# R&S®RT-ZFxx Oscilloscope Test Fixtures

# **Specifications**

#### R&S®RT-ZF1 USB 2.0 compliance test fixture set

The USB 2.0 compliance test fixture set contains a signal quality board and a load board for testing USB 2.0 (high speed), USB 1.1 (full speed) and USB 1.0 (low speed). It is used in combination with the R&S®RTO oscilloscope, the R&S®RTO-K21 option and the R&S®ScopeSuite software.

General data		
Temperature loading	operating temperature range	0 °C to +45 °C
	storage temperature range	-40 °C to +70 °C
Power supply		5.0 V DC ± 0.25 V via USB

#### R&S®RT-ZF2 Ethernet compliance test fixture set

The Ethernet compliance test fixture set contains the test fixture board and a network analyzer calibration board for testing the physical layer of the Ethernet standards 10BASE-T, 100BASE-TX, 1000BASE-T and 10GBASE-T. It is used in combination with the R&S®RTO oscilloscope, the R&S®RTO-K22 option and the R&S®ScopeSuite software.

General data		
Temperature loading	operating temperature range	0 °C to +45 °C
	storage temperature range	-40 °C to +70 °C
Dimensions (W x H x L)	test fixture board	approx. 235 mm × 28 mm × 140 mm
		$(9.3 \text{ in} \times 1.1 \text{ in} \times 5.5 \text{ in})$
	calibration board	approx. 27 mm × 17 mm × 140 mm
		$(1.1 \text{ in} \times 0.7 \text{ in} \times 5.5 \text{ in})$

# R&S®RT-ZF2C Ethernet 1000BASE-T jitter test cable

The Ethernet 1000BASE-T jitter test cable contains the jitter test channel in line with IEEE 802.3-2008 chapter 40.6.1.1.1 for testing the transmitter timing jitter of the Ethernet standard 1000BASE-T with the required poor signal to echo ratio. It is used in combination with the R&S®RTO oscilloscope, the R&S®RTO-K22 option, the R&S®ScopeSuite software and the R&S®RT-ZF2 Ethernet compliance test fixture set.

General data		
Temperature loading	operating temperature range	0 °C to +45 °C
	storage temperature range	–40 °C to +70 °C
Dimensions of the cable reel	ø × H	approx. 450 mm × 120 mm
		(17.7 in × 4.7 in)





#### R&S®RT-ZF3 frequency converter (100BASE-T1)

The frequency converter is intended to be used in combination with the BroadR-Reach®/100BASE-T1 compliance tests (R&S®RTO-K24), the R&S®RTO oscilloscope and the R&S®ScopeSuite software. It converts the BroadR-Reach® transmitter clock frequency of 66 2/3 MHz to the 10 MHz frequency clock used for the reference clock synchronization of measurement instruments.

General data		
Temperature loading	operating temperature range	+5 °C to +40 °C
-	storage temperature range	-40 °C to +70 °C
Dimensions	W×H×L	approx. 54 mm × 22 mm × 140 mm
		$(2.1 \text{ in} \times 0.7 \text{ in} \times 5.5 \text{ in})$
Input	voltage range (at 50 Ω)	0.7 mV to 12 V
	expected frequency	66.666667 MHz
	frequency range	61 MHz to 69 MHz
	connector	1 SMA (50 Ω, female)
Output	voltage (at 50 Ω)	4.25 V ± 0.25 V
	frequency	input frequency/6.6667; resulting in
		10 MHz at the expected input frequency
		of 66.666667 MHz
	connectors	2 BNC (50 Ω, female)

#### R&S®RT-ZF4 10BASE-Te energy efficient Ethernet test fixture

The 10BASE-Te energy efficient Ethernet test fixture is intended to be used in combination with the energy efficient Ethernet compliance tests (R&S®RTO-K86), the R&S®RTO oscilloscope and the R&S®ScopeSuite software. It implements resistive and inductive loads with or without a twisted pair model in line with IEEE standard 802.3az.

General data		
Temperature loading	operating temperature range	+5 °C to +40 °C
	storage temperature range	-40 °C to +70 °C
Dimensions	W×H×L	approx. 75 mm × 26 mm × 140 mm
		$(3.0 \text{ in} \times 1.0 \text{ in} \times 5.5 \text{ in})$

### R&S®RT-ZF5 Ethernet probing fixture

The Ethernet probing fixture is intended to be used as a general means of probing an Ethernet signal. Full duplex connections can be probed on separated directions.

General data		
Temperature loading	operating temperature range	+5 °C to +40 °C
	storage temperature range	–40 °C to +70 °C
Dimensions	W×H×L	approx. 140 mm $\times$ 22 mm $\times$ 160 mm (5.5 in $\times$ 0.9 in $\times$ 6.3 in)
Sections	directional probe	separation of forward and reverse direction of a full duplex signal; input and output: RJ-45; coupled: 4 SMA (50 Ω, female) per lane
	load and probe	100 $\Omega$ termination and probe pins input: RJ-45
	DUT and link partner	line tab with probe pins; input and output: RJ-45
Directional probe section	mainline loss (< 300 MHz)	1.5 dB (meas.)
	coupling (< 300 MHz)	15.5 dB (meas.)
	directivity (< 300 MHz)	26 dB (meas.)

#### R&S®RT-ZF6 frequency converter (1000BASE-T1)

The frequency converter is intended to be used in combination with the 1000BASE-T1 compliance tests (R&S®RTO-K87), the R&S®RTO oscilloscope and the R&S®ScopeSuite software. It converts the 1000BASE-T1 transmitter clock frequency of 125 MHz to the 10 MHz frequency clock used for the reference clock synchronization of measurement instruments.

General data		
Temperature loading	operating temperature range	+5 °C to +40 °C
	storage temperature range	-40 °C to +70 °C
Dimensions	W×H×L	approx. 54 mm × 22 mm × 140 mm
		$(2.1 \text{ in} \times 0.7 \text{ in} \times 5.5 \text{ in})$
Input	voltage range (at 50 Ω)	7 mV to 12 V
	expected frequency	125 MHz
	frequency range	122 MHz to 128 MHz
	connector	1 SMA (50 Ω, female)
Output	voltage (at 50 Ω)	4 V ± 0.25 V
	frequency	input frequency/12.5; resulting in 10 MHz
		at the expected input frequency of
		125 MHz
	connectors	2 BNC (50 Ω, female)

#### R&S®RT-ZF7 automotive Ethernet trigger and decode fixture

The automotive Ethernet trigger and decode fixture is intended to be used for probing an automotive Ethernet signal (e.g. 100BASE-T1 or 1000BASE-T1). Full duplex connections can be probed on separated directions. The package contains two R&S®RT-ZF7A SMA adapters and four SMA adapters (50  $\Omega$ , male to male). The fixture is used in combination with the R&S®RTO and R&S®RTP oscilloscopes and automotive Ethernet options (R&S®RTO-K57 and R&S®RTP-K57).

General data		
Temperature loading	operating temperature range	+5 °C to +40 °C
	storage temperature range	-40 °C to +70 °C
Altitude		up to 4600 m above sea level
Dimensions	$W \times H \times L$	approx. 54 mm × 15 mm × 73 mm
		$(2.1 \text{ in} \times 0.6 \text{ in} \times 2.9 \text{ in})$
Connection	through	differential SMA (50 Ω, female)
	directional probe	separation of forward and reverse
		direction of a full duplex signal; differential
		SMA (50 $\Omega$ , female) for each direction
Directional probe section	mainline loss (5 MHz to 1 GHz)	< 2 dB (meas.)
	coupling (5 MHz to 1 GHz)	15.5 dB to 16.5 dB (meas.)
	directivity (5 MHz to 1 GHz)	> 26 dB (meas.)

# R&S®RT-ZF7A SMA adapter

The SMA adapter connects differential wires to differential SMA plugs. The main intended use case is to connect a twisted pair automotive Ethernet cable to SMA.

General data		
Temperature loading	operating temperature range	+5 °C to +40 °C;
		+23 °C for compliance tests
	storage temperature range	–40 °C to +70 °C
Altitude		up to 4600 m above sea level
Dimensions	W×H×L	approx. 38 mm × 8 mm × 42 mm
		$(1.5 \text{ in} \times 0.3 \text{ in} \times 1.7 \text{ in})$
Connections	solder pads	differential signal, 2 x ground
	SMA	differential SMA (50 Ω, female)
Compliance		complies with the adapter specification of
		the OPEN Alliance Automotive Ethernet
		ECU Test Specification (version 2.0,
		at +23 °C; meas.)

# R&S®RT-ZF8 automotive Ethernet compliance fixture

The automotive Ethernet compliance fixture provides fixtures for testing the physical layer of automotive Ethernet standards 100BASE-T1 and 1000BASE-T1 signals for compliance. The package contains two SMA terminations (50  $\Omega$ , male). The fixture is used in combination with the R&S®RTO and R&S®RTP oscilloscopes, the R&S®ScopeSuite software and automotive Ethernet options (R&S®RTO-K24, R&S®RTP-K24, R&S®RTO-K87, R&S®RTP-K87).

General data		
Temperature loading	operating temperature range	+5 °C to +40 °C; +23 °C for compliance tests
	storage temperature range	-40 °C to +70 °C
Altitude		up to 4600 m above sea level
Dimensions	W×H×L	approx. 128 mm $\times$ 20 mm $\times$ 123 mm (5.0 in $\times$ 0.8 in $\times$ 4.8 in)
Sections	general purpose SMA adapter	solder pads (differential signal, $2 \times \text{ground}$ ) to differential SMA (50 $\Omega$ , female); complies with the adapter specification of the OPEN Alliance Automotive Ethernet ECU Test Specification (version 2.0, at +23 °C; meas.)
	return loss (single ended)	solder pads (differential signal, 2 × ground) to single ended SMA (50 Ω, female)
	common mode emission	solder pads (differential data, $2 \times$ ground) to single ended SMA (50 $\Omega$ , female)
	distortion test (SMA output)	differential SMA (50 $\Omega$ , female) for signal input, disturber input and measurement output (to oscilloscope)
	common mode emission (SMA)	differential SMA (50 $\Omega$ , female) to single ended SMA (50 $\Omega$ , female)
	distortion test (probe output)	differential SMA (50 $\Omega$ , female) for signal input and disturber input; measurement output via probing pins

# R&S®RT-ZF20 probe deskew and calibration test fixture

The probe deskew and calibration test fixture is used to deskew any combination of Rohde & Schwarz probes. It can be used with any Rohde & Schwarz oscilloscope.

Step voltage swing	large loop	4.5 V (meas.)
	small loop	2.5 V (meas.)
Step current swing	large loop	900 mA (meas.)
,	small loop	240 mA (meas.)
Step rise time (10 % to 90 %)	large loop	290 ns (meas.)
	small loop	80 ns (meas.)
Step fall time (20 % to 80 %)	large loop	40 ns (meas.)
	small loop	4 ns (meas.)

General data		
Temperature loading	operating temperature range	0 °C to +50 °C
	storage temperature range	-40 °C to +70 °C
Altitude	operation	up to 3000 m
	transport	up to 4600 m
EMC		in line with EMC Directive 2014/30/EC
Power supply		5.0 V DC ± 0.25 V via USB
Dimensions		
Probe deskew and calibration test	$W \times H \times L$	approx. 78 mm × 36 mm × 124 mm
fixture		$(3.1 \text{ in} \times 1.4 \text{ in} \times 4.9 \text{ in})$
Large loop current probe	cutout (W x L)	approx. 28 mm × 28 mm (1.1 in × 1.1 in)
	core diameter	≥ 20 mm (0.79 in)
Small loop current probe	cutout (W x L)	approx. 9.5 mm × 14.5 mm
		$(0.37 \text{ in} \times 0.57 \text{ in})$
	core diameter	≥ 5 mm (0.20 in)
Voltage probe connectors (both loops)	pin diameter	0.64 mm (0.025 in) square pins and
		ø 2 mm (0.078 in) clamp-on connectors
	pin distance	2.54 mm (0.10 in) and 5.12 mm (0.20 in)

# R&S®RT-ZF30 probe test fixture

The probe test fixture is used to deskew any combination of Rohde & Schwarz high bandwidth probes.

Electrical data		
Impedance		50 Ω
Frequency		DC to 32 GHz (meas.)
Return loss	DC to 15 GHz	≥ 20 dB (meas.)
	15 GHz to 32 GHz	≥ 12 dB (meas.)
Insertion loss	DC to 10 GHz	≤ 1.5 dB (meas.)
	10 GHz to 32 GHz	≤ 3 dB (meas.)
Mechanical data		
Mating cycles	RPC-2.92	≥ 500 (meas.)
Interfaces		
Connectors	1	RPC-2.92
	2	RPC-2.92
RoHS		in line with EN 50581

# **Ordering information**

Designation	Туре	Order No.
USB 2.0 compliance test fixture set,	R&S®RT-ZF1	1317.3420.02
incl. signal quality board; load board; 1.3 m USB 2.0 A to B cable (2); 20 cm USB 2.0 A		
to B cable (2); USB A to mini adapter; USB A to micro B adapter; 1.0 m SMA cable (2);		
carrying case; operating manual		
Ethernet compliance test fixture set,	R&S®RT-ZF2	1317.5522.02
incl. test fixture board; calibration board; 250 mm S/FTP Ethernet cable,		
SMA termination (3); carrying case; operating manual		
Ethernet 1000BASE-T jitter test cable	R&S®RT-ZF2C	1317.5639.02
Frequency converter (100BASE-T1)	R&S®RT-ZF3	5025.0670.02
10BASE-Te energy efficient Ethernet test fixture	R&S®RT-ZF4	1333.0880.02
Ethernet probing fixture	R&S®RT-ZF5	1333.0896.02
Frequency converter (1000BASE-T1)	R&S®RT-ZF6	1337.8579.02
Automotive Ethernet trigger and decode fixture	R&S®RT-ZF7	1801.3688.02
SMA adapter	R&S®RT-ZF7A	1801.4126.02
Automotive Ethernet compliance fixture	R&S®RT-ZF8	1801.3694.02
Probe deskew and calibration test fixture,	R&S®RT-ZF20	1800.0004.02
incl. test board; 1.3 m USB 2.0 A to B cable; carrying case; operating manual		
Probe test fixture, incl. SMA adapter (m/m)	R&S®RT-ZF30	1333.2099.02

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