R&S®FSMR3000 MEASURING RECEIVER

3 year warranty

Specifications

Data Sheet
Version 01.01

ROHDE&SCHWARZ
Make ideas real

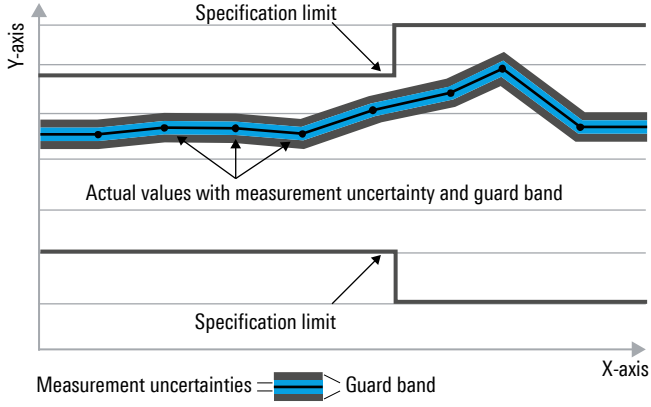
CONTENTS

Definitions

General
Product data applies under the following conditions:

- 3 hours storage at ambient temperature followed by 1 hour warm-up operation for all measurements with the exception of tuned RF level, where warm-up time is 4 hours
- 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.



Non-traceable specifications with limits (n. trc.)
Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

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 designated with the format “parameter: value”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP/3GPP2 standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bits per second (Gbps), million bits per second (Mbps), thousand bits per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

Specifications

Measuring receiver

Frequency

Frequency range	R&S®FSMR3008	
	DC coupled	100 kHz to 8 GHz
	AC coupled	10 MHz to 8 GHz
	R&S®FSMR3026	
	DC coupled	100 kHz to 26.5 GHz
	AC coupled	10 MHz to 26.5 GHz
	R&S®FSMR3050	
	DC coupled	100 kHz to 50 GHz
	AC coupled	10 MHz to 50 GHz
Reference frequency, internal		
Accuracy		±(time since last adjustment × aging rate + temperature drift + calibration accuracy)
Aging per year	standard	$\pm 1 \times 10^{-7}$
	with R&S®FSMR3-B4 OCXO precision frequency reference option	$\pm 3 \times 10^{-8}$
Temperature drift (0 °C to +50 °C)	standard	$\pm 1 \times 10^{-7}$
	with R&S®FSMR3-B4 OCXO precision frequency reference option	$\pm 1 \times 10^{-9}$
Achievable initial calibration accuracy	standard	$\pm 1 \times 10^{-8}$
	with R&S®FSMR3-B4 OCXO precision frequency reference option	$\pm 5 \times 10^{-9}$
Frequency counter measurements		
Frequency range		20 Hz to maximum frequency
Sensitivity	100 kHz to 26.5 GHz	–120 dBm
	26.5 GHz to 50 GHz	–100 dBm
Frequency counter resolution		0.001 Hz
Count accuracy	S/N > 25 dB	±(frequency × reference accuracy + ½ (last digit))

RF power measurements

The R&S®FSMR3000 performs absolute RF power measurements using power sensors connected to the R&S®FSMR3000. The absolute level measurement uncertainty is therefore based on the specifications of the corresponding power sensors. Please refer to the power sensor data sheets for details.

Tuned RF level measurements

The specifications in this section apply to a temperature range from +20 °C to +30 °C.

IF bandwidth		
Selectable IF bandwidths		1 Hz to 10 MHz in 1/2/3/5 sequence, 75 Hz
Level range		
Minimum to maximum power range with R&S®FSMR3-B24 option [1], RF preamplifier on	for RF input of R&S® FSMR3008, R&S®FSMR3026, IF bandwidth = 10 Hz	
	100 kHz to 2 MHz	–137 dBm to +30 dBm
	2 MHz to 10 MHz	–140 dBm to +30 dBm
	10 MHz to 3.1 GHz	–152 dBm to +30 dBm
	3.1 GHz to 19.2 GHz	–140 dBm to +30 dBm
	19.2 GHz to 26.5 GHz	–122 dBm to +30 dBm
	for RF input of R&S®FSMR3050, IF bandwidth = 10 Hz	
	100 kHz to 2 MHz	–137 dBm to +30 dBm
	2 MHz to 10 MHz	–140 dBm to +30 dBm
	10 MHz to 3.1 GHz	–150 dBm to +30 dBm
	3.1 GHz to 19.2 GHz	–140 dBm to +30 dBm
	19.2 GHz to 26.5 GHz	–123 dBm to +30 dBm
	26.5 GHz to 31.2 GHz	–136 dBm to +30 dBm
	31.2 GHz to 41 GHz	–126 dBm to +30 dBm
	41 GHz to 45 GHz	–118 dBm to +30 dBm
	45 GHz to 50 GHz	–110 dBm to +30 dBm

[1] For tuned RF level measurements, the R&S®FSMR3-B24 option is recommended. Without this option the minimum power is 25 dB higher.

Relative level measurement		
Residual noise threshold power [2]		minimum power + 30 dB
Linearity uncertainty		±(0.009 dB + 0.005 dB per 10 dB step)
Total measurement uncertainty	residual noise threshold to maximum power	±(0.015 dB + 0.005 dB per 10 dB step), (nom.)
	minimum power to residual noise threshold	< (cumulative error + 0.0012 × (input power – residual noise threshold power)[2])
	input level > +20 dBm	< ((power sensor level uncertainty at +20 dBm) + 0.1 dB)
Range to range level uncertainty	applies to RF range changes	
	100 kHz to 18 GHz	< 0.005 dB
	18 GHz to 40 GHz	< 0.015 dB
	40 GHz to 50 GHz	< 0.030 dB

Absolute level measurement uncertainties		
Absolute level measurement uncertainty of the R&S®FSMR3000 base unit	RF attenuation = 10 dB, RF preamplifier off, +20 °C to +30 °C	
	100 kHz ≤ f ≤ 8 GHz	< 1.0 dB (σ = 0.33 dB)
	8 GHz < f < 18 GHz	< 2.0 dB (σ = 0.67 dB)
	18 GHz ≤ f ≤ 50 GHz	< 3.0 dB (σ = 1.00 dB)
Absolute level measurement uncertainty for tuned RF level measurements in combination with power sensor		power sensor level uncertainty + relative level measurement uncertainty

AM/FM/PM modulation analysis

Amplitude modulation (AM)

Modulation rate	100 kHz ≤ RF < 10 MHz	10 Hz to 10 kHz
	10 MHz ≤ RF ≤ 50 GHz	10 Hz to 1 MHz
AM modulation depth		
Modulation range		0 % to 100 %
Modulation depth uncertainty	AF ≤ 100 kHz	< (0.2 % + 0.2 % of reading)
	AF ≤ 1 MHz	< (0.2 % + 1 % of reading)
Residual AM	demodulation bandwidth ≤ 200 kHz, RMS, mixer level ≥ –10 dBm [3], measurement bandwidth 30 Hz to 23 kHz	
	RF ≤ 8 GHz	< 0.005 %
	RF > 8 GHz	< 0.05 %
Inherent harmonic distortion	10 Hz ≤ AF ≤ 100 kHz	
	100 kHz ≤ RF < 8 GHz	< 0.1 %
	8 GHz ≤ RF ≤ 50 GHz	< 0.25 %
FM rejection (incidental AM)	RMS, modulation rate 400 Hz to 1 kHz, measurement bandwidth 3 kHz, demodulation bandwidth 200 kHz or 400 kHz, ADC pre-filter = WIDE, 10 MHz ≤ RF ≤ 8 GHz, FM deviation < 50 kHz	< 0.025 %

Frequency modulation (FM)

Modulation rate	100 kHz ≤ RF < 10 MHz	10 Hz to 10 kHz
	10 MHz ≤ RF ≤ 50 GHz	10 Hz to 5 MHz
FM deviation		
Maximum FM deviation (peak)	100 kHz ≤ RF < 10 MHz	50 kHz
	10 MHz ≤ RF < 1 GHz	5 MHz
	1 GHz ≤ RF ≤ 50 GHz	16 MHz
FM deviation uncertainty	AF ≤ 1 MHz, 3.3 × (AF + FM deviation) ≤ demodulation bandwidth ≤ 10 × (AF + FM deviation)	< 0.5 % × (AF + FM deviation) + 5 Hz
Inherent harmonic distortion	10 Hz ≤ AF ≤ 100 kHz, FM deviation ≤ 16 MHz	< 0.1 %
AM rejection (incidental FM)	AF ≤ 1 kHz, highpass 300 Hz, lowpass 3 kHz, modulation depth < 50 %	< 20 Hz

[2] The residual noise threshold is defined as the input power level at which the uncertainty switches from linearity dominated to noise dominated.

[3] Mixer level = signal level – RF attenuation + preamplifier gain.

Phase modulation (PM)

Modulation rate	100 kHz ≤ RF < 10 MHz	10 Hz to 10 kHz
	10 MHz ≤ RF ≤ 50 GHz	10 Hz to 5 MHz
Phase deviation		
PM deviation range		max. 10 000 rad and < 16 MHz / AF, whichever is smaller
Phase deviation uncertainty	AF ≤ 1 MHz and AF × (phase deviation + 1) ≤ 0.3 × demodulation bandwidth	< 0.5 % of reading + 0.002 rad
Inherent harmonic distortion	deviation ≤ 10 rad	
	10 Hz ≤ AF ≤ 100 kHz	< 0.1 %
	100 kHz < AF ≤ 1 MHz	< 0.5 %
AM rejection (incidental PM)	AF ≤ 1 kHz, highpass 300 Hz, lowpass 3 kHz, modulation depth < 50 %	< 0.02 rad

Distortion and noise

The distortion and noise measurement applies to the demodulated signal.

Distortion measurement		
Distortion display range		0.001 % to 100 % (–100 dB to 0 dB)
THD measurement uncertainty	fundamental frequency: 100 Hz to 100 kHz measurement bandwidth: 250 kHz or 10th harmonic, whichever is lower	< 0.5 dB (meas.)
SINAD measurement		
SINAD display range		100 dB to 0 dB
SINAD measurement uncertainty	measurement bandwidth: 100 Hz to 250 kHz, number of harmonics ≤ 10	< 0.5 dB (meas.)

Modulation filters

The modulation filters are applicable to the demodulated signal.

Lowpass filters		
3 kHz	flatness ≤ 3 kHz	< 1 %
15 kHz	flatness ≤ 15 kHz	< 1 %
30 kHz	flatness ≤ 30 kHz	< 1 %
80 kHz	flatness ≤ 80 kHz	< 1 %
300 kHz	flatness ≤ 300 kHz	< 1 %
Highpass filters		
50 Hz	flatness ≥ 50 Hz	< 1 %
300 Hz	flatness ≥ 300 Hz	< 1 %
400 Hz	flatness ≥ 400 Hz	< 1 %

Inputs and outputs

RF input		
Impedance		50 Ω
Connector	R&S®FSMR3008	N female
	R&S®FSMR3026	APC 3.5 mm male (compatible with SMA)
	R&S®FSMR3050	1.85 mm male (compatible with 2.4 mm)
VSWR		
R&S®FSMR3008	RF attenuation ≤ 4 dB	
	10 MHz ≤ f ≤ 8 GHz	typ. 1.87 [4]
	5 dB ≤ RF attenuation ≤ 9 dB	
	10 MHz ≤ f < 1 GHz	< 1.5, typ. 1.20 [4]
	10 MHz ≤ f < 3.6 GHz	< 1.5, typ. 1.31 [4]
	3.6 GHz ≤ f ≤ 8 GHz	< 2.0, typ. 1.51 [4]
	RF attenuation ≥ 10 dB	
	10 MHz ≤ f < 1 GHz	< 1.2, typ. 1.09 [4]
	1 GHz ≤ f < 3.6 GHz	< 1.5, typ. 1.19 [4]
	3.6 GHz ≤ f ≤ 8 GHz	< 2.0, typ. 1.42 [4]

[4] Typical VSWR performance: performance expected to be met in 95 % of the cases with a confidence level of 95 %, temperature +20 °C to +30 °C, input set to “DC coupled”. These values are not warranted and are subject to modification if a significant change in the statistical behavior of production instruments is observed.

RF input		
R&S®FSMR3026, R&S®FSMR3050	RF attenuation ≤ 4 dB	
	10 MHz ≤ f ≤ 26.5 GHz	typ. 1.87 [4]
	26.5 GHz < f ≤ 40 GHz	typ. 2.0 [4]
	40 GHz < f ≤ 50 GHz	2.0 (nom.)
	5 dB ≤ RF attenuation ≤ 9 dB	
	10 MHz ≤ f ≤ 3.5 GHz	< 1.5, typ. 1.24 [4]
	3.5 GHz < f ≤ 8 GHz	< 1.8, typ. 1.26 [4]
	8 GHz < f ≤ 18 GHz	< 1.8, typ. 1.39 [4]
	18 GHz < f ≤ 26.5 GHz	< 2.0, typ. 1.43 [4]
	26.5 GHz < f ≤ 40 GHz	< 2.5, typ. 1.8 [4]
	40 GHz < f ≤ 50 GHz	2.0 (nom.)
	RF attenuation ≥ 10 dB	
	10 MHz ≤ f ≤ 3.5 GHz	< 1.2, typ. 1.12 [4]
	3.5 GHz < f ≤ 8 GHz	< 1.5, typ. 1.19 [4]
	8 GHz < f ≤ 18 GHz	< 1.5, typ. 1.25 [4]
	18 GHz < f ≤ 26.5 GHz	< 2.0, typ. 1.37 [4]
	26.5 GHz < f ≤ 40 GHz	< 2.5, typ. 1.7 [4]
	40 GHz < f ≤ 50 GHz	2.0 (nom.)
Power sensors		see corresponding power sensor data sheet
Setting range of attenuator		0 dB to 75 dB, in 5 dB steps [5]

Maximum RF input level		
DC voltage	AC coupled	50 V
	DC coupled	0 V
CW RF power	RF attenuation = 0 dB	20 dBm (= 0.1 W)
	RF attenuation ≥ 10 dB	30 dBm (= 1 W)
Maximum pulse power, pulse duration τ = 3 µs	RF attenuation ≥ 10 dB	100 W
Maximum pulse voltage	RF attenuation ≥ 10 dB	50 V

Probe power supply		
Supply voltages		+15 V DC, –12.6 V DC and ground, max. 150 mA (nom.)

Noise source control		
Connector		BNC female
Output voltage		0 V/28 V, max. 100 mA, switchable (nom.)

Smart noise source control		
Connector		7-pin LEMOSA female for R&S®NRP-Zxx power sensors and R&S®FS-SNSxx smart noise sources

Power sensor		
Connector		6-pin LEMOSA female for R&S®NRP-Zxx power sensors

Trigger in/out		
Connector		BNC female
Impedance		50 Ω (nom.)

Reference input 1 MHz to 50 MHz		
Connector		BNC female
Impedance		50 Ω (nom.)
Input frequency range		1 MHz ≤ f_{in} ≤ 50 MHz, in 1 Hz steps
Required level		> 0 dBm

[5] With R&S®FSMR3-B1 option in spectrum analyzer mode: 0 dB to 79 dB, mechanical RF attenuator: 5 dB steps, electronic IF attenuator: 1 dB steps.

Reference input 100 MHz/1 GHz		
Connector		SMA female
Impedance		50 Ω (nom.)
Input frequency range		100 MHz, 1 GHz
Required level		0 dBm to 10 dBm

Reference output 10 MHz		
Connector		BNC female
Impedance		50 Ω (nom.)
Output frequency		10 MHz
Level		10 dBm (nom.)

Reference output 1 MHz to 50 MHz		
Connector		BNC female
Impedance		50 Ω (nom.)
Output frequency	internal reference	not active
	external reference	same as reference input signal
Level		same as reference input signal

Reference output 100 MHz		
Connector		SMA female
Impedance		50 Ω (nom.)
Output frequency		100 MHz
Level		6 dBm (nom.)

Reference output 640 MHz		
Connector		SMA female
Impedance		50 Ω (nom.)
Output frequency		640 MHz
Level		16 dBm (nom.)

IEC/IEEE bus control		
Command set		SCPI 1997.0
Connector		24-pin Amphenol female
Interface functions		SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C0

IF/VIDEO/DEMOD output (only supported with R&S®FSMR3-B1 option in spectrum analyzer mode)		
Connector		BNC female, 50 Ω (nom.)
IF out		
Bandwidth		equal to RBW setting
IF frequency		(RBW/2) to (240 MHz – RBW/2)
Output level	center frequency > 10 MHz, span = 0 Hz or I/Q analyzer on, signal at reference level and center frequency	0 dBm (nom.)
Video out		
Bandwidth		equal to VBW setting
Output scaling	logarithmic display scale	logarithmic
	linear display scale	linear
Output level	center frequency > 10 MHz, span = 0 Hz, signal at reference level and center frequency	1 V at 50 Ω load (nom.)

External monitor		
Connector		DVI-D, DisplayPort Rev 1.1

LAN interface		10/100/1000BASE-T
Connector		RJ-45

General data

Display		30.7 cm (12.1") WXGA color touchscreen
Resolution		1280 × 800 pixel (WXGA resolution)
Pixel failure rate		< 1 × 10^{-5}

Data storage		
Internal	standard	solid state disk ≥ 128 Gbyte
External		supports USB 2.0 compatible memory devices

Temperature		
Operating temperature range		+5 °C to +50 °C
Permissible temperature range		0 °C to +55 °C
Storage temperature range		–40 °C to +70 °C
Climatic loading	without condensation	+40 °C at 90 % rel. humidity, in line with EN 60068-2-30

Altitude		
Maximum operating altitude	above sea level	4600 m (approx. 15100 ft)

Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, displacement: 0.15 mm constant amplitude (1.8 g at 55 Hz); 55 Hz to 150 Hz, acceleration: 0.5 g constant, 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 MIL-STD-810E method no. 516.4, procedure I, MIL-PRF-28800F, class 3

EMC		IEC/EN 61326-1 [6, 7], IEC/EN 61326-2-1, CISPR 11/EN 55011 [6], IEC/EN 61000-3-2, IEC/EN 61000-3-3

Recommended calibration interval		1 year

Power supply		
AC input voltage range		100 V to 240 V
AC supply frequency		50 Hz to 60 Hz/400 Hz
Maximum input current		7.3 A to 4.6 A (100 V to 240 V)
Power consumption	R&S®FSMR3008	
	without options	150 W (meas.)
	with all options	250 W (meas.)
	R&S®FSMR3026	
	without options	175 W (meas.)
	with all options	275 W (meas.)
	R&S®FSMR3050	
	without options	200 W (meas.)
	with all options	300 W (meas.)
Safety		in line with IEC 61010-1, EN 61010-1, UL 61010-1, CAN/CSA-C22.2 No. 61010-1
Test mark		VDE, $_{C}$CSA$_{US}$

[6] Emission limits for class A equipment.

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

Dimensions and weight		
Dimensions (nom.)	W × H × D, including front handles and rear feet	462 mm × 240 mm × 504 mm (18.15 in × 9.44 in × 19.81 in)
Net weight (nom.)	R&S®FSMR3008, with all options	22 kg (52.9 lb)
	R&S®FSMR3026, with all options	24 kg (52.9 lb)
	R&S®FSMR3050, with all options	24.5 kg (54 lb)

R&S®FSMR3-B1 spectrum analyzer measurements

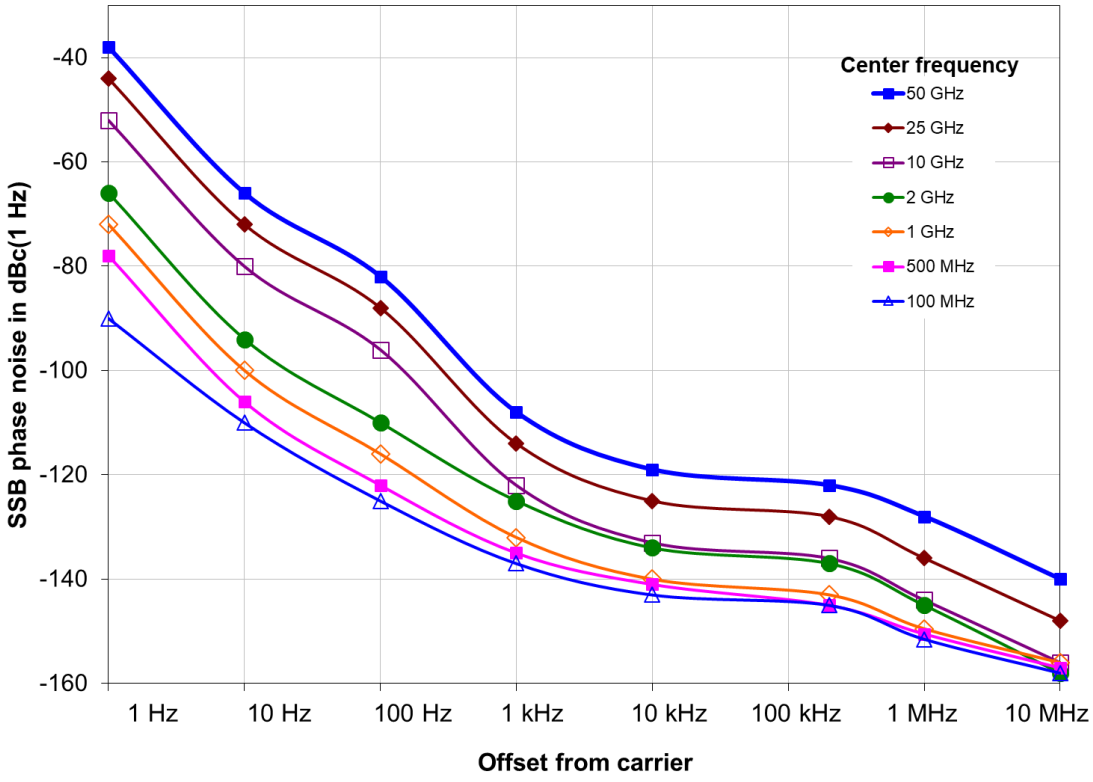
The following specifications apply for operation of the R&S®FSMR3000 in spectrum analyzer mode unless otherwise stated.

Frequency

Frequency range	R&S®FSMR3008	
	DC coupled	2 Hz to 8 GHz
	AC coupled	10 MHz to 8 GHz
	R&S®FSMR3026	
	DC coupled	2 Hz to 26.5 GHz
	AC coupled	10 MHz to 26.5 GHz
	R&S®FSMR3050	
	DC coupled	2 Hz to 50 GHz
	AC coupled	10 MHz to 50 GHz
Frequency resolution		0.01 Hz
Reference frequency, internal		see section Measuring receiver

Frequency readout		
Marker resolution		1 Hz
Uncertainty		±(marker frequency × reference accuracy + 10 % × resolution bandwidth + ½ (span / (sweep points – 1)) + 1 Hz)
Number of sweep (trace) points	default value	1001
	range	101 to 100001
Marker tuning frequency step size	marker step size = sweep points	span / (sweep points – 1)
	marker step size = standard	span / (default sweep points – 1)
Frequency counter resolution		0.001 Hz
Count accuracy		±(frequency × reference accuracy + ½ (last digit))
Display range for frequency axis		0 Hz, 10 Hz to maximum frequency
Resolution		0.1 Hz
Maximum span deviation		±0.1 %

Spectral purity		
SSB phase noise	frequency = 1000 MHz, carrier offset	
	10 Hz, without R&S®FSMR3-B4 option	–80 dBc (1 Hz) (nom.)
	10 Hz, with R&S®FSMR3-B4 option	–95 dBc (1 Hz) (nom.)
	100 Hz	–106 dBc (1 Hz), typ. –112 dBc (1 Hz)
	1 kHz	< –125 dBc (1 Hz), typ. –130 dBc (1 Hz)
	10 kHz	< –134 dBc (1 Hz), typ. –138 dBc (1 Hz)
	100 kHz	< –136 dBc (1 Hz), typ. –140 dBc (1 Hz)
	1 MHz	< –145 dBc (1 Hz), typ. –149 dBc (1 Hz)
	10 MHz	–156 dBc (1 Hz) (nom.)
Residual FM	frequency = 1000 MHz, RBW = 1 kHz, sweep time = 100 ms	< 0.1 Hz (nom.)



Typical phase noise at different center frequencies in spectrum analyzer mode (with R&S®FSMR3-B4 option for offsets ≤ 10 Hz)

Sweep time

Sweep time range	span = 0 Hz	1 µs to 16000 s
	span ≥ 10 Hz	3 µs to 16000 s [8]
Sweep time accuracy	span = 0 Hz, sweep points ≤ 10001	±0.1 % (nom.)
	span ≥ 10 Hz	±3 % (nom.)

Resolution bandwidths

Sweep filters and FFT filters		
Resolution bandwidths (–3 dB)	standard	1 Hz to 10 MHz in 1/2/3/5 sequence, 3.9 kHz, 6.25 kHz additionally
	with R&S®FSMR3-B8E option	20 MHz, 40 MHz additionally
	with R&S®FSMR3-B8 option	20 MHz, 40 MHz, 50 MHz, 80 MHz additionally
Bandwidth uncertainty		< 3 % (nom.)
Shape factor 60 dB:3 dB		< 5 (nom.)

Video bandwidths	standard	1 Hz to 10 MHz in 1/2/3/5 sequence
	with R&S®FSMR3-B8E option	20 MHz, 40 MHz additionally [9]
	with R&S®FSMR3-B8 option	20 MHz, 40 MHz, 50 MHz, 80 MHz additionally [9]

Signal analysis bandwidth	standard	10 MHz (nom.)
	with R&S®FSMR3-B80 option	80 MHz (nom.)

[8] The selected sweep time is the net data acquisition time (without the extra time needed for hardware settling or FFT processing).

[9] For video bandwidth settings > 20 MHz, the video bandwidth filter is bypassed.

Level

Level display		
Display range		displayed noise floor up to +30 dBm
Logarithmic level axis		1 dB to 200 dB, in steps of 1/2/5
Linear level axis		10 % of reference level per level division, 10 divisions or logarithmic scaling
Number of traces		6
Trace detector		max. peak, min. peak, auto peak (normal), sample, RMS, average
Trace functions		clear/write, max. hold, min. hold, average, view
Setting range of reference level		–130 dBm to (–10 dBm + RF attenuation – RF preamplifier gain), in steps of 0.01 dB
Units of level axis	logarithmic level display	dBm, dBµV, dBmV, dBµA, dBpW
	linear level display	µV, mV, µA, mA, pW, nW

Intermodulation

1 dB compression of input mixer (two-tone)	RF attenuation = 0 dB, RF preamplifier off	
	f_{in} ≤ 3 GHz	+15 dBm (nom.)
	3 GHz < f_{in} ≤ 8 GHz	+10 dBm (nom.)
	f_{in} > 8 GHz	+7 dBm (nom.)
	with R&S®FSMR3-B24 option, RF attenuation = 0 dB, RF preamplifier on	
	f_{in} ≤ 3 GHz	–13 dBm (nom.)
	3 GHz < f_{in} ≤ 8 GHz	–20 dBm (nom.)
	f_{in} > 8 GHz	–23 dBm (nom.)
Third-order intercept point (TOI)	RF attenuation = 0 dB, level = –15 dBm (both), ∆f > 5 × RBW, YIG preselector on, RF preamplifier off	
	f_{in} < 10 MHz	28 dBm (nom.)
	10 MHz ≤ f_{in} < 1 GHz	> 25 dBm, typ. 30 dBm
	1 GHz ≤ f_{in} < 3 GHz	> 20 dBm, typ. 25 dBm [10]
	3 GHz ≤ f_{in} < 8 GHz	> 17 dBm, typ. 20 dBm
	8 GHz ≤ f_{in} < 10 GHz	> 8 dBm
	10 GHz ≤ f_{in} ≤ 50 GHz	> 10 dBm
	R&S®FSMR3008 with R&S®FSMR3-B24 option, RF attenuation = 0 dB, level = –50 dBm (both), ∆f > 5 × RBW, YIG preselector on, RF preamplifier on	
	10 MHz ≤ f_{in} < 1 GHz	–10 dBm (nom.)
	1 GHz ≤ f_{in} < 8 GHz	–13 dBm (nom.)
	R&S®FSMR3026 with R&S®FSMR3-B24 option, RF attenuation = 0 dB, level = –50 dBm (both), ∆f > 5 × RBW, YIG preselector on, RF preamplifier on	
	10 MHz ≤ f_{in} < 1 GHz	–10 dBm (nom.)
	1 GHz ≤ f_{in} < 8 GHz	–13 dBm (nom.)
	8 GHz ≤ f_{in} ≤ 26.5 GHz	–15 dBm (nom.)
	R&S®FSMR3050 with R&S®FSMR3-B24 option, RF attenuation = 0 dB, level = –55 dBm (both), ∆f > 5 × RBW, YIG preselector on, RF preamplifier on	
	10 MHz ≤ f_{in} < 1 GHz	–5 dBm (nom.)
	1 GHz ≤ f_{in} < 4 GHz	–10 dBm (nom.)
	f_{in} > 4 GHz	–20 dBm (nom.)
Second-harmonic intercept point (SHI)	RF attenuation = 0 dB, level = –5 dBm, YIG preselector on, RF preamplifier off	
	1 MHz < f_{in} ≤ 500 MHz	45 dBm (nom.)
	500 MHz < f_{in} < 1.5 GHz [11]	47 dBm (nom.)
	500 MHz < f_{in} < 1.5 GHz [12]	52 dBm (nom.)
	1.5 GHz ≤ f_{in} ≤ 4 GHz	62 dBm (nom.)
	4 GHz < f_{in} ≤ 25 GHz	65 dBm (nom.)
	with R&S®FSMR3-B24 option, RF attenuation = 0 dB, level = –50 dBm, YIG preselector on, RF preamplifier on	
	50 MHz < f_{in} ≤ 21.75 GHz	10 dBm (nom.)

[10] With R&S®FSMR3-B13 highpass filter option, highpass off. With highpass on, the TOI degrades by 5 dB (nom.).

[11] Without R&S®FSMR3-B13 highpass filter option or highpass off.

[12] With R&S®FSMR3-B13 highpass filter option, highpass on.

Sensitivity

All noise level data in this section not marked as typical (typ.) or nominal (nom.) are specified values whose compliance is ensured by testing.

Displayed average noise level		
RF preamplifier off	RF attenuation = 0 dB, termination = 50 Ω, normalized to 1 Hz RBW, trace average, average mode log, sample detector, +5 °C to +40 °C	
	2 Hz ≤ f ≤ 100 Hz	–103 dBm
	100 Hz < f ≤ 1 kHz	–120 dBm
	1 kHz < f < 9 kHz	–135 dBm
	RF attenuation = 0 dB, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 1 Hz, +5 °C to +40 °C, YIG preselector on	
	9 kHz ≤ f ≤ 1 MHz	–145 dBm
	1 MHz < f ≤ 1 GHz	–149 dBm
	1 GHz < f < 3 GHz [13]	–150 dBm
	1 GHz < f < 3 GHz [14]	–153 dBm
	3 GHz ≤ f < 8 GHz	–150 dBm
	8 GHz ≤ f < 13.6 GHz	–148 dBm
	13.6 GHz ≤ f < 18 GHz	–147 dBm
	18 GHz ≤ f < 25 GHz	–145 dBm
	25 GHz ≤ f ≤ 34 GHz	–140 dBm
	34 GHz < f ≤ 40 GHz	–137 dBm
	40 GHz < f ≤ 43.5 GHz	–135 dBm
	43.5 GHz < f ≤ 47 GHz	–133 dBm
	47 GHz < f ≤ 49 GHz	–131 dBm
	49 GHz < f ≤ 50 GHz	–129 dBm
R&S®FSMR3008 RF preamplifier = 30 dB	RF attenuation = 0 dB, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 1 Hz, +5 °C to +40 °C, YIG preselector on	
	10 MHz < f ≤ 60 MHz	–160 dBm
	60 MHz < f ≤ 3 GHz	–165 dBm
	3 GHz < f ≤ 8 GHz	–162 dBm
R&S®FSMR3026 RF preamplifier = 30 dB	RF attenuation = 0 dB, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 1 Hz, +5 °C to +40 °C, YIG preselector on	
	100 kHz < f ≤ 60 MHz	–160 dBm
	60 MHz < f ≤ 3 GHz	–165 dBm
	3 GHz < f ≤ 18 GHz	–162 dBm
	18 GHz < f ≤ 23 GHz	–160 dBm
	23 GHz < f ≤ 26.5 GHz	–156 dBm
R&S®FSMR3050 RF preamplifier = 30 dB	RF attenuation = 0 dB, termination = 50 Ω, log. scaling, normalized to 1 Hz RBW, RBW = 1 kHz, VBW = 1 Hz, +5 °C to +40 °C, YIG preselector on	
	100 kHz < f ≤ 60 MHz	–160 dBm
	60 MHz < f ≤ 3 GHz	–165 dBm
	3 GHz < f ≤ 8 GHz	–160 dBm
	8 GHz < f ≤ 18 GHz	–162 dBm
	18 GHz < f ≤ 26.5 GHz	–160 dBm
	26.5 GHz < f ≤ 40 GHz	–158 dBm
	R&S®FSMR3-B24 option, model .49	
	40 GHz < f ≤ 43 GHz	–157 dBm
	43 GHz < f ≤ 50 GHz	–149 dBm
	R&S®FSMR3-B24 option, model .50	
	40 GHz < f ≤ 43.5 GHz	–157 dBm
	43.5 GHz < f ≤ 47 GHz	–155 dBm
	47 GHz < f ≤ 50 GHz	–153 dBm
Improvement with noise cancellation	for noise-like signals	
	100 kHz < f ≤ 43 GHz	13 dB (nom.)
	f > 43 GHz	0 dB (nom.)

[13] Without R&S®FSMR3-B13 highpass filter option or highpass off.

[14] With R&S®FSMR3-B13 highpass filter option, highpass on.

Spurious responses

Spurious responses	YIG preselector on for f ≥ 8 GHz, mixer level ≤ –10 dBm [15], sweep optimization: auto or dynamic	
Image response	f_{in} – 2 × 8997 MHz (1st IF)	< –90 dBc
	f_{in} – 2 × 1317 MHz (2nd IF)	< –90 dBc
	f_{in} – 2 × 37 MHz (3rd IF)	< –90 dBc
	f_{in} = external interfering signal frequency	
Intermediate frequency response	f_{in} = 1st IF (8997 MHz)	< –90 dBc
	f_{in} = 2nd IF (1317 MHz)	< –90 dBc
	f_{in} = 3rd IF (37 MHz)	< –90 dBc
	f_{in} = external interfering signal frequency	
Residual spurious response	RF attenuation = 0 dB	
	f ≤ 1 MHz	< –90 dBm
	1 MHz < f ≤ 8900 MHz	< –110 dBm
	8900 MHz < f ≤ 26.5 GHz	< –100 dBm
	26.5 GHz < f ≤ 50 GHz	< –100 dBm
	with R&S®FSMR3-B60 option	
	26.5 GHz < f ≤ 50 GHz	< –90 dBm
	f = receive frequency	
Local oscillators related spurious	f_{in} < 1 GHz	
	10 Hz ≤ offset from carrier < 200 Hz	< –90 dBc
	offset from carrier > 200 Hz	< –100 dBc
	f_{in} ≥ 1 GHz	
	10 Hz ≤ offset from carrier < 200 Hz	< –90 dBc + 20 log (f_{in}/GHz)
	offset from carrier > 200 Hz	< –100 dBc + 20 log (f_{in}/GHz)
Vibrational environmental stimuli	max. 0.21 g (RMS)	< –60 dBc + 20 log (f_{in}/GHz) (nom.)

Level measurement uncertainty

Absolute level uncertainty	RBW = 10 kHz, level = –10 dBm, reference level = –10 dBm, RF attenuation = 10 dB	
	f = 64 MHz	< 0.2 dB (σ = 0.07 dB)
Frequency response, referenced to 64 MHz, YIG preselector on	RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB, RF preamplifier off, +20 °C to +30 °C	
	2 Hz ≤ f < 9 kHz	< 1 dB (nom.)
	9 kHz ≤ f < 10 MHz	< 0.45 dB (σ = 0.17 dB)
	10 MHz ≤ f < 3.6 GHz	< 0.35 dB (σ = 0.12 dB)
	3.6 GHz ≤ f ≤ 8 GHz	< 0.6 dB (σ = 0.20 dB)
	8 GHz < f < 22 GHz, span < 1 GHz	< 1.5 dB (σ = 0.50 dB)
	22 GHz ≤ f ≤ 26.5 GHz, span < 1 GHz	< 2 dB (σ = 0.67 dB)
	26.5 GHz < f ≤ 50 GHz, span < 1 GHz	< 2.5 dB (σ = 0.83 dB)
	any RF attenuation, +15 °C to +40 °C	
	2 Hz ≤ f < 9 kHz	< 1 dB (nom.)
	9 kHz ≤ f < 3.6 GHz	< 0.6 dB (σ = 0.20 dB)
	3.6 GHz ≤ f ≤ 8 GHz	< 0.8 dB (σ = 0.27 dB)
	8 GHz < f < 22 GHz, span < 1 GHz	< 2 dB (σ = 0.67 dB)
	22 GHz ≤ f ≤ 26.5 GHz, span < 1 GHz	< 2.5 dB (σ = 0.83 dB)
	26.5 GHz < f ≤ 50 GHz, span < 1 GHz	< 3 dB (σ = 1.0 dB)
	RF attenuation ≤ 20 dB, RF preamplifier on, +20 °C to +30 °C	
	10 MHz ≤ f < 3.6 GHz	< 0.6 dB (σ = 0.2 dB)
	3.6 GHz ≤ f ≤ 8 GHz	< 0.8 dB (σ = 0.27 dB)
	8 GHz < f < 22 GHz, span < 1 GHz	< 2 dB (σ = 0.67 dB)
	22 GHz ≤ f ≤ 26.5 GHz, span < 1 GHz	< 2.5 dB (σ = 0.83 dB)
	26.5 GHz < f ≤ 50 GHz, span < 1 GHz	< 3 dB (σ = 1.0 dB)
Frequency response, referenced to 64 MHz, YIG preselector off	RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB, RF preamplifier off, +20 °C to +30 °C, electronic attenuator off	
	f < 8 GHz	same values as with preselector on
	8 GHz ≤ f < 22 GHz	< 1.5 dB (σ = 0.5 dB)
	22 GHz ≤ f ≤ 26.5 GHz	< 2 dB (σ = 0.6 dB)
	26.5 GHz < f ≤ 50 GHz, span < 1 GHz	< 2.5 dB (σ = 0.83 dB)
	any RF attenuation or electronic attenuator on, +15 °C to +40 °C	
	f < 8 GHz	same values as with preselector on
	8 GHz ≤ f < 22 GHz	< 2 dB (σ = 0.6 dB)
	22 GHz ≤ f ≤ 26.5 GHz	< 2.5 dB (σ = 0.75 dB)
	26.5 GHz < f ≤ 50 GHz, span < 1 GHz	< 3 dB (σ = 1.0 dB)

[15] Mixer level = signal level – RF attenuation + preamplifier gain.

	RF attenuation ≤ 20 dB, RF preamplifier on, +20 °C to +30 °C	
	f < 8 GHz	same values as with preselector on
	8 GHz ≤ f < 22 GHz	< 2 dB (σ = 0.6 dB)
	22 GHz ≤ f ≤ 26.5 GHz	< 2.5 dB (σ = 0.75 dB)
	26.5 GHz < f ≤ 50 GHz, span < 1 GHz	< 3 dB (σ = 1.0 dB)
Attenuator switching uncertainty	f = 64 MHz, 0 dB to 70 dB, referenced to 10 dB attenuation	< 0.2 dB (σ = 0.07 dB)
Uncertainty of reference level setting	input mixer level ≤ –15 dBm	0 dB [16]
	input mixer level > –15 dBm	< 0.1 dB (nom.)
Bandwidth switching uncertainty	referenced to RBW = 10 kHz, f = 64 MHz	< 0.2 dB (σ = 0.08 dB)

Nonlinearity of displayed level		
Logarithmic level display	S/N > 16 dB, 0 dB ≤ level ≤ –70 dB	< 0.1 dB (σ = 0.04 dB)
	S/N > 16 dB, –70 dB < level ≤ –90 dB	< 0.2 dB (σ = 0.08 dB)
Linear level display	S/N > 16 dB, 0 dB to –70 dB	< 5 % of reference level (nom.)

Total measurement uncertainty		
YIG preselector on	signal level = 0 dB to –70 dB below reference level, S/N > 20 dB, sweep time = auto, RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB, RF preamplifier off, electronic attenuator off, span/RBW < 100, 95 % confidence level, +20 °C to +30 °C	
	9 kHz ≤ f ≤ 10 MHz	±0.37 dB
	10 MHz < f ≤ 3.6 GHz	±0.30 dB
	3.6 GHz < f ≤ 8 GHz	±0.44 dB
	8 GHz < f ≤ 22 GHz	±1.4 dB
	22 GHz < f ≤ 26.5 GHz	±1.7 dB
	26.5 GHz < f ≤ 50 GHz	±2.5 dB
YIG preselector off	signal level = 0 dB to –70 dB below reference level, S/N > 20 dB, sweep time = auto, RF attenuation = 10 dB, 20 dB, 30 dB, 40 dB, RF preamplifier off, electronic attenuator off, span/RBW < 100, 95 % confidence level, +20 °C to +30 °C	
	8 GHz ≤ f ≤ 22 GHz	±1.0 dB
	22 GHz < f ≤ 26.5 GHz	±1.2 dB
	26.5 GHz < f ≤ 50 GHz	±1.7 dB

Trigger functions

Trigger		
Trigger source	spectrum analysis	free run, video, external, IF power, RF power
Trigger offset	span ≥ 10 Hz	5 ns to 20 s
	span = 0 Hz	(–sweep time) to 20 s
Minimum trigger offset resolution	span > 0 Hz	5 ns
	span = 0 Hz, trigger offset > 0	5 ns
	span = 0 Hz, trigger offset < 0	sweep time/number of sweep points
Maximum deviation of trigger offset		5 ns
IF power trigger		
Sensitivity	minimum signal power	–60 dBm + RF attenuation – RF preamplifier gain (nom.)
	maximum signal power	–10 dBm + RF attenuation – RF preamplifier gain (nom.)
IF power trigger bandwidth	RBW > 500 kHz	20 MHz (nom.) [17]
	RBW ≤ 500 kHz, FFT	20 MHz (nom.)
	RBW ≤ 500 kHz, swept	6 MHz (nom.)
RF power trigger		
Sensitivity	minimum signal power	–30 dBm + RF attenuation – RF preamplifier gain (nom.)
	maximum signal power	+10 dBm + RF attenuation – RF preamplifier gain (nom.)
RF power trigger frequency range	f ≤ 8 GHz	8 GHz (nom.)
	f > 8 GHz	center frequency ± 250 MHz (nom.) [18]

[16] The reference level setting affects only the graphical representation of the measurement result on the display, not the measurement itself. The reference level setting causes no additional uncertainty in measurement results.

[17] Sweep optimization = auto.

[18] YIG preselector off for f ≥ 8 GHz.

Gated sweep		
Gate source		video, external, IF power, RF power
Gate delay		5 ns to 20 s, min. resolution 5 ns
Gate length		5 ns to 20 s, min. resolution 5 ns
Maximum deviation of gate length		±5 ns

I/Q data

The following specifications apply for operation of the R&S®FSMR3000 in I/Q mode unless otherwise stated.

Memory length		max. 440 Msample I and Q
Word length of I/Q samples	sampling rate > 100 MHz or number of samples > 300 Msample	18 bit
	otherwise	24 bit
Sampling rate		100 Hz to 200 MHz
Maximum signal analysis bandwidth (equalized)	standard	10 MHz
	with R&S®FSMR3-B80 option	80 MHz (nom.) [18]

Signal analysis bandwidth ≤ 80 MHz		
Amplitude flatness	(1.25 × signal analysis bandwidth) ≤ f_{center} < 8 GHz	±0.3 dB (nom.)
	f_{center} ≥ 8 GHz, YIG preselector off	±0.5 dB (nom.)
Deviation from linear phase	(1.25 × signal analysis bandwidth) ≤ f_{center} < 8 GHz	±1° (nom.)
	f_{center} ≥ 8 GHz, YIG preselector off	±2° (nom.)
Level display nonlinearity		see Nonlinearity of displayed level
Level measurement uncertainty		see Total measurement uncertainty, YIG preselector off
Third-order intermodulation distortion		see Third-order intercept point (TOI)
ADC related spurious response	mixer level = –30 dBm [19]	
	analysis bandwidth < 17 MHz	–100 dBc (nom.)
	17 MHz ≤ analysis bandwidth < 80 MHz	–80 dBc (nom.)
Other spurious responses		see section Spurious responses

R&S®FSMR3-B13 highpass filters

Frequency		
Frequency range	filter 1	1 GHz to 1.75 GHz
	filter 2	1.75 GHz to 3 GHz

Stopband attenuation		
500 MHz to 875 MHz	filter 1	> 20 dB (nom.)
875 MHz to 1.5 GHz	filter 2	> 20 dB (nom.)

R&S®FSMR3-B24 RF preamplifier

Frequency		
	R&S®FSMR3008	100 kHz to 8 GHz
	R&S®FSMR3026	100 kHz to 26.5 GHz
	R&S®FSMR3050	100 kHz to 50 GHz

Setting range		
RF preamplifier gain	R&S®FSMR3008, R&S®FSMR3026	15 dB (nom.), 30 dB (nom.) (selectable)
	R&S®FSMR3050	30 dB (nom.)

[19] Level of a tone at the input mixer (also abbreviated as “mixer level”) = signal level – RF attenuation + preamplifier gain.

R&S®FSMR3-B60 phase noise and amplitude noise measurements

Phase noise measurements

Measurement results		• SSB phase noise • spurious signals • integrated RMS phase deviation • residual FM • time jitter
Offset frequency range	input signal ≤ 3.33 GHz	10 mHz to 30 % of carrier frequency
	input signal > 3.33 GHz	10 mHz to 1 GHz
Signal level range	level setting = high	–20 dBm to +30 dBm
	level setting = low	–40 dBm to +30 dBm
Number of traces		6
Phase noise measurement uncertainty	DUT phase noise ≥ 15 dB above phase noise sensitivity of R&S®FSMR3-B60 [20]	
	10 mHz ≤ offset < 1 MHz	< 1.5 dB
	1 MHz ≤ offset ≤ 30 MHz	< 2 dB
	offset > 30 MHz	< 3 dB
Level measurement uncertainty	–20 dBm ≤ signal level ≤ 15 dBm, +20 °C to +30 °C	
	1 MHz ≤ signal frequency < 8 GHz	< 1 dB
	8 GHz ≤ signal frequency < 18 GHz	< 2 dB
	18 GHz ≤ signal frequency	< 3 dB
Spurious level	f_{in} < 1 GHz	
	10 Hz ≤ offset from carrier < 1 kHz	< –90 dBc
	offset from carrier ≥ 1 kHz	< –100 dBc
	f_{in} ≥ 1 GHz	
	10 Hz ≤ offset from carrier < 1 kHz	< –90 dBc + 20 log (f_{in}/GHz)
	offset from carrier ≥ 1 kHz	< –100 dBc + 20 log (f_{in}/GHz)
AM suppression	10 mHz < offset < 1 MHz	40 dB (nom.)
	1 MHz ≤ offset ≤ 30 MHz, level setting = high	30 dB (nom.)
	1 MHz ≤ offset ≤ 10 MHz, level setting = low	30 dB (nom.)

Phase noise sensitivity with R&S®FSMR3-B60 cross correlation (low phase noise)

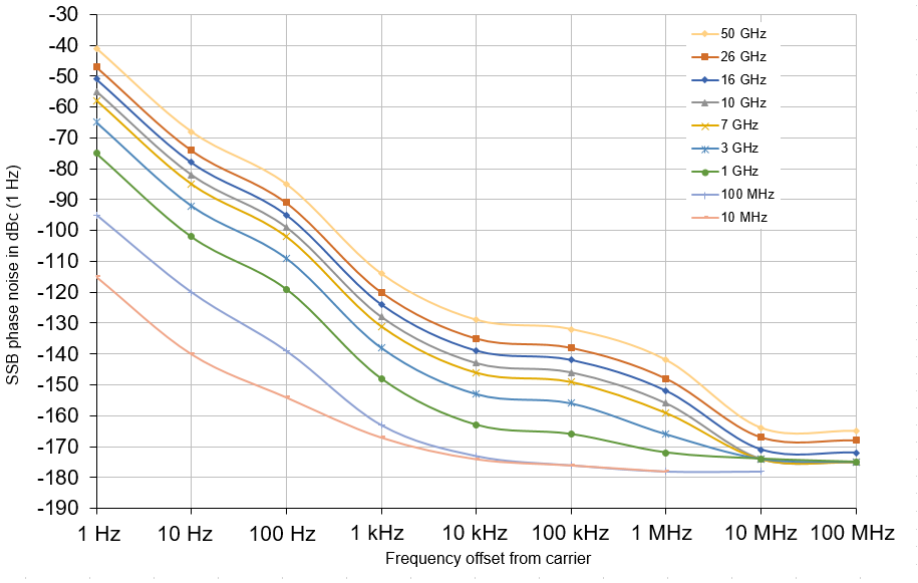
Start offset = 1 Hz, correlation factor = 1, frequency reference: internal, internal reference loop bandwidth = 30 Hz, signal level ≥ 10 dBm [21], +20 °C to +30 °C, specified values in dBc (1 Hz), numbers in brackets are typical values in dBc (1 Hz)

RF input frequency	Offset frequency from the carrier								
	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz	30 MHz
1 MHz	(–115)	(–140)	–140 (–146)	–158 (–164)	–170 (–176)	–170 (–176)			
10 MHz	(–115)	(–140)	–140 (–146)	–158 (–164)	–170 (–176)	–170 (–176)	–170 (–176)		
100 MHz	(–95)	(–120)	–133 (–139)	–157 (–163)	–167 (–173)	–170 (–176)	–172 (–178)	–172 (–178)	–172 (–178)
1 GHz	(–75)	(–102)	–113 (–119)	–142 (–148)	–157 (–163)	–160 (–166)	–167 (–173)	–168 (–174)	–168 (–174)
3 GHz	(–65)	(–92)	–103 (–109)	–132 (–138)	–147 (–153)	–150 (–156)	–160 (–166)	–168 (–174)	–168 (–174)
7 GHz	(–58)	(–85)	–96 (–102)	–125 (–131)	–140 (–146)	–143 (–149)	–153 (–159)	–168 (–174)	–168 (–174)
10 GHz	(–55)	(–82)	–93 (–99)	–122 (–128)	–137 (–143)	–140 (–146)	–150 (–156)	–168 (–174)	–168 (–174)
16 GHz	(–51)	(–78)	–89 (–95)	–118 (–124)	–133 (–139)	–136 (–142)	–146 (–152)	–165 (–171)	–165 (–171)
26 GHz	(–47)	(–74)	–85 (–91)	–114 (–120)	–129 (–135)	–132 (–138)	–142 (–148)	–161 (–167)	–161 (–167)
50 GHz	(–41)	(–68)	–79 (–85)	–108 (–114)	–123 (–129)	–126 (–132)	–136 (–142)	–158 (–164)	–158 (–164)

[20] The phase noise sensitivity improvement due to the number of cross correlations is included. For DUT phase noise between 6 dB and 15 dB above phase noise sensitivity of the R&S®FSMR3000, add 1 dB of uncertainty.

[21] For signal levels below 10 dBm the broadband noise floor is limited to nominal (–172 dBm – (signal level in dBm)) dBc (1 Hz), whereas the close in phase noise is not affected. Example: with a signal level of –10 dBm the nominal broadband noise floor is –162 dBc (1 Hz).

Improvement of phase noise sensitivity by number of correlations (with R&S®FSMR3-B60 option)				
	Correlations, offset frequencies ≥ 1 Hz [22]			
	10	100	1000	10 000
Improvement	5 dB	10 dB	15 dB	20 dB



Typical phase noise sensitivity with R&S®FSMR3-B60 and R&S®FSMR3-B4
(start offset = 1 Hz, correlation factor = 1, signal level = 10 dBm)

Measurement speed, nominal values

Auto freq = off, correlation factor set to ≥ 10, measurement times normalized to correlation factor = 1			
Span	**Bandwidth in % of offset**		
	30 %	**10 %**	**3 %**
1 Hz to 1 MHz	7 s	8 s	25 s
1 kHz to 1 MHz	0.03 s	0.04 s	0.07 s

To obtain the measurement time for a given number of correlations (without automatic signal frequency search), multiply the above figures by the number of correlations.

AM noise measurements

Offset frequency range	input signal ≤ 100 MHz	10 mHz to 30 % of carrier frequency
	input signal > 100 MHz	10 mHz to 30 MHz
AM noise measurement uncertainty	10 mHz < offset < 1 MHz	< 2 dB
	1 MHz ≤ offset ≤ 30 MHz	< 2.5 dB
Level measurement uncertainty	–20 dBm ≤ signal level ≤ +15 dBm, +20 °C to +30 °C	
	1 MHz ≤ signal frequency < 8 GHz	< 1 dB
	8 GHz ≤ signal frequency < 18 GHz	< 2 dB
	18 GHz ≤ signal frequency	< 3 dB
FM rejection (incidental AM)	RMS, modulation rate 400 Hz to 1 kHz, measurement bandwidth 50 Hz to 15 kHz, FM deviation < 40 kHz	< 0.3 %
Inherent residual AM (RMS)	residual AM bandwidths: 0.3 kHz to 3 kHz or 0.03 kHz to 20 kHz	< 0.02 %

[22] For offset frequencies below 1 Hz the improvement impact of correlation is limited by the coupling between the two R&S®FSMR3000 local oscillators. The improvement achievable in this case ranges from 15 dB (nom.) at 0.1 Hz frequency offset to 3 dB (nom.) at a frequency offset ≤ 30 mHz.

AM noise sensitivity

Start offset 1 Hz, correlations = 1, signal level ≥ 10 dBm [21], specified values in dBc (1 Hz), for typical values subtract 6 dB									
RF input frequency	**Offset frequency from the carrier**								
	1 Hz	**10 Hz**	**100 Hz**	**1 kHz**	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**	**30 MHz**
100 MHz ≤ f ≤ 1 GHz	–102	–117	–132	–147	–155	–165	–165	–165	–165
1 GHz < f ≤ 12 GHz	–97	–112	–127	–142	–152	–160	–165	–165	–165
12 GHz < f ≤ 18 GHz	–87	–102	–117	–132	–147	–160	–165	–165	–165
18 GHz < f ≤ 33 GHz	–77	–92	–107	–122	–137	–150	–160	–165	–165
33 GHz < f ≤ 50 GHz	–67	–82	–97	–112	–127	–140	–150	–160	–160

Improvement of AM noise sensitivity by number of correlations				
	Correlations			
	10	**100**	**1000**	**10 000**
Improvement	5 dB	10 dB	15 dB	20 dB

R&S®FSMR3-B65 LO inputs for residual phase noise measurements

With the R&S®FSMR3-B65 option, the R&S®FSMR3000 provides two auxiliary LO inputs to support the use of external signal sources. This allows residual phase noise measurements with two or three DUTs frequency translating or non-frequency translating.

Residual phase noise measurements

Frequency range	R&S®FSMR3008	100 MHz to 8 GHz
	R&S®FSMR3026, R&S®FSMR3050	100 MHz to 18 GHz
Offset frequency range		10 mHz to 30 MHz
Measurement uncertainty		< 2 dB (nom.)
Required LO drive level per input	level setting = low	
	100 MHz ≤ signal frequency < 12 GHz	–5 dBm
	12 GHz ≤ signal frequency < 16 GHz	0 dBm
	16 GHz ≤ signal frequency ≤ 18 GHz	+5 dBm
	level setting = high	
	100 MHz ≤ signal frequency < 12 GHz	+5 dBm
	12 GHz ≤ signal frequency < 16 GHz	+7 dBm
	16 GHz ≤ signal frequency ≤ 18 GHz	+10 dBm
Input level measurement uncertainty	–20 dBm ≤ signal level ≤ +15 dBm, +20 °C to +30 °C	
	1 MHz ≤ signal frequency < 8 GHz	< 1.5 dB
	8 GHz ≤ signal frequency ≤ 18 GHz	< 2 dB

Residual phase noise sensitivity

Start offset 1 Hz, correlation factor = 10, signal level ≥ 10 dBm, values in dBc (1 Hz) measured with a low phase noise reference [23]								
RF input frequency	**Offset frequency from the carrier**							
	1 Hz	**10 Hz**	**100 Hz**	**1 kHz**	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**
100 MHz	–125	–136	–150	–160	–170	–173	–175	–177
500 MHz	–118	–135	–148	–160	–175	–175	–175	–175
10 GHz	–100	–112	–124	–140	–150	–160	–160	–160

Residual AM noise sensitivity

Start offset 1 Hz, correlation factor = 10, signal level ≥ 10 dBm, values in dBc (1 Hz) measured with a low phase noise reference [23]								
RF input frequency	**Offset frequency from the carrier**							
	1 Hz	**10 Hz**	**100 Hz**	**1 kHz**	**10 kHz**	**100 kHz**	**1 MHz**	**10 MHz**
100 MHz	–114	–125	–140	–155	–168	–175	–175	–175
10 GHz	–106	–115	–130	–140	–150	–160	–165	–165

LO inputs

Inputs		
LO aux input, channel 1	SMA (f), 50 Ω	max. input level +20 dBm
LO aux input, channel 2	SMA (f), 50 Ω	max. input level +20 dBm

[23] Explanation of measured values: see Definitions.

R&S®FSMR3-K980 health and utilization monitoring service (HUMS)

Health and utilization monitoring service (HUMS) [24, 25]		
Interfaces	protocols and interfaces supported for data readout and display	• SNMP (v1, v2c, v3) • REST (JSON) • SCPI • device web
Services	information provided	• device information (model, serial number, BIOS, date, time, system, HUMS and software information) • user-defined information tags (e.g. for asset management) • equipment information (hardware, options, software, licenses) • system operating status • instrument security information • service related information (due dates etc.) • mass storage related information • instrument utilization data • device history (event log)

[24] For details, see application note: www.rohde-schwarz.com/appnote/GFM336

[25] For use with common available asset management tools.

Ordering information

Designation	Type	Order No.
Measuring receiver, 100 kHz to 8 GHz	R&S®FSMR3008	1345.4004.08
Measuring receiver, 100 kHz to 26.5 GHz	R&S®FSMR3026	1345.4004.26
Measuring receiver, 100 kHz to 50 GHz	R&S®FSMR3050	1345.4004.50
Accessories supplied		
Power cable, quick start guide; for R&S®FSMR3026: coaxial adapter, 3.5 mm (f) to 3.5 mm (f), APC3.5-compatible; for R&S®FSMR3050: coaxial adapter, 1.85 mm (f) to 1.85 mm (f)		

Options

Designation	Type	Order No.	Retro fittable	Remarks
Spectrum analyzer, 2 Hz to 8 GHz	R&S®FSMR3-B1	1345.3050.08	no	for R&S®FSMR3008, ex-factory
Spectrum analyzer, 2 Hz to 26 GHz	R&S®FSMR3-B1	1345.3050.26	no	for R&S®FSMR3026, ex-factory
Spectrum analyzer, 2 Hz to 50 GHz	R&S®FSMR3-B1	1345.3050.50	no	for R&S®FSMR3050, ex-factory
OCXO, precision frequency reference	R&S®FSMR3-B4	1345.3072.02	yes	user-retrofittable
Resolution bandwidth up to 80 MHz	R&S®FSMR3-B8	1345.3166.26	no	for R&S®FSMR3008 and R&S®FSMR3026, R&S®FSMR3-B1 option required
Resolution bandwidth up to 80 MHz	R&S®FSMR3-B8	1345.3166.50	no	for R&S®FSMR3050, R&S®FSMR3-B1 option required; contact service center
Resolution bandwidth up to 40 MHz	R&S®FSMR3-B8E	1345.3372.02	yes	R&S®FSMR3-B1 option required user-retrofittable
External generator control	R&S®FSMR3-B10	1345.3089.02	yes	contact service center
Highpass filter	R&S®FSMR3-B13	1345.3395.02	yes	user-retrofittable
Spare solid-state drive (removable hard drive)	R&S®FSMR3-B18	1345.3095.02	yes	user-retrofittable
RF preamplifier, 100 kHz to 8 GHz	R&S®FSMR3-B24	1345.3108.08	yes	
RF preamplifier, 100 kHz to 26.5 GHz	R&S®FSMR3-B24	1345.3108.26	yes	
RF preamplifier, 100 kHz to 50 GHz	R&S®FSMR3-B24	1345.3108.49	yes	no export license required
RF preamplifier, 100 kHz to 50 GHz	R&S®FSMR3-B24	1345.3108.50	yes	export license required
80 MHz analysis bandwidth	R&S®FSMR3-B80	1345.3608.02	yes	user-retrofittable
Phase noise analyzer with cross correlation, 1 MHz to 8 GHz	R&S®FSMR3-B60	1345.3114.08	no	for R&S®FSMR3008, ex-factory includes R&S®FSMR3-B4
Phase noise analyzer with cross correlation, 1 MHz to 26 GHz	R&S®FSMR3-B60	1345.3114.26	no	for R&S®FSMR3026, ex-factory includes R&S®FSMR3-B4
Phase noise analyzer with cross correlation, 1 MHz to 50 GHz	R&S®FSMR3-B60	1345.3114.50	no	for R&S®FSMR3050, ex-factory includes R&S®FSMR3-B4
LO inputs for residual phase noise measurements	R&S®FSMR3-B65	1345.3120.02	yes	R&S®FSMR3-B60 option required

Firmware

Designation	Type	Order No.	Remarks
Pulse measurement application	R&S®FSMR3-K6	1345.3137.02	R&S®FSMR3-B1 option required
AM/FM/PM modulation analysis	R&S®FSMR3-K7	1345.3389.02	R&S®FSMR3-B1 option required
VOR/ILS measurements	R&S®FSMR3-K15	1345.3143.02	R&S®FSMR3-B1 option required
Noise figure measurements	R&S®FSMR3-K30	1345.3637.02	R&S®FSMR3-B1 option required, R&S®FSMR3-B24 option recommended
Phase noise measurements	R&S®FSMR3-K40	1345.3620.02	R&S®FSMR3-B1 option required
Vector signal analysis application	R&S®FSMR3-K70	1345.3150.02	R&S®FSMR3-B1 option required
Multi-modulation analysis	R&S®FSMR3-K70M	1345.1211.02	R&S®FSMR3-B1 and R&S®FSMR3-K70 options required
BER PRBS measurements	R&S®FSMR3-K70P	1345.1228.02	R&S®FSMR3-B1 and R&S®FSMR3-K70 options required
Health and utilization monitoring service (HUMS)	R&S®FSMR3-K980	1350.6718.02	

Recommended extras

Designation	Type	Order No.
IEC/IEEE bus cable, length: 1 m	R&S®PCK	0292.2013.10
IEC/IEEE bus cable, length: 2 m	R&S®PCK	0292.2013.20
19" rack adapter	R&S®ZZA-KN5	1175.3040.00
Front cover	R&S®ZZF-511	1174.8825.00
Noise sources		
Smart noise sources for noise figure and gain measurement up to 55 GHz (requires R&S®FSMR3-K30)	R&S®FS-SNS18/26/40/55	1338.8008.xx (xx = 18/26/40/55)
Matching pads, 50 Ω/75 Ω		
L section, matching at both ends	R&S®RAM	0358.5414.02
Series resistor, 25 Ω, matching at one end (considered in instrument function RF INPUT 75 Ω)	R&S®RAZ	0358.5714.02
High-power attenuators		
100 W, 3/6/10/20/30 dB, 1 GHz	R&S®RBU100	1073.8495.xx (xx = 03/06/10/20/30)
50 W, 3/6/10/20/30 dB, 2 GHz	R&S®RBU50	1073.8695.xx (xx = 03/06/10/20/30)
50 W, 20 dB, 6 GHz	R&S®RDL50	1035.1700.52
Connectors and cables		
Coaxial adapter, 1.85 mm (f) to 1.85 mm (f)		3588.9654.00
Coaxial semi-rigid cable, 1.85 mm (m) to 1.85 mm (m), length: 90 mm, U shape		1325.1251.00
Coaxial adapter, 1.85 mm (f) to 2.92 mm (f)		3628.4728.02
Coaxial adapter, 2.92 mm (f) to 2.92 mm (f)		3588.8664.00
Coaxial adapter, 3.5 mm (f) to 3.5 mm (f), APC3.5-compatible		3689.9442.00
Coaxial adapter, 3.5 mm (m) to 3.5 mm (m), APC3.5-compatible		3587.7770.00
Coaxial adapter, N (f) to 3.5 mm (m), APC3.5-compatible		3587.7806.00
Coaxial adapter, N (f) to 3.5 mm (f), APC3.5-compatible		3587.7829.00
Coaxial adapter, N (m) to 3.5 mm (f), APC3.5-compatible		3587.7835.00
Coaxial cable, SMA (m) to SMA (m), length: 1 m		3586.9970.00
Connectors and cables		
Probe power connector, 3-pin		1065.9480.00
N type adapter for R&S®RT-Zxx oscilloscope probes	R&S®RT-ZA9	1417.0909.02
DC block		
DC block, 10 kHz to 18 GHz (N type)	R&S®FSE-Z4	1084.7443.02
Tools		
Torque wrench for N type connectors, 1.5 Nm coupling torque (for R&S®FSW8/13)	R&S®ZN-ZTW	1328.8534.71
Torque wrench for 3.5/2.92/2.4/1.85 mm connectors, 0.9 Nm coupling torque (for R&S®FSW26/43/50/67)	R&S®ZN-ZTW	1328.8534.35
Torque wrench for 1.0 mm connectors, 0.23 Nm coupling torque (for R&S®FSW85)	R&S®ZN-ZTW	1328.8534.11

Supported power sensors [26]

Designation	Type	Order No.
Universal power sensors		
10 MHz to 8 GHz, 100 mW, 2-path	R&S®NRP-Z211	1417.0409.02
10 MHz to 8 GHz, 200 mW	R&S®NRP-Z11	1138.3004.02
10 MHz to 18 GHz, 100 mW, 2-path	R&S®NRP-Z221	1417.0309.02
10 MHz to 18 GHz, 200 mW	R&S®NRP-Z21	1137.6000.02
10 MHz to 18 GHz, 2 W	R&S®NRP-Z22	1137.7506.02
10 MHz to 18 GHz, 15 W	R&S®NRP-Z23	1137.8002.02
10 MHz to 18 GHz, 30 W	R&S®NRP-Z24	1137.8502.02
Power sensor modules with power splitter [27]		
DC to 18 GHz, 500 mW	R&S®NRP-Z27	1169.4102.02
DC to 26.5 GHz, 500 mW	R&S®NRP-Z37	1169.3206.02

[26] For average power measurement only.

[27] N (m) to 3.5 mm (f) coaxial adapter needed for R&S®FSMR3008, 3.5 mm (f) to 3.5 mm (f) coaxial adapter needed for R&S®FSMR3026 and 1.85 mm (f) to 2.92 mm (f) coaxial adapter needed for R&S®FSMR3050.

Designation	Type	Order No.
Thermal power sensors		
0 Hz to 18 GHz, 100 mW	R&S®NRP18T	1424.6115.02
0 Hz to 18 GHz, 100 mW	R&S®NRP18TN	1424.6121.02
0 Hz to 33 GHz, 100 mW	R&S®NRP33T	1424.6138.02
0 Hz to 33 GHz, 100 mW	R&S®NRP33TN	1424.6144.02
0 Hz to 40 GHz, 100 mW	R&S®NRP40T	1424.6150.02
0 Hz to 40 GHz, 100 mW	R&S®NRP40TN	1424.6167.02
0 Hz to 50 GHz, 100 mW	R&S®NRP50T	1424.6173.02
0 Hz to 50 GHz, 100 mW	R&S®NRP50TN	1424.6180.02
0 Hz to 67 GHz, 100 mW	R&S®NRP67T	1424.6196.02
0 Hz to 67 GHz, 100 mW	R&S®NRP67TN	1424.6209.02
0 Hz to 110 GHz, 100 mW	R&S®NRP110T	1424.6215.02
Average power sensors		
8 kHz to 6 GHz, 200 mW	R&S®NRP6A	1424.6796.02
8 kHz to 6 GHz, 200 mW	R&S®NRP6AN	1424.6809.02
9 kHz to 6 GHz, 2 W	R&S®NRP-Z92	1171.7005.02
8 kHz to 18 GHz, 200 mW	R&S®NRP18A	1424.6815.02
8 kHz to 18 GHz, 200 mW	R&S®NRP18AN	1424.6821.02
Three-path diode power sensors		
100 pW to 200 mW, 10 MHz to 8 GHz	R&S®NRP8S	1419.0006.02
100 pW to 200 mW, 10 MHz to 8 GHz, LAN version	R&S®NRP8SN	1419.0012.02
100 pW to 200 mW, 10 MHz to 18 GHz	R&S®NRP18S	1419.0029.02
100 pW to 200 mW, 10 MHz to 18 GHz, LAN version	R&S®NRP18SN	1419.0035.02
100 pW to 200 mW, 10 MHz to 33 GHz	R&S®NRP33S	1419.0064.02
100 pW to 200 mW, 10 MHz to 33 GHz, LAN version	R&S®NRP33SN	1419.0070.02
100 pW to 100 mW, 50 MHz to 40 GHz	R&S®NRP40S	1419.0041.02
100 pW to 100 mW, 50 MHz to 40 GHz, LAN version	R&S®NRP40SN	1419.0058.02
Wideband power sensor		
50 MHz to 18 GHz, 100 mW	R&S®NRP-Z81	1137.9009.02

Warranty		
Base unit		3 years
All other items [28]		1 year
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 with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	
Extended warranty with accredited calibration coverage, one year	R&S®AW1	
Extended warranty with accredited calibration coverage, two years	R&S®AW2	

Extended warranty with a term of one and two years (WE1 and WE2)
Repairs carried out during the contract term are free of charge [29]. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration coverage (CW1 and CW2)
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 [29] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

Extended warranty with accredited calibration (AW1 and AW2)
Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated under accreditation, inspected and maintained during the term of the contract. It includes all repairs [29] and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

[28] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.
[29] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.