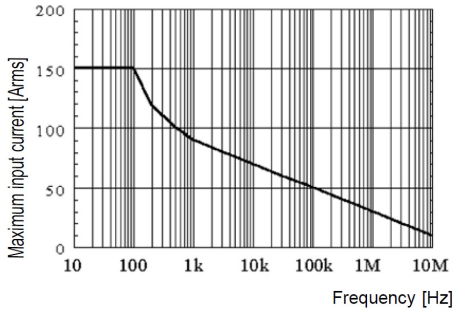
All parameters are valid when the probe is connected to an appropriate Rohde & Schwarz oscilloscope with an input impedance of 1 MΩ. See table on page 4 and Rohde & Schwarz oscilloscope operating manual for more details.

		R&S®RT-ZC10	R&S®RT-ZC20
Step response			
Rise time	10 % to 90 %	35 ns (meas.)	3.5 ns (meas.)
Frequency response			
Bandwidth	–3 dB, starting at DC	10 MHz (meas.)	100 MHz (meas.)
Input impedance		see figures	
DC characteristics			
Sensitivity		0.01 V/A	0.1 V/A
Sensitivity error (at 23 °C ± 5 °C)	up to 150 A (RMS) up to ±300 A	±1 % ±2 % (meas.)	
	up to 30 A (RMS) up to ±50 A		±1 % ±2 % (meas.)
Temperature drift, sensitivity	0 °C to +40 °C	±2 % (meas.)	
Zero error	referenced to probe input after demagnetizing and zero adjustment	±100 mA (meas.)	±10 mA (meas.)
External magnetic fields	400 A/m magnetic field, DC or 60 Hz, referenced to probe input	< 150 mA (meas.)	< 5 mA (meas.)

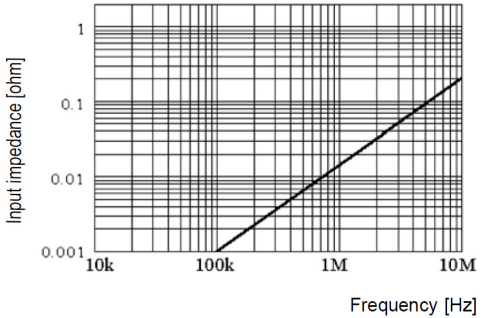
Maximum rated input			
Maximum continuous current	derated, see figures	150 A (RMS)	30 A (RMS)
Maximum transient current	peak (within max. continuous current) single pulse, pulse width < 30 µs	±300 A ±500 A	±50 A ±50 A
Maximum circuit voltage	insulated conductor, voltage to earth	600 V (CAT II) 300 V (CAT III)	300 V (CAT I)
Other			
Noise	20 MHz measurement bandwidth, referenced to probe input	25 mA (RMS)	2.5 mA (RMS)
Supply voltage	external power supply necessary, e.g. R&S®RT-ZA13	±12 V ± 0.5 V	
Maximum power		5.5 W	5.3 W
Interface		BNC	BNC

General data

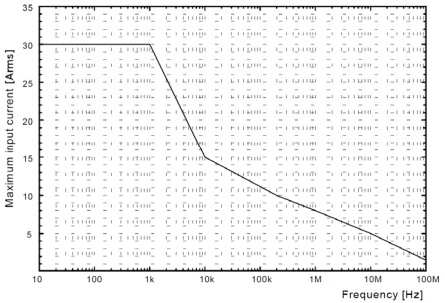
		R&S®RT-ZC10	R&S®RT-ZC20
Temperature			
Temperature loading	operating temperature range	0 °C to +40 °C	
	storage temperature range	−10 °C to +50 °C	
Climatic loading		80 % relative humidity	
Altitude	operation	up to 2000 m	
Safety		in line with EN 61010-2-032	
EMC		in line with EN 61326-1 (class B equipment)	
Calibration interval		2 years	
Mechanical data			
Dimensions	max. conductor diameter	20 mm (0.79 in)	5 mm (0.2 in)
	cable length, probe	approx. 2 m (78.7 in)	approx. 1.5 m (59 in)
	cable length, power supply	approx. 1 m (39.4 in)	approx. 1 m (39.4 in)
	probe head (L × W × H)	approx. 176 mm × 69 mm × 27 mm (6.93 in × 2.72 in × 1.06 in)	approx. 175 mm × 18 mm × 40 mm (6.89 in × 0.71 in × 1.57 in)
Weight	probe only	approx. 500 g (1.1 lb)	approx. 240 g (0.53 lb)



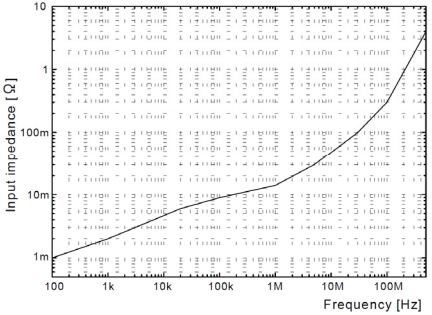
R&S®RT-ZC10 continuous maximum input current.



R&S®RT-ZC10 insertion impedance (meas.).



R&S®RT-ZC20 continuous maximum input current.



R&S®RT-ZC20 insertion impedance (meas.).

R&S®RT-ZA13 probe power supply

Electrical data		
Number of channels		4
Output voltage		±12 V ± 0.5 V
Maximum output current	sum total of all channels	2.5 A
Power requirements		100 V to 240 V 50/60 Hz
Maximum rated input power		170 W

General data

Safety		in line with EN 61010-1
EMC		in line with EN 61326-1 (class B equipment), EN 61000-3-2, EN 61000-3-3
Mechanical data		
Dimensions	L × W × H	approx. 200 mm × 80 mm × 119 mm (7.9 in × 3.1 in × 4.7 in)
Weight		approx. 1.1 kg (2.4 lb)
Connector		LEMO FFA.OS.304.CLAC44Z

Ordering information

Designation	Type	Order No.
Passive probes		
500 MHz Passive Voltage Probe, 10:1, 10 MΩ, 9.5 pF, 400 V RMS Incl. adjustment tool; coding rings (set) 3 × 4 colors; ground lead 15 cm; ground spring 2.5; solid tip CuBe 0.5 mm; sprung hook 2.5; spring tip gold-plated 0.5 mm; operating manual	R&S®RT-ZP10	1409.7550.00
500 MHz Passive Voltage Probe, 10:1, 10 MΩ, 9.5 pF, 400 V RMS Incl. adjustment tool; coding rings (set) 3 × 4 colors; ground lead 15 cm; ground spring 2.5; solid tip CuBe 0.5 mm; sprung hook 2.5; spring tip gold-plated 0.5 mm; operating manual	R&S®RTM-ZP10	1409.7708.02
High-voltage probes		
400 MHz High-Voltage Probe, passive, 100:1, 50 MΩ, 7.5 pF, 1 kV RMS Incl. adjustment tool; BNC adapter 5.0-L; coding rings (set) 3 × 4 colors; flexible adapter 5.0-L; ground lead 22 cm (2); ground lead 22 cm to 4 mm banana plug; insulating cap 5.0-L; operating manual; protection cap 5.0-L; safety alligator clip (2); solid tip 0.8 mm (5); spring tip 0.8 mm (5); sprung hook 5.0-L (2)	R&S®RT-ZH10	1409.7720.02
400 MHz High-Voltage Probe, passive, 1000:1, 50 MΩ, 7.5 pF, 1 kV RMS See R&S®RT-ZH10 for equipment included	R&S®RT-ZH11	1409.7737.02

Designation	Type	Order No.
Active probes		
1.0 GHz Active Voltage Probe, single-ended, 1 MΩ, 0.8 pF Incl. R&S®RT-ZA2 accessory set, R&S®ProbeMeter, micro button	R&S®RT-ZS10	1410.4080.02
1.0 GHz Active Voltage Probe, single-ended, 1 MΩ, 0.8 pF Incl. signal pin (5); ground pin, pogo (2); ground pin, solderable, offset (2); marker band kit; mini clip (1); lead 15 cm (5.9 in) (1)	R&S®RT-ZS10E	1418.7007.02
1.5 GHz Active Voltage Probe, single-ended, 1 MΩ, 0.8 pF Incl. R&S®RT-ZA2 accessory set, R&S®ProbeMeter, micro button	R&S®RT-ZS20	1410.3502.02
3.0 GHz Active Voltage Probe, single-ended, 1 MΩ, 0.8 pF Incl. R&S®RT-ZA2 accessory set, R&S®ProbeMeter, micro button	R&S®RT-ZS30	1410.4309.02
Differential probes		
1.5 GHz Active Voltage Probe, differential, 1 MΩ, 0.6 pF Incl. R&S®ProbeMeter, micro button Incl. signal pin, solder-in (10); signal pin, variable spacing (4); browser adapter; adapter, square pin (2); flex adapter, solder-in, 4 cm (1.6 in) and 10 cm (3.9 in); flex adapter, square pin, 4 cm (1.6 in) and 10 cm (3.9 in); lead 6 cm (2.4 in) (2); lead 15 cm (5.9 in) (1); mini clip (2); micro clip (2); marker band kit; carrying case; operating manual	R&S®RT-ZD20	1410.4409.02
3.0 GHz Active Voltage Probe, differential, 1 MΩ, 0.6 pF See R&S®RT-ZD20 for equipment included	R&S®RT-ZD30	1410.4609.02
Current probes		
10 MHz Current Probe, AC/DC, 0.01 V/A, 150 A (RMS)	R&S®RT-ZC10	1409.7750.02
100 MHz Current Probe, AC/DC, 0.1 V/A, 30 A (RMS)	R&S®RT-ZC20	1409.7766.02

Designation	Type	Order No.
Accessories and sets		
Accessory Kit for R&S®RT-ZP10, R&S®RTM-ZP10 passive voltage probes Contains: adjustment tool; BNC adapter 2.5; coding rings (set) 3 × 4 colors; dual adapter 2.5 mm to 0.8 mm sockets; ground blade 2.5; ground lead 15 cm; ground spring 2.5 (5); IC-cap 2.5 0.5 mm pitch green; IC-cap 2.5 0.65 mm pitch blue; IC-cap 2.5 0.8 mm pitch grey; IC-cap 2.5 1.0 mm pitch brown; IC-cap 2.5 01.27 mm pitch black; insulating cap 2.5; solid tip CuBe 0.5 mm (5); sprung hook 2.5; spring tip gold-plated 0.5 mm (5)	R&S®RT-ZA1	1409.7566.02
Spare Accessory Set for R&S®RT-ZS10/-ZS10E/-ZS20/-ZS30 active voltage probes Contains: signal pin (10); ground pin, pogo (5); ground pin, solderable, offset (10); ground adapter, square pin (2); marker band kit; mini clip (2); micro clip (2); lead 6 cm (2.4 in) (2); lead 15 cm (5.9 in) (2); accessory box; carrying case; operating manual	R&S®RT-ZA2	1416.0405.02
Pin Set for R&S®RT-ZS10/-ZS10E/-ZS20/-ZS30 active voltage probes Contains: signal pin (20); ground pin, pogo (5); ground pin, solderable, offset (20); ground adapter, square pin (2); marker band kit	R&S®RT-ZA3	1416.0411.02
Mini Clips Contains: mini clip (10)	R&S®RT-ZA4	1416.0428.02
Micro Clips Contains: micro clip (4)	R&S®RT-ZA5	1416.0434.02
Lead Set Contains: lead 6 cm (2.4 in) (5); lead 15 cm (5.9 in) (5)	R&S®RT-ZA6	1416.0440.02
Differential Pin Set for R&S®RT-ZD20/-ZD30 Contains: signal pin, solder-in (20); signal pin, variable spacing (10); browser adapter (2); adapter, square pin (2)	R&S®RT-ZA7	1417.0609.02
Probe Box to N/USB Adapter	R&S®RT-ZA9	1417.0909.02
SMA Adapter	R&S®RT-ZA10	1416.0457.02
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