

# SYNCHRONIZED MULTICHANNEL HIGH-RESOLUTION POWER METER AND SWITCHING MODULES

## Specifications

R&S®OSP-B157W8 PLUS

R&S®OSP-B157WX



Data Sheet  
Version 02.00

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# Definitions

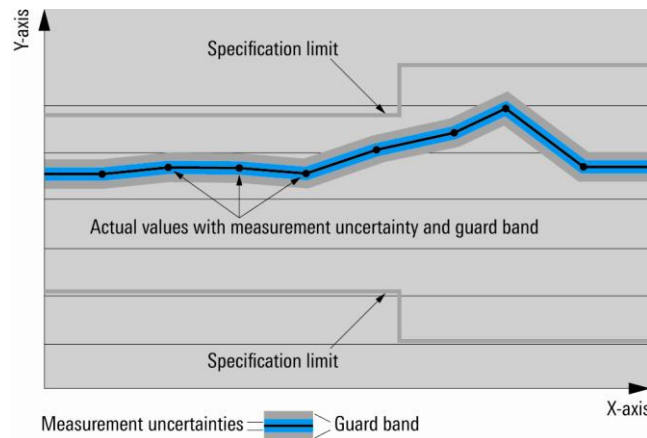
## General

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  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ,  $\pm$ , 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 with the R&S®OSP-B157W8 PLUS module and its frequency extension R&S®OSP220 with the R&S®OSP-B157WX.

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 and R&S®OSP-B157WX 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 base module. While the extension forwards lower frequency signals to the base module, it can bypass higher frequency signals to an appropriate measurement channel.

Both 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 open switch and control platform is referred to as “switch unit”.

## R&S®OSP150 with R&S®OSP-B157W8 PLUS

The R&S®OSP-B157W8 or R&S®OSP-B157W8 PLUS module is integrated in an R&S®OSP150 switch unit.



*R&S®OSP150 with R&S®OSP-B157W8 PLUS (front view)*

### Key features of the R&S®OSP-B157W8 PLUS base 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 switching for wireless test cases from 800 MHz to 7.5 GHz
- High dynamic range of step attenuator
- RF 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:

- An individually programmable attenuator
- An A/D converter for the power measurement results
- A power detector for synchronous RMS power measurement with high sampling rate and burst detection
- Solid-state switches, which enable the following:
  - 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

The R&S®OSP-B157WX module is integrated in an R&S®OSP220 switch unit.



*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 40 GHz 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 on 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)

# General data of the R&S®OSP platform

		R&S®OSP220	R&S®OSP150	
<b>Interfaces (front panel)</b>				
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 female connector
External trigger	input and output	2	–	BNC
Status display	display of TCP/IP address	1	–	black/white
<b>Interfaces (rear panel)</b>				
LAN	remote control via LAN	1	1	Ethernet RJ-45 connector (f), 10/100 Mbit/s
USB		1	–	USB 3.0, type A female connector
Protected memory slot	operating system	1	–	microSD card slot
<b>Environmental conditions</b>				
Temperature <sup>1</sup>	operating temperature range storage temperature range	0 °C to +50 °C –25 °C to +70 °C		
Damp heat		+40 °C, 90 % rel. humidity, constant, in line with EN 60068-2-30		
<b>Mechanical resistance</b>				
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		
<b>Power supply</b>				
Rated voltage		100 V to 240 V AC (± 10 %)		
Rated frequency		50 Hz to 60 Hz (± 10 %)		
Rated power	without modules	< 25 W		
Max. input power		1.5 A to 3.6 A (max. 310 VA)		
<b>Dimensions (W × H × D)</b>	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)		
<b>Weight</b>	R&S®OSP150 (without module)	approx. 4.5 kg (9.92 lb)		
	R&S®OSP220 (without module)	approx. 6.85 kg (15.1 lb)		
<b>Product conformity</b>				
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, cCSA <sub>UL</sub> certificate no.: 1960595		
RoHS	RoHS Directive 2011/65/EC	in line with EN 50581		

<sup>1</sup> 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®OSP220		1 × R&S®OSP-B157WX
	R&S®OSP150		1 × R&S®OSP-B157W8 PLUS
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 and R&S®OSP-B157WX modules are delivered optionally with a factory calibration in line with the standards of the German Calibration Service (DAkkS, formerly DKD). The calibration data is saved in the modules.

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 and R&S®OSP-B157WX	every 2 years unless otherwise specified

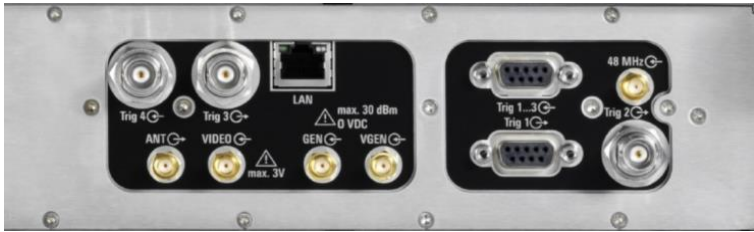
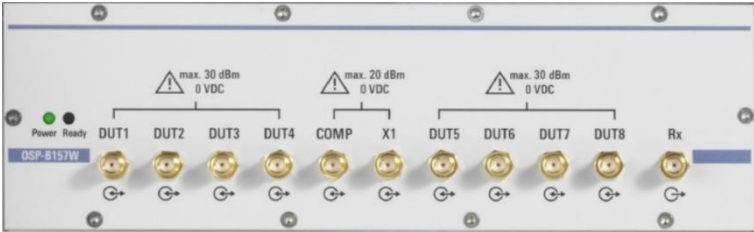



Rear view of the R&S®OSP-B157W8 PLUS basic module integrated in the R&S®OSP150



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

## 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  
OSP-B157WX	R&S®OSP module with RF switch matrix and signal conditioning up to 40 GHz	double-width module 

# Module specifications

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

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

<b>RF signal conditioning</b>		
Frequency range	overall system	30 MHz to 40 GHz <sup>2</sup>
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	800 MHz to 7.5 GHz, calibrated for complete frequency range
Number of DUT antenna ports		8
Maximum input power of R&S®OSP-B157W8		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
<b>Power measurement</b>		
Absolute measurement uncertainty	for CW signal at +23 °C, 0 dBm input, 0 dB attenuation	± 0.5 dB for 2.4 GHz and 5 GHz ISM bands
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
Synchronization error port to port		< 100ns
Noise floor	2.4 GHz	< -48 dBm
	5 GHz	< -38 dBm
Max. measurement duration		100 s at 1 Msample/s
Signal bandwidth		> 300 MHz
<b>Operating temperature range</b>	overall system and R&S®OSP-B157W8 PLUS	+5 °C to +40 °C

<sup>2</sup> 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 (ext.)
Switching time		10 ms (nom.)
Current consumption (module)		max. 675 mA (+28 V DC)
Dimensions (W × H × D)		107.6 mm × 65.5 mm × 88.0 mm (4.24 in × 2.58 in × 3.46 in)
Slot position		1, 2 front
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				

## Ordering information

Designation	Type	Order No.
<b>Basic module</b>		
Open switch and control platform	R&S®OSP150	1505.3009.15
Synchronized multichannel high-resolution power meter and switching module, 8-port R&S®OSP150 module 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, operating manual, 50 Ω SMA type termination, SMA plug jack adapter		
<b>Extension module</b>		
Open switch and control platform	R&S®OSP220	1528.3105.02
Frequency extension module 8-port R&S®OSP120 RF switch matrix and signal conditioning module up to 40 GHz for 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®ACAOSP220	3598.2746.03
Scope of delivery: power cord, getting started guide, operating manual, connection cables, USB 3.0 flash drive with calibration data		

<b>Service options</b>		
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, 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	0240.2187.14
Documentation of calibration values	R&S®DCV-1	

### Extended warranty with a term of one to four years (WE1 to WE4)

Repairs carried out during the contract term are free of charge <sup>3</sup>. 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 <sup>3</sup> and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

For the R&S®TS8997 regulatory test system for wireless devices product brochure, see PD 3606.8095.12.

For the R&S®WMS32 wireless measurement system software data sheet, see PD 3607.4870.22.

For the R&S®TS8997 service level agreement for R&S®TS8997, see PD 3607.3351.32.

For the R&S®OSP open switch and control platform data sheets, see PD 5213.9928.22 and PD 5216.1340.22.

## Certificates



The terms HDMI and HDMI High-Definition Multimedia Interface, and the HDMI Logo are trademarks or registered trademarks of HDMI Licensing LLC in the United States and other countries.

<sup>3</sup> Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.





## Service that adds value

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- ▶ Uncompromising quality
- ▶ Long-term dependability

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- ▶ Longevity and optimized total cost of ownership

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