

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 × H × L) | test fixture board | approx. 235 mm × 28 mm × 140 mm (9.3 in × 1.1 in × 5.5 in) |
| | calibration board | approx. 27 mm × 17 mm × 140 mm (1.1 in × 0.7 in × 5.5 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 in × 0.7 in × 5.5 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 in × 1.0 in × 5.5 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 × 22 mm × 160 mm (5.5 in × 0.9 in × 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 Ω 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 in × 0.7 in × 5.5 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 Ω, 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 × H × L | approx. 54 mm × 15 mm × 73 mm (2.1 in × 0.6 in × 2.9 in) |
| Connection | through | differential SMA (50 Ω, female) |
| | directional probe | separation of forward and reverse direction of a full duplex signal; differential SMA (50 Ω, 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 in × 0.3 in × 1.7 in) |
| Connections | solder pads | differential signal, 2 × 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-ZF7P SMA adapter for PoDL

The SMA adapter connects differential wires to differential SMA plugs. The main intended use case is to connect a twisted pair Ethernet cable with power to SMA. If there is DC power on the data line, it will be blocked from the SMA connectors.

| 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 × 50 mm (1.5 in × 0.3 in × 2 in) |
| Connections | clamps | 2 × positive, 2 × negative, 2 × ground |
| | SMA | differential SMA (50 Ω, female) |
| DC block | | DC power is blocked by 1 μF capacitors |
| Maximum DC voltage | | 35 V |

R&S®RT-ZF7P test fixture 10BASE-T1S

The 10BASE-T1S test fixture connects differential wires to differential SMA plugs and terminates them differentially with 100 Ω in line with the Open Alliance 10BASE-T1S Physical Media Attachment Test Suite specification.

| 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 × 50 mm (1.5 in × 0.3 in × 2 in) |
| Connections | clamps | 2 × positive, 2 × negative, 2 × ground |
| | SMA | differential SMA (50 Ω, female) |

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 Ω, 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 × 20 mm × 123 mm (5.0 in × 0.8 in × 4.8 in) |
| Sections | general purpose SMA adapter | solder pads (differential signal, 2 × ground) to differential SMA (50 Ω, 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 × ground) to single ended SMA (50 Ω, female) |
| | distortion test (SMA output) | differential SMA (50 Ω, female) for signal input, disturber input and measurement output (to oscilloscope) |
| | common mode emission (SMA) | differential SMA (50 Ω, female) to single ended SMA (50 Ω, female) |
| | distortion test (probe output) | differential SMA (50 Ω, 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 fixture | W × H × L | approx. 78 mm × 36 mm × 124 mm (3.1 in × 1.4 in × 4.9 in) |
| Large loop current probe | cutout (W × 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 × L) | approx. 9.5 mm × 14.5 mm (0.37 in × 0.57 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 RoHS Directive 2011/65/EU |

Ordering information

| Designation | Type | Order No. |
|---|-------------|--------------|
| USB 2.0 compliance test fixture set, 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 | R&S®RT-ZF1 | 1317.3420.02 |
| Ethernet compliance test fixture set, incl. test fixture board; calibration board; 250 mm S/FTP Ethernet cable, SMA termination (3); carrying case; operating manual | R&S®RT-ZF2 | 1317.5522.02 |
| 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 |
| SMA adapter, for PoDL | R&S®RT-ZF7P | 1802.9680.02 |
| Test fixture 10BASE-T1S | R&S®RT-ZF7P | 1802.9680.03 |
| Automotive Ethernet compliance fixture | R&S®RT-ZF8 | 1801.3694.02 |
| Probe deskew and calibration test fixture, incl. test board; 1.3 m USB 2.0 A to B cable; carrying case; operating manual | R&S®RT-ZF20 | 1800.0004.02 |
| Probe test fixture, incl. SMA adapter (m/m) | R&S®RT-ZF30 | 1333.2099.02 |

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