SYNCHRONIZED MULTICHANNEL HIGH-RESOLUTION POWER METER AND SWITCHING MODULES

Specifications

R&S®OSP-B157W8 PLUS
R&S®OSP-B157WX
R&S®OSP-B157WN

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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
- 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 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.

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.

Introduction

This data sheet refers to the combination of the R&S®OSP150 switch unit with the R&S®OSP-B157W8 PLUS basic module as well as to the combination of the R&S®OSP220 switch unit alternatively with the R&S®OSP-B157WX frequency extension module or the R&S®OSP-B157WN normalization extension module.

The R&S®OSP is a modular switch and control platform that enables you to perform RF switch and control tasks quickly. The flexibility of the R&S®OSP permits a broad scope of applications ranging from simple RF switch functions to RF wiring of complex systems such as EMC or regulatory test systems. For information on the R&S®OSP open switch and control platform and additional modules, please refer to the R&S®OSP data sheet (PD 5216.1340.22).

The R&S®OSP-B157W8, R&S®OSP-B157W8 PLUS, R&S®OSP-B157WX and R&S®OSP-B157WN are standard modules for the R&S®OSP open switch and control platform and are intended for use with the R&S®WMS32 software. For information on the R&S®WMS32 wireless measurement system software, please refer to the R&S®WMS32 data sheet (PD 3607.4870.22).

The R&S®OSP-B157WX serves as a frequency extension for the R&S®OSP-B157W8 PLUS main module. While the extension forwards lower frequency signals to the base module, it can bypass higher frequency signals to an appropriate measurement channel.

All three modules are typically used in the R&S®TS8997 automatic test system, which performs regulatory conformance tests of wireless short-range devices (SRD). Regarding R&S®OSP-B157W8 the test cases focus on the 2.4 GHz and 5 GHz frequency bands for Wi-Fi and for industrial, scientific and medical (ISM) applications. These tests are performed in line with selected FCC and ETSI standards. R&S®OSP-B157W8 PLUS addresses tests in frequency bands between 800 MHz and 7.5 GHz, however the upper band covers the frequency range from 6425 MHz to 7125 MHz between the incumbent services and MFCN (mobile/fixed communications network) services.

**Designation of "module" versus "switch unit"**

This data sheet uses the following nomenclature:

- The R&S®OSP-B157W8 PLUS hardware option is referred to as "basic module".
- The R&S®OSP-B157WX hardware option is referred to as "extension module".
- The R&S®OSP-B157WN hardware option is referred to as "extension module".
- The R&S®OSP open switch and control platform is referred to as "switch unit".

R&S®OSP150 with R&S®OSP-B157W8 PLUS

R&S®OSP150 switch unit with integrated R&S®OSP-B157W8 or R&S®OSP-B157W8 PLUS module
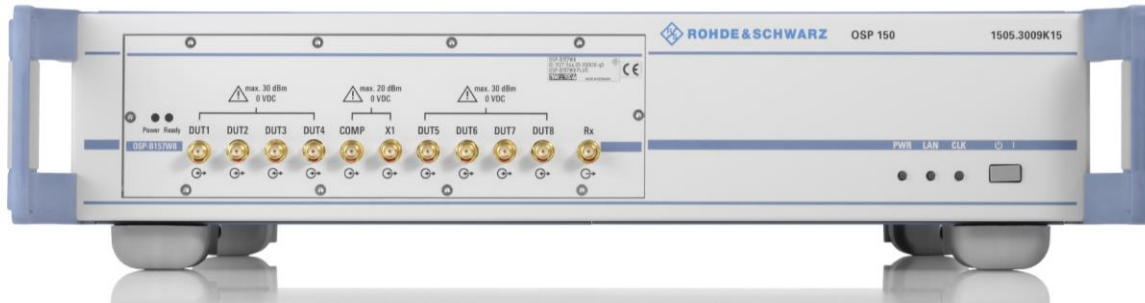
R&S®OSP150 with R&S®OSP-B157W8 PLUS (front view)

Key features of the R&S®OSP-B157W8 PLUS main module

The R&S®OSP-B157W8 PLUS 7.5 GHz module with up to eight channels is based on a printed RF switch board in solid-state relay (SSR) architecture. It allows flexible operation of the connected DUT (up to eight ports) and measuring instruments.

The module features the following:

- Signal conditioning via the integrated attenuators, couplers and combiners (without the need of additional amplifiers or filters in case of performing conducted measurements)
- RF path switching for wireless test cases from 800 MHz to 7.5 GHz
- High dynamic range of step attenuator
- RF path switching for spurious emission measurements up to 18 GHz (in combination with the R&S®OSP-B157WX up to 40 GHz)
- Power measurements in the 2.4 GHz and 5 GHz bands with specific evaluations in line with ETSI and FCC standards mentioned in that document
- Built-in digital control of the signal paths including A/D conversion of the power measurements
- Multiple trigger input and output options
- External clock input
- Analyzer video signal input
- LAN interface for remote control of the module using the R&S®WMS32 wireless measurement system software

Each of the eight configurable channels has the following integrated semiconductor components:

- Individually programmable attenuator
- A/D converter for the power measurement results
- Power detector for synchronous RMS power measurement with high sampling rate and burst detection
- Solid-state switches, which enable:
  - Switching the (vector) signal generator output to the calibration port or to the DUT ports
  - Switching the measurement paths from DUT ports to a spectrum analyzer/test receiver or to the power measurement

These channels are conditioned via the integrated couplers, directional couplers, attenuators and combiners and distribute the signal from a companion device.

R&S®OSP220 with R&S®OSP-B157WX

R&S®OSP220 switch unit with integrated R&S®OSP-B157WX module

R&S®OSP220 with R&S®OSP-B157WX (front view)

Key features of the R&S®OSP-B157WX frequency extension module

The R&S®OSP-B157WX frequency extension module is specially designed to extend the frequency range of the R&S®OSP-B157W8 PLUS to provide automatic spurious measurements up to 40 GHz.

It uses coaxial RF architecture and features the following:

- Electromechanical RF relay switches for flexible operation of up to eight DUT channels
- The module can forward incoming signals on each DUT channel to the connected DUT input of the R&S®OSP-B157W8 PLUS. This forwarding is used for measurements at frequencies up to 6 GHz, which the R&S®OSP-B157W8 can handle
- Alternatively, incoming signals on a single DUT channel can be switched to the module's RX port and to a connected signal analyzer, receiver or other measuring instrument. This switching state is typically used for measurements at frequencies above 6 GHz and up to 40 GHz, which the R&S®OSP-B157W8 cannot handle (signals for spurious emission measurements up to 18 GHz are also switched to the instrument connected to the extension module's RX port)

R&S®OSP220 with R&S®OSP-B157WN

R&S®OSP220 switch unit with integrated R&S®OSP-B157WN module

R&S®OSP220 with R&S®OSP-B157WX (front view)
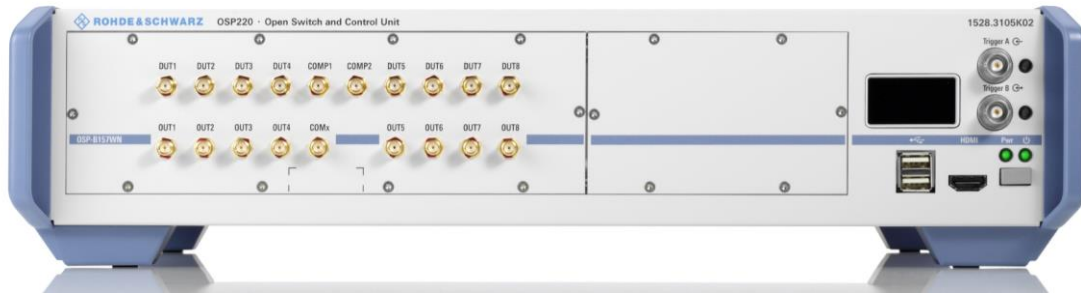
Key features of the R&S®OSP-B157WN extension module

In case conducted measurement is not possible due to monolithic integral antennas our new OSP-B157WN offers an innovative test method based on fixture approach with normalization procedure proposed by ETSI.

The R&S®OSP-B157WN module with up to eight channels is based on a printed RF switch board in solid-state relay (SSR) architecture. It allows flexible operation of conducted (up to eight ports) and normalized measurements in combination with an appropriate shielding box R&S®TS7124.

The module features the following:

- Solid-state relay switches for flexible operation of up to eight DUT channels and normalized measurements
- High dynamic range of step attenuator
- LAN interface for remote control of the module using the R&S®WMS32 wireless measurement system software
- The module can forward incoming signals on each DUT channel to the connected DUT input of the R&S®OSP-B157W8 PLUS. This forwarding is used for conducted measurements at frequencies up to 7.5 GHz, which the R&S®OSP-B157W8 PLUS can handle
- Alternatively, incoming signals from the probe antennas within the R&S®TS7124 can be switched to the R&S®OSP-B157W8 PLUS

General data of the R&S®OSP platform

		R&S®OSP220	R&S®OSP150	
Interfaces (front panel)				
USB	for keyboard, mouse or USB stick	2	–	2 × USB 2.0, type A connector (f)
HDMI™	for external monitor, resolution 800 × 480 pixel	1	–	HDMI™, type A connector (f)
External trigger	input and output	2	–	BNC
Status display	display of TCP/IP address	1	–	black/white
Interfaces (rear panel)				
LAN	remote control via LAN	1	–	Ethernet RJ-45 connector (f), 10/100 Mbit/s
USB		1	–	USB 3.0, type A connector (f)
Protected memory slot	operating system	1	–	microSD card slot

Environmental conditions		
Temperature [1]	operating temperature range	0 °C to +50 °C
	storage temperature range	–25 °C to +70 °C
Damp heat		+40 °C, 90 % rel. humidity, constant, in line with EN 60068-2-30

Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, 0.3 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.2 g (RMS) in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with EN 60068-2-27, MIL-STD-810E, method no. 516.4, procedure I

Power supply		
Rated voltage		100 V to 240 V AC (± 10 %)
Rated frequency		50 Hz to 60 Hz (± 10 %)
Rated power	without modules	< 25 W
Maximum input power		1.5 A to 3.6 A (max. 310 VA)

Dimensions (W × H × D)	R&S®OSP150	465.3 mm × 108.7 mm × 494.8 mm (18.32 in × 4.27 in × 19.5 in)
		for rack mounting (without modules) 19" 1/1, 2 RU, depth 450 mm (17.7 in)
	R&S®OSP220	444.7 mm × 107.6 mm × 471.9 mm (17.51 in × 4.24 in × 18.58 in)
		for rack mounting (without modules) 1/1 19", 2 RU, depth 425 mm (16.73 in)
Weight	R&S®OSP150 (without module)	approx. 4.5 kg (9.92 lb)
	R&S®OSP220 (without module)	approx. 6.85 kg (15.1 lb)

Product conformity		
Electromagnetic compatibility	EU: EMC Directive 2014/30/EC	in line with EN 61326-1 (industrial environment), EN 61326-2-1, EN 55011 (class B)
Electrical safety	EU: Low Voltage Directive 2014/35/EC	in line with EN 61010-1, VDE certificate no.: 40022952
	USA/Canada	CAN 22.2 No. 61010-1-04, UL 61010-1, $_c$CSA$_{UL}$ certificate no.: 1960595
RoHS	RoHS Directive 2011/65/EC	in line with EN 50581

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[1] Temperature ranges apply to all base units and R&S®OSP modules (unless a different range is specified for the respective module).

Module slots

Number of module slots	R&S®OSP150		1 × R&S®OSP-B157W8 PLUS
	R&S®OSP220		1 × R&S®OSP-B157WX
Output current	R&S®OSP150	each control bus	max. 800 mA (28 V DC)
		to all control buses	max. 2 A (28 V DC)
	R&S®OSP220	each control bus	max. 800 mA (27 V DC)
		to all control buses	max. 10 A (28 V DC)

Dimensions (W × H × D) of R&S®OSP150		
Module slot 1	module slot without front panel	95.6 mm × 52.6 mm × max. 70 mm (3.76 in × 2.07 in × max. 2.76 in)
Module slots 2, 3, 1F, 2F	module slot without front panel	95.6 mm × 52.6 mm × max. 370 mm (3.76 in × 2.07 in × max. 14.57 in)
Double-width module slot 2 and 3	module slot without front panel	204.2 mm × 52.6 mm × max. 370 mm (8.04 in × 2.07 in × max. 14.57 in)
Triple-width module slot 1 to 3	module slot without front panel	312.8 mm × 52.6 mm × 70 mm, depth: in parts 370 mm (12.31 in × 2.07 in × 2.76 in, depth: in parts 14.57 in)

Dimensions (W × H × D) of R&S®OSP220		
Standard rear module slot	RS01	95.6 mm × 52.6 mm × max. 70 mm (3.76 in × 2.07 in × max. 2.76 in)
Standard front module slot	FS03 (not for R&S®OSP230)	95.6 mm × 52.6 mm × max. 70 mm (3.76 in × 2.07 in × max. 2.76 in)
Standard slots with higher depth	RS02, RS03, FS01, FS02	95.6 mm × 52.6 mm × max. 340 mm (3.76 in × 2.07 in × max. 13.38 in)
Double-width module slot	RS02 to RS03 and FS01 to FS02	204.2 mm × 52.6 mm × max. 340 mm (8.04 in × 2.07 in × max. 13.38 in)
Triple-width module slot	RS01 to RS03; FS01 to FS03 (not for R&S®OSP230)	312.8 mm × 52.6 mm × 70 mm, (12.31 in × 2.07 in × 2.76 in, depth: in parts 340 mm (13.38 in) (FS01 + FS02, RS02 + RS03)

Calibration interval

The R&S®OSP-B157W8 PLUS, R&S®OSP-B157WX and R&S®OSP-B157WN modules are delivered optionally with a factory calibration in line with the standards of the German Calibration Service (DAkkS, formerly DKD). The calibration data for R&S®OSP-B157W8PLUS is saved on the module for the other modules are delivered on an USB stick.

For a later recalibration, including the power detectors in the R&S®OSP-B157W8 PLUS, we recommend to send your switch unit (including the module) to your nearest Rohde & Schwarz service center.

Open switch and control platform	R&S®OSP	no calibration necessary
Synchronized multichannel high-resolution power meter and switching modules	R&S®OSP-B157W8 PLUS, R&S®OSP-B157WX and R&S®OSP-B157WN	every 2 years unless otherwise specified

Rear view of the R&S®OSP-B157W8 PLUS basic module integrated in the R&S®OSP150

Rear view of the R&S®OSP-B157WX extension module integrated in the R&S®OSP220

Rear view of the R&S®OSP-B157WN extension module integrated in the R&S®OSP220

Overview of special R&S®OSP modules for the R&S®TS8997

Type (R&S®)	Module designation	View of module width
OSP-B157W8 PLUS	R&S®OSP module with integrated RF power meter, solid-state RF switch and signal conditioning	double-width module: *front panel* *rear panel*
OSP-B157WX	R&S®OSP module with RF switch matrix and signal conditioning up to 40 GHz	double-width module: *front panel*
OSP-B157WN	R&S®OSP module with RF switch matrix	double-width module: *front panel* *rear panel*

Module specifications

R&S®OSP-B157W8 PLUS basic module with integrated power meter for R&S®TS8997

RMS power meter, high sampling rate, deep memory		8 ports, 7.5 GHz (18 GHz), SMA (f)
Generators and analyzer ports		3 ports, 7.5 GHz (18 GHz), SMA (f)
Companion port and X1		7.5 GHz, SMA (f)
Remote control port		LAN (RJ-45)
Clock input	for external 48 MHz clock	SMA (f)
Trigger input and output		2 × 9-pin D-Sub, 3 × BNC connector (f)
Video		video in, SMA (f)
Slot position		1, 2 and 3
Dimensions (W × H × D)	standard width	210.5 mm × 65.5 mm × 410.1 mm (8.29 in × 2.58 in × 16.15 in)
Weight		approx. 4 kg (8.82 lb)

RF signal conditioning		
Frequency range	overall system	30 MHz to 40 GHz [2]
Frequency range of R&S®OSP-B157W8 PLUS	RF paths spurious	30 MHz to 18 GHz
	RF paths inband	800 MHz to 7.5 GHz
	power measurement, calibrated for complete frequency rage	800 MHz to 7.5 GHz
Number of DUT antenna ports		8
Maximum input power of R&S®OSP-B157W8 PLUS		30 dBm
Insertion loss	module has a complex path switching schematic with more than 70 signal paths; the signal paths are designed to cover all requirements of the supported ETSI and FCC standards in 2.4 GHz and 5 GHz bands	
Dynamic range of step attenuator for DUT4 to COMP	up to 3 GHz	50 dB
	up to 6 GHz	40 dB
	up to 7.5 GHz	30 dB
Power measurement		
Absolute measurement uncertainty	for CW signal at +23 °C, 0 dBm input, 0 dB attenuation for 2.4 GHz and 5 GHz ISM bands	± 0.5 dB
	for CW signal at +23 °C, 0 dBm input, 0 dB attenuation above 6 GHz	± 1,2 dB
VSWR	inband	< 1.8
	outband	< 3
Frequency response accuracy	at +23 °C	< 0.3 dB
Measurement error due to modulation		< 0.3 dB
Measurement error due to linearity		0.1 dB + 0.005 dB/dB
Resolution		0.01 dB
Measurement error due to temperature		0.025 dB/K
Sampling rate per channel		max. 10 Msample/s
Syncronization error port to port		< 100ns
Noise floor	2.4 GHz	< –48 dBm
	5 GHz	< –38 dBm
	above 6 GHz	< -28 dBm
Maximum measurement duration for a single port		100 s at 1 Msample/s
Signal bandwidth		< 320 MHz
Operating temperature range	overall system including R&S®OSP-B157W8 PLUS	+5 °C to +40 °C

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[2] In combination with R&S®OSP-B157WX.

R&S®OSP-B157WX frequency extension module for the R&S®TS8997

Number and type of relays		8 × SPDT, 2 × SP6T
Relay type		coaxial relay, 2.92 mm, K (f)
Frequency range		DC to 40 GHz
Relay impedance		50 Ω
Termination impedance		50 Ω external
Switching time		10 ms (nom.)
Current consumption (module)		max. 675 mA (+28 V DC)
Slot position		1, 2 front
Dimensions (W × H × D)		107.6 mm × 65.5 mm × 88.0 mm (4.24 in × 2.58 in × 3.46 in)
Weight		approx. 1 kg (2.20 lb)

RF characteristics

Type	Parameter	DC to 6 GHz	6 GHz to 12.4 GHz	12.4 GHz to 18 GHz	18 GHz to 26.5 GHz	26.5 GHz to 40 GHz
SPDT, ext. terminated, failsafe	VSWR	≤ 1.30	≤ 1.40	≤ 1.50	≤ 1.90	≤ 2.3
	insertion loss	< 1 dB	< 4 dB	< 5 dB	< 6 dB	< 9 dB
	isolation	≥ 70 dB	≥ 60 dB	≥ 60 dB	≥ 55 dB	≥ 50 dB
	average power	40 W	30 W	25 W	10 W	5 W
	number of switching cycles	1 million				

R&S®OSP-B157WN normalization extension module for the R&S®TS8997

Relay type		solid-state relay (SSR)
Frequency range	normalized measurements	400 MHz to 7.5 GHz
	conducted measurements	10 MHz to 13 GHz
Step attenuator range	maximum achievable attenuation depends on frequency	90 dB
Relay impedance		50 Ω
Termination impedance		50 Ω external
Switching time		10 ms (nom.)
Current consumption (module)		max. 800 mA (+28 V DC)
Dimensions (W × H × D)		217 mm × 66 mm × 132 mm (8.54 in × 2.60 in × 5.20 in)
Slot position		1, 2 and 3
Weight		approx. 1.2 kg (2.65 lb)

RF characteristics

Type	Parameter	2.4 GHz to 2.5 GHz	5.0 GHz to 5.85 GHz	5.85 GHz to 7.5 GHz
Conducted path (DUT to OUT)	insertion loss	< 2.8 dB	< 4.0 dB	< 6.0 dB
	maximum input power	1 W	1 W	1 W
Normalization path (ANT to OUT)	insertion loss	< 2.8 dB	< 4.5 dB	< 6.0 dB
	maximum input power	1 W	1 W	1 W

Ordering information

Designation	Type	Order No.
Main module		
Open switch and control platform	R&S®OSP150	1505.3009.15
Main module for R&S®OSP150 8-port synchronized multichannel high-resolution power meter and switching module for R&S®OSP150, with integrated RF power meter, solid-state RF switch and signal conditioning up to 7.5 GHz/18 GHz, for EMC and RF spectrum matters (ERM) measurements for R&S®TS8997 test system, incl. R&S®WMS32-WB software option	R&S®OSP-B157W8 PLUS	1527.1144.05
Accredited calibration for R&S®OSP150 with R&S®OSP-B157W8 PLUS in line with ISO 17025 and ISO 9001 certified, traceability to national and international standards	R&S®ACAOSP-B15	3598.1079.03
Scope of delivery: power cord, getting started guide, 50 Ω SMA type termination, SMA plug jack adapter		
Extension module		
Open switch and control platform	R&S®OSP220	1528.3105.02
Frequency extension module for R&S®OSP220 8-port RF switch matrix and signal conditioning module up to 40 GHz to be used with EMC and RF spectrum matters (ERM) measurements used in R&S®TS8997 test system	R&S®OSP-B157WX	1531.4909.02
Accredited calibration for R&S®OSP220 with R&S®OSP-B157WX in line with ISO 17025 and ISO 9001 certified, traceability to national and international standards	R&S®ACAOSP-B15	3598.3188.03
Scope of delivery: power cord, getting started guide, connection cables, USB 3.0 flash drive with calibration data		
Extension module		
Open switch and control platform	R&S®OSP220	1528.3105.02
Extension module for normalized measurements 8-port RF switch matrix and signal conditioning module to be used with R&S®OSP-B157W8 PLUS and R&S®OSP-B157WX for testing of single antenna equipment with no connectors/antenna ports available and a known max. EIRP in a normalized test fixture for the R&S®TS8997 test system.	R&S®OSP-B157WN	1531.5311.02
Accredited calibration for R&S®OSP220 with R&S®OSP-B157WN in line with ISO 17025 and ISO 9001 certified, traceability to national and international standards	R&S®ACAOSP-B15	3598.3188.03
Scope of delivery: power cord, getting started guide, connection cables, USB 3.0 flash drive with calibration data		

Service options		
Extended warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended warranty, two years	R&S®WE2	
Extended warranty, three years	R&S®WE3	
Extended warranty, four years	R&S®WE4	
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	
Extended warranty with calibration coverage, three years	R&S®CW3	
Extended warranty with calibration coverage, four years	R&S®CW4	
Documentation of calibration values	R&S®DCV-1	0240.2187.14

Extended warranty with a term of one to four years (WE1 to WE4)
Repairs carried out during the contract term are free of charge [3]. Necessary calibration and adjustments carried out during repairs are also covered. Simply contact the forwarding agent we name; your product will be picked up free of charge and returned to you in top condition a couple of days later.

Extended warranty with calibration (CW1 to CW4)
Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs [3] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

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[3] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

For the R&S®OSP open switch and control platform data sheets, see PD 5213.9928.22 and PD 5216.1340.22.
For the R&S®TS8997 regulatory test system for wireless devices product brochure, see PD 3606.8095.12.
For the R&S®TS8997 service level agreement for R&S®TS8997, see PD 3607.3351.32.
For the R&S®WMS32 wireless measurement system software data sheet, see PD 3607.4870.22.

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