R&S®CMA180
Radio Test Set
Specifications

ROHDE&SCHWARZ

Test&Measurement

Data Sheet | 05.00

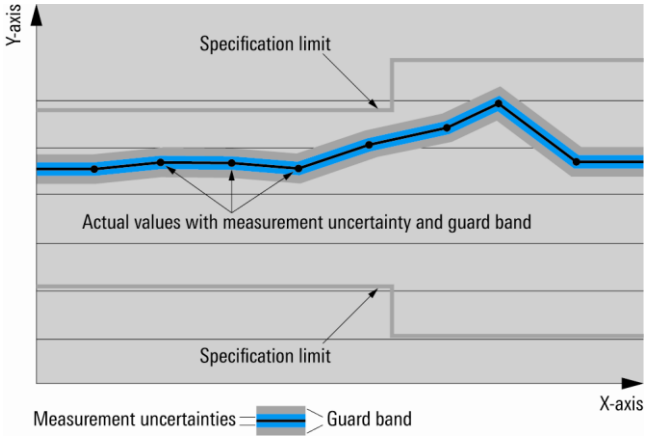
CONTENTS

Definitions

General
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 15 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

The R&S®CMA180 radio test set is a compact tester for analog radios. It is equipped with a high-performance RF generator, RF analyzer, AF generator and AF analyzer and features advanced interfaces. Its future-ready hardware concept also permits testing of digital radios.

An arbitrary waveform generator (ARB) allows the generation of complex RF signals, an I/Q recorder allows offline analysis.
Tests of navigation systems are supported with VOR/ILS- and GPS-generator signals.
The automation of tests is facilitated by the R&S®CMArun test sequencer.

Designed for high performance, usability and portability, the R&S®CMA180 is the right choice for development, production and service applications.

General technical specifications

RF generator

Frequency range		0.1 MHz to 3000 MHz
Frequency resolution		1 Hz
Frequency uncertainty		same as timebase + frequency resolution

Output level range		
RF COM with high-power attenuator	0.1 MHz to 30 MHz	
	continuous wave (CW)	–141 dBm to –17 dBm
	peak envelope power (PEP)	up to –17 dBm
	overranging (PEP)	up to –13 dBm
	30 MHz to 2000 MHz	
	continuous wave (CW)	–141 dBm to –15 dBm
	peak envelope power (PEP)	up to –15 dBm
	overranging (PEP)	up to –9 dBm
	2000 MHz to 3000 MHz	
	continuous wave (CW)	–120 dBm to –20 dBm
	peak envelope power (PEP)	up to –20 dBm
	overranging (PEP)	up to –13 dBm
RF COM without high-power attenuator	0.1 MHz to 30 MHz	
	continuous wave (CW)	–128 dBm to 0 dBm
	peak envelope power (PEP)	up to 0 dBm
	overranging (PEP)	up to 4 dBm
	30 MHz to 2000 MHz	
	continuous wave (CW)	–128 dBm to 2 dBm
	peak envelope power (PEP)	up to 2 dBm
	overranging (PEP)	up to 8 dBm
	2000 MHz to 3000 MHz	
	continuous wave (CW)	–120 dBm to –3 dBm
	peak envelope power (PEP)	up to –3 dBm
	overranging (PEP)	up to 4 dBm
RF OUT	0.1 MHz to 30 MHz	
	continuous wave (CW)	–120 dBm to 8 dBm
	peak envelope power (PEP)	up to 8 dBm
	overranging (PEP)	up to 12 dBm
	30 MHz to 2000 MHz	
	continuous wave (CW)	–120 dBm to 10 dBm
	peak envelope power (PEP)	up to 10 dBm
	overranging (PEP)	up to 16 dBm
	2000 MHz to 3000 MHz	
	continuous wave (CW)	–112 dBm to 5 dBm
	peak envelope power (PEP)	up to 5 dBm
	overranging (PEP)	up to 12 dBm

Output level uncertainty	in temperature range from +20 °C to +35 °C, no overranging	
RF COM	output level > –120 dBm	
	0.1 MHz to 1 MHz	< 1.2 dB
	1 MHz to 2000 MHz	< 0.7 dB
	2000 MHz to 2700 MHz	< 1.2 dB
	2700 MHz to 3000 MHz	< 1.5 dB
RF OUT	output level > –112 dBm	
	0.1 MHz to 1 MHz	< 1.2 dB
	1 MHz to 2000 MHz	< 0.7 dB
	2000 MHz to 2700 MHz	< 1.2 dB
	2700 MHz to 3000 MHz	< 1.5 dB

Output level uncertainty	in temperature range from 0 °C to +50 °C [1], no overranging	
RF COM	output level > –120 dBm	
	0.1 MHz to 1 MHz	< 2.0 dB
	1 MHz to 2000 MHz	< 1.0 dB
	2000 MHz to 2700 MHz	< 2.0 dB
	2700 MHz to 3000 MHz	< 2.0 dB
RF OUT	output level > –112 dBm	
	0.1 MHz to 1 MHz	< 2.0 dB
	1 MHz to 2000 MHz	< 1.0 dB
	2000 MHz to 2700 MHz	< 2.0 dB
	2700 MHz to 3000 MHz	< 2.0 dB

Output level linearity with fixed RF output attenuator setting (digital gain)	in temperature range from +20 °C to +35 °C, level range 0 dB to –30 dB	
RF COM	no overranging	< 0.2 dB, < 0.1 dB (typ.)

Output level resolution		0.01 dB
Output level repeatability	typical values after 1 h warm-up time, always returning to same level and frequency, no temperature change, insignificant time change	< 0.02 dB

Output level setting range	possible settings in the HMI, specifications not warranted	
RF COM with high-power attenuator	0.1 MHz to 3000 MHz	–158 dBm to –9 dBm
RF COM without high-power attenuator	0.1 MHz to 3000 MHz	–141 dBm to 8 dBm
RF OUT	0.1 MHz to 3000 MHz	–133 dBm to 16 dBm

RF power overload protection		
RF COM with high-power attenuator ("RF COM connector attenuation" in setup menu)	max. allowed input power for continuous operation	100 W
	max. allowed input power for 1 min (typ.), at T_{amb} ≤ +25 °C, recovery time necessary	150 W
	shutdown (open)	when thermal overload is detected
RF COM without high-power attenuator ("RF COM connector attenuation" in setup menu)	max. allowed input power	1 W (typ.)
	shutdown (open)	when voltage overload is detected
RF IN	max. allowed input power	100 mW/+20 dBm
	shutdown (short)	when voltage overload is detected
RF OUT	max. allowed reverse input power	20 mW/+13 dBm
	shutdown (short)	when voltage overload is detected

Shutdown: All three connectors are shut down simultaneously; RF COM is switched to open, and RF IN and RF OUT are switched to short.

VSWR		
RF COM with high-power attenuator	0.1 MHz to 2000 MHz	< 1.2
	2000 MHz to 2700 MHz	< 1.7
	2700 MHz to 3000 MHz	< 2.0
RF COM without high-power attenuator	0.1 MHz to 2000 MHz	< 1.4
	2000 MHz to 2700 MHz	< 1.4
	2700 MHz to 3000 MHz	< 2.0
RF OUT	0.1 MHz to 2000 MHz	< 1.53
	2000 MHz to 2700 MHz	< 1.53
	2700 MHz to 3000 MHz	< 1.53

RF OUT is switched to short when off.

[1] With HD (R&S®CMA-S052B): +5 °C to +45 °C.

Attenuation of second harmonics		
RF COM with high-power attenuator	0.1 MHz to 3000 MHz, P < –27 dBm	> 30 dB
RF COM without high-power attenuator	0.1 MHz to 3000 MHz, P < –10 dBm	> 30 dB
RF OUT	0.1 MHz to 3000 MHz, P < –2 dBm	> 30 dB

Attenuation of third harmonics		
RF COM with high-power attenuator	0.1 MHz to 3000 MHz, P < –27 dBm	> 40 dB
RF COM without high-power attenuator	0.1 MHz to 3000 MHz, P < –10 dBm	> 40 dB
RF OUT	0.1 MHz to 3000 MHz, P < –2 dBm	> 40 dB

Attenuation of nonharmonics	for full-scale CW signal	
RF COM, RF OUT, with/without high-power attenuator	0.1 MHz to 30 MHz	> 60 dB
	30 MHz to 2000 MHz, except $f_{nonharmonic}$ = 2659.9375 MHz – $f_{carrier}$, except $f_{nonharmonic}$ = 2 × $f_{carrier}$ – 2659.9375 MHz, except $f_{nonharmonic}$ = 2659.9375 MHz	> 55 dB
	2000 MHz to 3000 MHz, except $f_{nonharmonic}$ = 7362.5 MHz – 2 × $f_{carrier}$, except $f_{nonharmonic}$ = 2 × $f_{carrier}$ – 3681.25 MHz, except $f_{nonharmonic}$ = 4702.5625 MHz – $f_{carrier}$	> 45 dB

Nonharmonics, absolute		
RF COM with high-power attenuator	harmonics of 24.576 MHz and 25 MHz, except 175 MHz, 225 MHz, 275 MHz, 325 MHz, 375 MHz	< –130 dBm
	175 MHz, 225 MHz, 275 MHz, 325 MHz, 375 MHz	< –120 dBm
	harmonics of 800 MHz	< –130 dBm
	920.3125 MHz and 1840.625 MHz	< –130 dBm
	2760.9375 MHz	< –115 dBm

Phase noise	single sideband, 0.1 MHz to 30 MHz	
	10 kHz offset from carrier	< –130 dBc (1 Hz)
	100 kHz offset from carrier	< –130 dBc (1 Hz)
	3 MHz offset from carrier	< –133 dBc (1 Hz)
	single sideband, 30 MHz to 890 MHz	
	10 kHz offset from carrier	< –113 dBc (1 Hz)
	100 kHz offset from carrier	< –115 dBc (1 Hz)
	3 MHz offset from carrier	< –130 dBc (1 Hz)
	single sideband, 890 MHz to 3000 MHz	
	10 kHz offset from carrier	< –110 dBc (1 Hz)
	100 kHz offset from carrier	< –110 dBc (1 Hz)
	3 MHz offset from carrier	< –122 dBc (1 Hz)

Residual FM	CCITT, RMS	
	0.1 MHz to 30 MHz	< 2 Hz
	30 MHz to 2000 MHz	< 3 Hz
	2000 MHz to 3000 MHz	< 5 Hz

Residual PM	CCITT, RMS	
	0.1 MHz to 30 MHz	< 0.5 mrad
	30 MHz to 2000 MHz	< 5 mrad
	2000 MHz to 3000 MHz	< 5 mrad

Residual AM	CCITT, RMS	
	0.1 MHz to 30 MHz	< 0.05 %
	30 MHz to 2000 MHz	< 0.1 %
	2000 MHz to 3000 MHz	< 0.1 %

Modulation

Modulation		CW (off), AM, FM, FM stereo, PM, SSB USB, SSB LSB, ARB

Amplitude modulation

Source		internal modulation source, external AF1 IN, AF2 IN, external SPDIF IN
AM depth	range	0 % to 100 %
	resolution	0.1 %
	uncertainty, internal source	< 1 %
	uncertainty, external source	< 3 %
Modulation frequency	range	0 Hz to 21 kHz
	resolution	0.1 Hz
Modulation distortion	CCITT-weighted	< 1 %

Frequency modulation

Source		internal modulation source, external AF1 IN, AF2 IN, external SPDIF IN
Deviation	range	0 Hz to 100 kHz
	resolution	1 Hz
	uncertainty, internal source	< 1 %
	uncertainty, external source	< 3 %
Modulation frequency	range, internal modulation generator	0 Hz to 21 kHz
Modulation distortion	CCITT-weighted	< 1 %

Phase modulation

Source		internal modulation source, external AF1 IN, AF2 IN, external SPDIF IN
Deviation	range	0 rad to 10 rad
	resolution	0.1 mrad
	uncertainty, internal source	< 1 %
	uncertainty, external source	< 3 %
Modulation frequency	range, internal modulation generator	0 Hz to 21 kHz
Modulation distortion	CCITT-weighted	< 1 %

SSB modulation

Source	upper sideband (USB), lower sideband (LSB)	internal modulation source, external AF1 IN, AF2 IN, external SPDIF IN
Modulation frequency		30 Hz to 21 kHz
Carrier suppression		> 70 dB
Sideband suppression		> 70 dB

FM stereo modulation

Source		internal modulation source, external AF1 IN, AF2 IN, external SPDIF IN
Maximum audio deviation		0 Hz to 90.5 kHz
Pilot deviation		0 Hz to 10 kHz
RDS deviation		0 Hz to 10 kHz

Internal modulation source

Modulation generators	2 generators, each single tone/multitone/noise/square with additional subtone/CTCSS tone/ DCS tone	
Frequency range	basic tone	1 Hz to 21 kHz
	square wave	1 Hz to 4 kHz
	subtone	1 Hz to 2 kHz
	resolution	1 Hz
	CTCSS tone	tone 1 (67 Hz) to tone 50 (254.1 Hz)
Multitone		1 to 20 selectable tones with individual frequencies and levels
	frequency range	1 Hz to 21 kHz
Noise		signal composite with flat frequency response from 0 Hz to 21 kHz
DCS	data rate	134.4 bit/s
	rate offset	±30 bit/s
	FSK deviation	0 Hz to 10 kHz
	modes	off_code, inverted FSK
	length	100 ms to 300 ms

Modulation source: DTMF, Selcall, free dialing

DTMF	DTMF frequencies	697 Hz, 770 Hz, 852 Hz, 941 Hz, 1209 Hz, 1336 Hz, 1447 Hz, 1633 Hz
	sequence	1 digit to 7 digit
	repetition	1 to 100
	pause	0 ms to 10000 ms
	digit time	0 ms to 3000 ms
	digit pause	0 ms to 3000 ms
Selcall	CCIR standard	
	Selcall frequencies	1981 Hz, 1124 Hz, 1197 Hz, 1275 Hz, 1358 Hz, 1446 Hz, 1540 Hz, 1640 Hz, 1747 Hz, 1860 Hz, 2400 Hz, 930 Hz, 2247 Hz, 991 Hz, 2110 Hz, 1055 Hz
	sequence	1 digit to 5 digit
	repetition	1 to 100
	pause	0 ms to 10000 ms
	digit time	0 ms to 3000 ms
	digit pause	0 ms to 3000 ms
Free dialing	single tones, dual tones	
	frequency range 1st tone	60 Hz to 4000 Hz
	frequency range 2nd tone	1200 Hz to 4000 Hz
	resolution	0.1 Hz
	sequence	1 digit to 7 digit
	repetition	1 to 100
	pause	0 ms to 10000 ms
	digit time	0 ms to 3000 ms
	digit pause	0 ms to 3000 ms

Modulation source: arbitrary waveform generator (ARB) (R&S®CMA-B110B option)

Memory size		1.024 Gbyte
Word length	I	16 bit
	Q	16 bit
	marker	4 bit to 16 bit
Sample length	with 4-bit marker	up to 227.55 Msample
Sample rate	minimum	400 Hz
	maximum	100 MHz
Maximum possible RF bandwidth	depending on arbitrary waveform file	20 MHz

Trigger		
Trigger sources		external TRIG IN
Delay		0 s to 100 s
Repetition		single, continuous

Interferer

Interferer		0.1 MHz to 3000 MHz
Delta frequency range		±10 MHz
Delta level range		±80 dB
Modulation		CW (off), AM, FM, PM

VOR/ILS signal generator (R&S®CMA-K130 option)

VOR mode		
Output level range and uncertainty		see general technical specifications
Frequency bands		108 MHz to 117.95 MHz
Bearing	switchable TO/FROM	0° to 360°
30 Hz tone (VAR)	modulation frequency, linked for VAR and REF	20 Hz to 40 Hz
	modulation depth [2]	0 % to 100 %
9960 Hz carrier (REF)	modulation frequency	7.5 kHz to 12.5 kHz
	FM deviation	300 Hz to 600 Hz
	modulation depth [2]	0 % to 100 %
1020 Hz auxiliary tone (IDENT)	modulation frequency	0 Hz to 21 kHz
	modulation depth [2]	0 % to 100 %
Uncertainty	modulation depth, at 30 %	0.1 %
	modulation frequency	0.05 Hz
	FM deviation	0.05 Hz
	bearing	0.01°

ILS mode		
Output level range and uncertainty		see general technical specifications
Frequency bands	localizer	108.1 MHz to 111.95 MHz
	glideslope	329.15 MHz to 335 MHz
90 Hz tone	modulation frequency, linked to 150 Hz	72 Hz to 108 Hz
150 Hz tone	modulation frequency, linked to 90 Hz	120 Hz to 180 Hz
90 Hz tone and 150 Hz tone	SDM [2]	0 % to 100 %
	DDM, depending on SDM	–1 to +1
	phase offset	–60° to +120°
1020 Hz auxiliary tone (IDENT)	modulation frequency	0 Hz to 21 kHz
	modulation depth [2]	0 % to 100 %
Uncertainty	modulation depth, at SDM 40 % to 80 %	0.1 %
	modulation frequency	0.05 Hz
	phase offset	0.05°
	DDM	0.001 FS

RF analyzer

RF power overload protection		
RF COM with high-power attenuator ("RF COM connector attenuation" in setup menu)	max. allowed input power for continuous operation, at T_{amb} ≤ +30 °C	100 W
	max. allowed input power for 1 min (typ.), recovery time necessary, at T_{amb} ≤ +30 °C	150 W
	shutdown (open)	when thermal overload is detected
RF COM without high-power attenuator ("RF COM connector attenuation" in setup menu)	max. allowed input power	1 W (typ.)
	shutdown (open)	when voltage overload is detected
RF IN	max. allowed input power	100 mW, +20 dBm
	shutdown (short)	when voltage overload is detected
RF OUT	max. allowed reverse input power	20 mW, +13 dBm
	shutdown (short)	when voltage overload is detected

Shutdown: All three connectors are shut down simultaneously; RF COM is switched to open, and RF IN and RF OUT are switched to short.

[2] Total modulation depth not to exceed 100 %.

Expected nominal power setting range		
RF COM with high-power attenuator	0.1 MHz to 3000 MHz	–13 dBm to 53 dBm
RF COM without high-power attenuator	0.1 MHz to 3000 MHz	–30 dBm to 36 dBm
RF IN	0.1 MHz to 3000 MHz	–36 dBm to 20 dBm

VSWR		
RF COM with high-power attenuator	0.1 MHz to 2000 MHz	< 1.2
	2000 MHz to 2700 MHz	< 1.7
	2700 MHz to 3000 MHz	< 2.0
RF COM without high-power attenuator	0.1 MHz to 2000 MHz	< 1.4
	2000 MHz to 2700 MHz	< 1.4
	2700 MHz to 3000 MHz	< 2.0
RF IN	0.1 MHz to 2000 MHz	< 1.58
	2000 MHz to 2700 MHz	< 1.58
	2700 MHz to 3000 MHz	< 1.58

RF IN is switched to short when off.

Harmonic response	second harmonic	
RF COM	f_{in} = 1 MHz to 1000 MHz, $f_{selected}$ = 2 MHz to 2000 MHz, input power near expected nominal power setting	< –30 dB
	f_{in} = 1000 MHz to 1500 MHz, $f_{selected}$ = 2000 MHz to 3000 MHz, input power near expected nominal power setting	< –30 dB
	third harmonic	
	f_{in} = 1 MHz to 666.7 MHz, $f_{selected}$ = 3 MHz to 2000 MHz, input power near expected nominal power setting	< –50 dB
	f_{in} = 666.7 MHz to 1000 MHz, $f_{selected}$ = 2000 MHz to 3000 MHz, input power near expected nominal power setting	< –50 dB

Spurious response	for full-scale, single-tone input signal	
	0.1 MHz to 2000 MHz, except f_{in} = 1318.46875 MHz + $f_{selected}$	< –55 dB
	2000 MHz to 3000 MHz, except f_{in} = 3681.25 MHz – $f_{selected}$, except f_{in} = 3681.25 MHz – 0.5 × $f_{selected}$	< –45 dB

Inherent spurious response	without input signal, 1 MHz to 3000 MHz	
	except f_{in} = 2760.9375 MHz	
	expected nominal power setting ≤ –10 dBm	< –100 dBm
	expected nominal power setting ≤ –10 dBm, 200 MHz, 400 MHz, 425 MHz, 475 MHz, 500 MHz, 600 MHz, 2250 MHz	< –90 dBm
	expected nominal power setting > –10 dBm	< –90 dB below expected nominal power setting

Phase noise	single sideband, 0.1 MHz to 30 MHz	
	10 kHz offset from carrier	< –127 dBc (1 Hz)
	100 kHz offset from carrier	< –127 dBc (1 Hz)
	3 MHz offset from carrier	< –130 dBc (1 Hz)
	single sideband, 30 MHz to 913 MHz	
	10 kHz offset from carrier	< –111 dBc (1 Hz)
	100 kHz offset from carrier	< –115 dBc (1 Hz)
	3 MHz offset from carrier	< –130 dBc (1 Hz)
	single sideband, 913 MHz to 3000 MHz	
	10 kHz offset from carrier	< –110 dBc (1 Hz)
	100 kHz offset from carrier	< –110 dBc (1 Hz)
	3 MHz offset from carrier	< –125 dBc (1 Hz)

Dynamic range	*RBW → 1 kHz*, with fixed expected nominal power setting	
RF COM with high-power attenuator	1 MHz to 2000 MHz, +12 dBm to +51.8 dBm	> 100 dB
	2000 MHz to 3000 MHz, +17 dBm to +51.8 dBm	> 95 dB
RF COM without high-power attenuator	1 MHz to 2000 MHz, –5 dBm to +33 dBm	> 100 dB
	2000 MHz to 3000 MHz, 0 dBm to +33 dBm	> 95 dB
RF IN	1 MHz to 2000 MHz, –11 dBm to +20 dBm	> 100 dB
	2000 MHz to 3000 MHz, –6 dBm to +20 dBm	> 95 dB

Power meter

TX test, expert test		
Frequency range		0.1 MHz to 3000 MHz
Frequency resolution		1 Hz
Measurement modes		power current RMS, power current min., power current max., power average RMS, power minimum, power maximum, standard deviation
Resolution bandwidths		Gaussian, 10 Hz to 10 MHz, in 1/3/5 steps, bandpass, 1 kHz to 20 MHz, in 1/2/3/5 steps, RRC, α = 0.1
Expected nominal power setting range		see general technical specifications
Measurement control	measurement timeout	0 s to 1000 s in steps of 1 ms
	repetition	continuous, single shot
	statistic	1 to 100000
	measurement length	10 µs to 1 s (< step length)
	step length	50 µs to 1 s

Level range		
RF COM with high-power attenuator	0.1 MHz to 1 MHz	
	continuous wave (CW)	up to 40 dBm
	peak envelope power (PEP)	up to 40 dBm
	1 MHz to 30 MHz	
	continuous wave (CW)	up to 51.8 dBm (150 W) [3]
	peak envelope power (PEP)	up to 51.8 dBm (150 W) [3]
	30 MHz to 2000 MHz	
	continuous wave (CW)	up to 51.8 dBm (150 W) [3]
	peak envelope power (PEP)	up to 51.8 dBm (150 W) [3]
	2000 MHz to 3000 MHz	
	continuous wave (CW)	up to 51.8 dBm (150 W) [3]
	peak envelope power (PEP)	up to 51.8 dBm (150 W) [3]
RF COM without high-power attenuator	0.1 MHz to 1 MHz	
	continuous wave (CW)	up to 23 dBm
	peak envelope power (PEP)	up to 23 dBm
	1 MHz to 30 MHz	
	continuous wave (CW)	up to 33 dBm (2 W)
	peak envelope power (PEP)	up to 33 dBm (2 W)
	30 MHz to 2000 MHz	
	continuous wave (CW)	up to 33 dBm (2 W)
	peak envelope power (PEP)	up to 33 dBm (2 W)
	2000 MHz to 3000 MHz	
	continuous wave (CW)	up to 33 dBm (2 W)
	peak envelope power (PEP)	up to 33 dBm (2 W)
RF IN	0.1 MHz to 1 MHz	
	continuous wave (CW)	up to 18 dBm
	peak envelope power (PEP)	up to 18 dBm
	1 MHz to 30 MHz	
	continuous wave (CW)	up to 20 dBm
	peak envelope power (PEP)	up to 20 dBm
	30 MHz to 2000 MHz	
	continuous wave (CW)	up to 20 dBm
	peak envelope power (PEP)	up to 20 dBm
	2000 MHz to 3000 MHz	
	continuous wave (CW)	up to 20 dBm
	peak envelope power (PEP)	up to 20 dBm

Level uncertainty	in temperature range from +20 °C to +35 °C, no overranging [4]	
RF COM	0.1 MHz to 1 MHz	< 1.0 dB
	1 MHz to 30 MHz	< 0.7 dB
	30 MHz to 2000 MHz	< 0.7 dB
	2000 MHz to 3000 MHz	< 1.0 dB
RF IN	0.1 MHz to 1 MHz	< 1.0 dB
	1 MHz to 30 MHz	< 0.8 dB
	30 MHz to 2000 MHz	< 0.8 dB
	2000 MHz to 3000 MHz	< 1.0 dB

Level uncertainty	in temperature range from 0 °C to +50 °C [5], no overranging [4]	
RF COM	0.1 MHz to 1 MHz	< 1.0 dB
	1 MHz to 30 MHz	< 0.8 dB
	30 MHz to 2000 MHz	< 0.8 dB
	2000 MHz to 3000 MHz	< 1.0 dB
RF IN	0.1 MHz to 1 MHz	< 1.0 dB
	1 MHz to 30 MHz	< 1.0 dB
	30 MHz to 2000 MHz	< 1.0 dB
	2000 MHz to 3000 MHz	< 1.0 dB

[3] Apply high power (> 100 W) for a limited time only (about 1 min).

[4] For suitable setting of expected nominal power.

[5] With HD (R&S®CMA-S052B): +5 °C to +45 °C.

Level resolution		0.01 dB
Level repeatability	typical values after 1 h warm-up time, always returning to same level and frequency, no temperature change, insignificant time change	< 0.02 dB

Level linearity, with fixed expected nominal power setting	in temperature range from +20 °C to +35 °C, no overranging	
RF COM	level range from 0 dB to –24 dB	< 0.1 dB

RF frequency meter

Frequency range		0.1 MHz to 3000 MHz
Resolution		1 Hz
Uncertainty		as reference frequency
Input level range	RF COM with high-power attenuator	> 10 dBm
	RF COM without high-power attenuator	> –7 dBm
	RF IN	> –13 dBm

Modulation deviation measurements

Frequency modulation		
Modes		RMS, RMS·√2, +PK, –PK, ±PK/2
Measurement range		0 Hz to 96 kHz
Resolution		1 Hz
Uncertainty		< 1 %
AF frequency range		10 Hz to 21 kHz
Residual FM	CCITT, RMS	
	0.1 MHz to 30 MHz	< 2 Hz
	30 MHz to 2000 MHz	< 3 Hz
	2000 MHz to 3000 MHz	< 5 Hz

Amplitude modulation		
Modes		RMS, RMS·√2, +PK, –PK, ±PK/2,
Measurement range		0 % to 100 %
Resolution		0.01 %
Uncertainty		< 1 %
AF frequency range		10 Hz to 21 kHz
Residual AM	CCITT, RMS	
	0.1 MHz to 30 MHz	< 0.05 %
	30 MHz to 2000 MHz	< 0.1 %
	2000 MHz to 3000 MHz	< 0.1 %

Phase modulation		
Modes		RMS, RMS·√2, +PK, –PK, ±PK/2
Measurement range		0 rad to 10 rad
Resolution		0.01 rad
AF frequency range		10 Hz to 21 kHz
Residual PM	CCITT, RMS	
	0.1 MHz to 30 MHz	< 2 mrad
	30 MHz to 2000 MHz	< 5 mrad
	2000 MHz to 3000 MHz	< 5 mrad

SSB modulation		SSB-USB, SSB-LSB
Modes		frequency error, power (RMS), power (PEP)

THD+N and THD meter (distortion meter)

Frequency range		100 Hz to 10.5 kHz
Measurement range		0 % to 100 %
Resolution		0.01 %
Inherent distortion	CCITT, AM > 5%, FM > 1 kHz, PM > 0.2 rad	< 0.1 % THD+N and < 0.05 % THD
Uncertainty		< 0.5 % + inherent distortion

SINAD meter

Frequency range		100 Hz to 10.5 kHz
Measurement range		up to 63 dB
Resolution		0.01 dB
Uncertainty	SINAD > 3 dB	< 1 dB

S/N meter

Frequency range		100 Hz to 10.5 kHz
Measurement range		up to 63 dB
Resolution		0.01 dB
Uncertainty	S/N > 3 dB	< 1 dB

AF FFT analyzer

Frequency range		DC to 21 kHz
FFT length		4k
Frequency resolution		11.7 Hz
FFT windows		flat top, rectangular, Hamming, Hann, Blackman-Harris
Statistic count		1 to 1000

Audio filter, weighting

Lowpass		off, 255 Hz, 3 kHz, 3.4 kHz, 4 kHz, 15 kHz
Highpass		off, 6 Hz, 50 Hz, 300 Hz
Bandpass, for level results only	center frequency	10 Hz to 21 kHz
	bandwidth	off, 20 Hz to 20 kHz
Weighting filter		off, A-weighting, CCITT, C-message
Deemphasis		off, 50 µs, 75 µs, 750 µs

Spectrum measurements

FFT spectrum analyzer

For RF signals		
Display		spectrum in frequency domain, I/Q signals in time domain, I/Q constellation diagram
Frequency range		0.1 MHz to 3000 MHz
Frequency span	in steps of 2	10 kHz, 20 kHz, 40 kHz, 80 kHz, 160 kHz, 320 kHz, 640 kHz, 1.25 MHz, 2.5 MHz, 5 MHz, 10 MHz, 20 MHz
FFT length		1k, 2k, 4k, 8k, 16k
Detector		peak, RMS
Averaging mode		logarithmic, linear
Trigger		free run, IF, external TRIG IN
Trigger slope		rising edge, falling edge
Trigger threshold		–50 dB to 0 dB
Trigger offset mode		fixed, variable
Trigger offset	start	–150 ms to +1 ms
	stop	0 ms to +150 ms
Trigger timeout		10 ms to 300 s
Trigger gap		0 ms to 10 ms
Repetition		continuous, single shot
Statistic count		1 to 1000

Expected nominal power setting range		see general technical specifications

Level range		see general technical specifications

Level uncertainty		see general technical specifications

Inherent spurious response		see general technical specifications

Spurious response		see general technical specifications

Harmonic response		see general technical specifications

Phase noise		see general technical specifications

Dynamic range		see general technical specifications

ACP/OBW measurements

ACP measurements		absolute and relative measurements
Measurement on channel number		–2, –1, 0, +1, +2
Channel space		100 Hz to 4 MHz
Measurement bandwidth		100 Hz to 4 MHz
Occupied bandwidth (OBW)	range	70 % to 99.9 %
Expected nominal power setting range		see general technical specifications
Level range		see general technical specifications
Level uncertainty		see general technical specifications

RF swept spectrum analyzer (R&S®CMA-K120 option)

Frequency range		100 kHz to 3000 MHz
Frequency span	start/stop, center/span, full span, last span	1 kHz to 2999.9 MHz
Resolution bandwidth (RBW)		auto, 100 Hz to 10 MHz in 1/2/3/5 steps
Video bandwidth (VBW)		auto, off, 10 Hz to 10 MHz in 1/2/3/5 steps
Sweep time	frequency sweep, depending on RBW, VBW and span	500 µs to 2000 s
	zero span, depending on RBW and VBW	80 µs to 2000 s
Detector		average, RMS, sample, min. peak, max. peak, auto peak
Trigger	frequency sweep	free run
	zero span	video, external TRIG IN, all R&S®CMA180 internal trigger sources
Display modes		continuous, single shot, continuous
		current, average, max., min.
Expected nominal power setting range		see general technical specifications
Level range		see general technical specifications
Level uncertainty		see general technical specifications
Inherent spurious response		see general technical specifications
Spurious response		see general technical specifications
Harmonic response		see general technical specifications
Phase noise		see general technical specifications
Dynamic range		see general technical specifications

Zero span mode (transient analysis, power versus time)		
Sweep time range		80 µs to 2000 s
Trigger		free run, video, external TRIG IN
Trigger slope		rising edge, falling edge
Trigger threshold		–50 dB to 0 dB
Trigger offset		–500 ms to +500 ms
Trigger timeout		10 ms to 300 s
Trigger gap		0 ms to 10 ms
Repetition		continuous, single shot
Statistic count		1 to 1000

Displayed average noise level (DANL)		
RF COM without high-power attenuator	0.1 MHz to 3000 MHz, RBW normalized to 1 Hz	< –150 dBm (typ.)

RF tracking generator (R&S®CMA-K120 option)

Tracking generator		
RF output	SA on RF COM	RF OUT
	SA on RF IN	RF COM, RF OUT
Expected nominal power setting range		see general technical specifications
Level range		see general technical specifications
Level uncertainty		see general technical specifications
Inherent spurious response		see general technical specifications
Spurious response		see general technical specifications
Harmonic response		see general technical specifications
Phase noise		see general technical specifications

I/Q recorder (R&S®CMA-K220 option)

I/Q recorder	samples from RF receiver ADC	
Sample length		4 Msample
Sample rate	depending on used filter	0.5 kHz to 100 MHz
Filter	Gauss, bandpass	1 kHz, 10 kHz, 100 kHz, 1 MHz, 10 MHz
Trigger	pretrigger, posttrigger	1 sample to 4 194 303 sample
	trigger source	free run, IF power, ext. TRIG IN
	trigger slope	rising, falling
Storage		HD/SSD, USB device
File format		IQ, R&Phi

AF generator (AF1 OUT, AF2 OUT)

AF1 OUT/AF2 OUT connectors

Output impedance		< 4 Ω
Maximum output current		20 mA

AF sine-wave generator

Frequency range		20 Hz to 21 kHz
Frequency uncertainty		same as timebase + half resolution, see base unit specifications
Frequency resolution		1 Hz
Level range	RMS	10 µV to 5 V
Level resolution	RMS	10 µV
Level uncertainty	at level ≥ 1 mV and frequency ≤ 10 kHz	≤ 1.5 % + resolution
THD+N	at level ≥ 100 mV, into load ≥ 600 Ω, measurement bandwidth 21.9 kHz	≤ 0.05 %
THD	at level ≥ 100 mV, into load ≥ 600 Ω, measurement bandwidth 21.9 kHz	≤ 0.025 %

Composite AF signals

Singletone/multitone/noise/square with additional subtone/CTCSS		see chapter internal modulation source

AF analyzer (AF1 IN, AF2 IN)

AF1 IN/AF2 IN connectors

Input impedance		100 kΩ | 15 pF

AF voltmeter

Frequency range	AC coupling	50 Hz to 21 kHz
Level range	AC coupling, RMS	50 µV to 30 V
	DC coupling	–43 V to +43 V
Level resolution	at level < 1 mV	1 µV
	at level ≥ 1 mV	0.1 %
Level uncertainty	at 1 mV ≤ level ≤ 20 mV	< 1.3 % + resolution
	at 20 mV ≤ level ≤ 20 V	< 1.0 % + resolution

THD+N and THD meter

Measurement bandwidth		21 kHz
Frequency range		100 Hz to 10.5 kHz
Level range	RMS	10 mV to 30 V
Resolution		0.01 %
Inherent distortion	at 100 mV ≤ level ≤ 20 V	< 0.05 % THD+N and < 0.025 % THD
Uncertainty	at 100 mV ≤ level ≤ 2 V	< 1 % + inherent distortion
	at 2 V ≤ level ≤ 20 V	< 2 % + inherent distortion

SINAD meter

Measurement bandwidth		21 kHz
Frequency range		100 Hz to 10.5 kHz
Measurement range		1 dB to 46 dB
Level range	RMS	10 mV to 30 V
Resolution		0.1 dB
Uncertainty	at 100 mV ≤ level ≤ 2 V, at 2 V ≤ level ≤ 20 V	< 1 dB

Audio filter, weighting

Lowpass		off, 255 Hz, 3 kHz, 3.4 kHz, 4 kHz, 15 kHz
Highpass		off, 6 Hz, 50 Hz, 300 Hz
Bandpass, for level results only	center frequency	10 Hz to 21 kHz
	bandwidth	off, 20 Hz to 20 kHz
Weighting filter		off, A-weighting, CCITT, C-message

Statistics

Statistical count		1 to 1000
Values		current, average, max., min., standard deviation

AF oscilloscope (R&S®CMA-K120 option)

Signal source		AF1IN, AF2IN, Demod, SPDIF
Display		
Traces	current, max	2
Markers		2
Horizontal	sweep	1 µs/div to 1 s/div in 1/2/5 steps
		autoscaling
Bandwidth (0 dB)		21 kHz
Input range		–43 V to +43 V
Scales	AFIN	0.1 mV/div to 20 V/div
	FM demod	100 Hz/div to 20 kHz/div
	AM demod	1 %/div to 20 %/div
	PM demod	0.1 rad/div to 10 rad/div
	all	autoscaling
Coupling		AC, DC
Autoranging	trigger slope	rising, falling
Trigger	threshold	–43 V to +43 V

AF frequency measurement

Signal source		AF1IN, AF2IN, Demod
Frequency range		10 Hz to 21 kHz

AF tones analyzer

Modes		DTMF, Selcall, free dialing
Measurements	tone number	0 to F
	frequency	Hz
	frequency deviation	Hz, %
	frequency resolution	0.1 Hz
	time, pause	ms

Digital interface, unbalanced

BNC rear panel connectors

SPDIF IN connector		BNC
Input impedance		75 Ω

SPDIF OUT connector		BNC
Output impedance		75 Ω

Sampling rate		48 kHz
Max. resolution		20-bit PCM
Output level		0.5 V, peak-to-peak
Max. output		0.6 V, peak-to-peak
Max. current		8 mA
Min. input		0.2 V, peak-to-peak
Modulation		biphase mark code
Usage		audio analysis

Timebase

Timebase TCXO

Max. frequency drift	in temperature range from 0 °C to +50 °C [6]	$\pm 1 \times 10^{-6}$
Max. aging	at +25 °C, after 14 days of continuous operation	$\pm 1 \times 10^{-6}$/year

Timebase OCXO (R&S®CMA-B690A option)

Max. frequency drift	in temperature range from 0 °C to +50 °C [6], referenced to +25 °C	$\pm 5 \times 10^{-8}$
	with instrument orientation	$\pm 5 \times 10^{-9}$
Retrace	at +25 °C, after 24 hours power on/2 hours power off/1 hour power on	$\pm 2 \times 10^{-8}$
Max. aging	at +25 °C, after 10 days of continuous operation	$\pm 1 \times 10^{-7}$/year, $\pm 1 \times 10^{-9}$/day
Warm-up time	at +25 °C, the frequency is in the range that is 10 times the frequency drift ($\pm 5 \times 10^{-7}$)	approx. 10 min

Timebase OCXO, high-performance (R&S®CMA-B690M option)

Max. frequency drift	in temperature range from 0 °C to +50 °C [6], referenced to +25 °C	$\pm 5 \times 10^{-9}$
	with instrument orientation	$\pm 1 \times 10^{-9}$
Retrace	at +25 °C, after 24 hours power on/ 2 hours power off/1 hour power on	$\pm 5 \times 10^{-9}$
Max. aging	at +25 °C, after 10 days of continuous operation	$\pm 3 \times 10^{-8}$/year, $\pm 5 \times 10^{-10}$/day
Warm-up time	at +25 °C, the frequency is in the range that is 10 times the frequency drift ($\pm 5 \times 10^{-8}$)	approx. 10 min

[6] With HD (R&S®CMA-S052B): +5 °C to +45 °C.

Reference frequency inputs/outputs

Synchronization input		BNC connector REF IN, rear panel
Frequency	sine wave	10 MHz
	square wave (TTL level)	10 MHz
Lock-in range	wide	± 1 kHz (typ.)
	medium	± 80 Hz (typ.)
	narrow	± 8 Hz (typ.)
Input voltage range		0.5 V to 2 V, RMS
Impedance		50 Ω

Synchronization output		BNC connector REF OUT, rear panel
Frequency		10 MHz from internal reference or frequency at synchronization input
Output voltage		> 2 V, peak-to-peak
Impedance		50 Ω

General data

RF connectors (front panel)		SnapN female, 50 Ω, compatible with N female connectors
RF COM		combined RF input and RF output
RF IN		RF input
RF OUT		RF output

AF connectors (front panel)		BNC connectors
AF1 IN, AF2 IN		AF inputs
AF1 OUT, AF2 OUT		AF outputs

Other interfaces (front panel)		
USB	for keyboard, mouse, USB stick	3 × USB 2.0 type A connector
SENSOR		for R&S®NRP-Zxx/R&S®NRT-Zxx power sensors
PHONES	for headphones	3.5 mm audio jack
	impedance	≥ 16 Ω

Loudspeaker (front panel)		

Remote control interfaces (rear panel)		
LAN REMOTE		Ethernet RJ-45 connector, 1000 Mbps
IEEE 488	R&S®CMA-B612A IEEE bus interface option	IEC 60625-2 (IEEE 488.2), 24-pin Amphenol connector
USB REMOTE	included in R&S®CMA-B612A IEEE bus interface option	USB 2.0 type B connector

Other interfaces (rear panel)		
USB	for keyboard, mouse, USB stick	2 × USB 2.0 type A connector
DVI	for external monitor	DVI-D connector
TRIG IN, TRIG OUT	trigger input/output	2 × BNC connector
SPDIF IN, SPDIF OUT	SPDIF input/output	2 × BNC connector

CONTROL interface (rear panel)		D-Sub 25-pin connector
4 × OUT	level	3.3 V TTL
4 × IN/OUT	level	3.3 V TTL
2 × relay	switching voltage	max. 30 V
	switching current	max. 2 A

Display		
Size		22.8 cm TFT color display (9.0")
Resolution		800 × 480 pixel (WVGA resolution)
Pixel failure rate		$< 1.1 \times 10^{-5}$

Storage memory		
Hard disk	R&S®CMA-S052B selection	480 Gbyte
Solid-state disk	R&S®CMA-S052N selection	480 Gbyte

Lifespan and data retention time of a NAND Flash SSD typically depend on the number of write cycles and the temperature.

Each byte can be overwritten 2000 times. When this value is reached, the solid-state disk (SSD) enters a read-only mode to ensure data retention. Depending on the operating and storage temperatures, the data retention period decreases over the SSD lifespan from several years to an ensured value of over 60 days.

Lifespan example: The lifespan is approx. five years if the entire SSD is written to once a day.

If you use an SSD as the system drive, start the instrument at least once a year with inserted SSD. Otherwise the data stored on the SSD may be lost. SSDs are not designed for long-term storage without power supply.

Environmental conditions		
Temperature	operating temperature range with HD (R&S®CMA-S052B)	+5 °C to +45 °C
	operating temperature range with SSD (R&S®CMA-S052N)	0 °C to +50 °C, in line with MIL-PRF-28800F
	storage temperature range	–40 °C to +71 °C, in line with MIL-PRF-28800F
Damp heat		5 % to 95 % rel. humidity, in line with MIL-PRF-28800F; 5 % to 80 % rel. humidity, in line with EN 600068-2-78
Altitude		4600 m
Classification		class 3 equipment, in line with MIL-PRF-28800F

Product conformity		
Electromagnetic compatibility	EU: in line with EMC Directive 2014/30/EC	applied harmonized standards: • EN 61326-1 (industrial environment) • EN 61326-2-1 • EN 55011 (class A)
	with R&S®CMA-S054M DC power supply	• EN 50498
	Directive of United Nations relating to approval of vehicles with regard to EMC (with R&S®CMA-S054M DC power supply)	applied standard: • ECE R10 Rev 4, Suppl. 2
Electrical safety	EU: in line with Low Voltage Directive 2014/35/EC	applied harmonized standard: • EN 61010-1
	USA/Canada	applied standards: • UL 61010-1 (third edition) • CAN C22.2 No. 61010.1-12
International safety approvals	VDE – Association for Electrical, Electronic and Information Technologies	GS mark – certificate no.: 40039469
	CSA – Canadian Standards Association	$_{C}CSA_{US}$ mark – certificate no.: 70002992
RoHS	EU: in line with Directive 2011/65/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment	EN 50581

Mechanical resistance		
Vibration	sinusoidal	• 5 Hz to 55 Hz, 0.15 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6 • 5 Hz to 55 Hz, in line with MIL-PRF-28800F
	random	• 10 Hz to 300 Hz, acceleration 1.2 g RMS, in line with EN 60068-2-64 • 5 Hz to 500 Hz, in line with MIL-PRF-28800F
Shock		• 30 g, in line with MIL-PRF-28800F • 516.4, procedure I, 45 Hz to 2000 Hz, max. 40 g, in line with MIL-STD-810E method

Power rating	R&S®CMA-S054B AC power supply	
Rated voltage		100 V to 240 V AC (±10 %)
Rated frequency		50 Hz to 60 Hz, 400 Hz (±5 %)
Rated current		3.3 A to 1.5 A
Power consumption	R&S®CMA180 basic model	approx. 75 W
	R&S®CMA180 with typical options	approx. 85 W
	standby	approx. 3 W

Power rating	R&S®CMA-S054M DC power supply	
Rated voltage		10 V to 30 V DC
Rated current		max. 27 A
Power consumption	R&S®CMA180 basic model	approx. 75 W
	R&S®CMA180 with typical options	approx. 85 W
	standby	approx. 3 W
Length of DC supply cable	each line of plus and minus signal	max. 5 m

Dimensions	W × H × D, overall	360.5 mm × 195.4 mm × 351 mm (14.19 in × 7.69 in × 13.82 in)
	for rack mounting	19", ¾, 4 HU, 350
Weight	base unit without options	approx. 10.9 kg (24 lb)
	fully equipped	approx. 13 kg (28.7 lb)

Calibration interval		24 months

Accessories

R&S®CMA-Z053A external power supply (prerequisite: R&S®CMA-S054M option)

The R&S®CMA-Z053A makes it possible to connect the R&S®CMA180 with the R&S®CMA-S054M DC power supply option to AC mains.

Power rating		
Rated voltage		100 V to 240 V AC (±10 %)
Rated frequency		50 Hz to 60 Hz (±5 %)
Rated current		max. 4 A
Output voltage		24 V DC (±3 %)
Output current		max. 9.2 A
Power consumption	with R&S®CMA180 load	see R&S®CMA-S054M DC power supply
	with no load	approx. 0.5 W
Altitude	operating	2000 m
Electromagnetic compatibility	EU: in line with EMC Directive 2004/108/EC	applied harmonized standards: • EN 61000 • EN 55022 class B
Electrical safety	EU: in line with Low Voltage Directive 2006/95/EC	applied harmonized standard: • EN 60950-1
	USA/Canada/Japan	applied standards: • UL/CAN/CSA-C22.2 No. 60950-1 • J60950-1
Dimensions	W × H × D, overall	210 mm × 85 mm × 46 mm (8.26 in × 3.34 in × 1.81 in)
Weight		approx. 1.1 kg (2.4 lb)

R&S®CMA-B060A battery compartment (prerequisite: R&S®CMA-S054M option)

Voltage		12 V (nom.)
Temperature	operating temperature range, discharge	0 °C to +50 °C
	storage temperature range	–40 °C to +71 °C, in line with MIL-PRF-28800F
Dimensions	W × H × D, overall	345.2 mm × 45.6 mm × 239.7 mm (13.59 in × 1.80 in × 9.44 in)
Weight		approx. 1.33 kg (2.9 lb)

R&S®CMA-Z061A Li-ion battery (prerequisite: R&S®CMA-S054M option, R&S®CMA-B060A option)

Set		consists of two batteries
Operating time	instrument without options, one set, batteries are hot swappable	1.5 h (nom.)
Charge time	with R&S®CMA-Z062 charger, T = +25 °C	3.5 h (nom.)
Temperature	operating temperature range, discharge	0 °C to +50 °C (see R&S®CMA-B060A battery compartment)
	operating temperature range, charge	0 °C to +45 °C
	storage temperature range	–20 °C to +60 °C [7]
Dimensions	W × H × D, overall, single battery	77.6 mm × 23 mm × 151 mm (3.1 in × 0.9 in × 5.9 in)
Weight	single battery	approx. 0.43 kg (0.96 lb)

[7] The battery packs should be stored in an environment with low humidity, free of corrosive gas at a recommended temperature range < +21 °C. Extended exposure to temperatures above +45 °C could degrade battery performance and life.

R&S®CMA-Z062A Li-ion battery charger for R&S®CMA-Z061A Li-ion battery

The R&S®CMA-Z062A Li-ion battery charger allows charging of R&S®CMA-Z061A Li-ion batteries.

AC input voltage range		100 V to 240 V AC (±10 %)
AC supply frequency		50 Hz to 60 Hz
Power consumption		max. 300 W
Dimensions	W × H × D, overall	400 mm × 127 mm × 203 mm (15.8 in × 5.0 in × 8.0 in)
Weight		3.1 kg (6.9 lb)

R&S®CMA-Z600A AF impedance matching unit (prerequisite: R&S®CMA180)

The R&S®CMA-Z600A allows the conversion and matching of unbalanced/balanced audio systems.

Pushbuttons are used to select between several operating modes and impedances.

From AF OUT UNBALANCED connector

Input from unbalanced AF generator source		BNC connector
Input impedance		> 100 kΩ | 15 pF
Maximum input level		5 V

AF OUT BALANCED connector

Output to DUT		XLR male connector
Modes	switchable	balanced/unbalanced
	XLR pin 1 switchable	float/unfloat
Output impedance	switchable	50 Ω, 150 Ω, 300 Ω, 600 Ω
		OUT LOW 2 Ω (nom.)
Frequency range		20 Hz to 21 kHz
Level range	for OUT LOW	50 µV to 5 V
	for 600 Ω/300 Ω/150 Ω	50 µV to 2.5 V
	for 50 Ω	50 µV to 1 V
Level uncertainty	at level ≥ 100 mV	≤ 1 % (typ.) + R&S®CMA180 AF generator specifications
THD+N	at level ≥ 100 mV, measurement bandwidth 21.9 kHz	≤ 0.05 % (typ.) + R&S®CMA180 AF generator specifications
CMRR	balanced mode	> 65 dB (typ.)

To AF IN UNBALANCED connector

Output to AF analyzer destination		BNC connector
Output impedance		3 Ω (nom.)

AF IN BALANCED connector

Input from DUT		XLR female connector
Modes	switchable	balanced/unbalanced
	XLR pin 1 switchable	float/unfloat
Input impedance	switchable	50 Ω, 150 Ω, 300 Ω, 600 Ω, IN HIGH 220 kΩ | 50 pF (nom.)
Frequency range		20 Hz to 21 kHz
Level range	for IN HIGH	50 µV to 7 V
	for IN HIGH with AF IN attenuation	500 µV to 30 V
	for 600 Ω/300 Ω/150 Ω/50 Ω	50 µV to 7 V
	for 600 Ω/300 Ω/150 Ω/50 Ω with AF IN attenuation	500 µV to 10 V
Level uncertainty	at level ≥ 100 mV, for frequency 50 Hz to 21 kHz	< 1 % (typ.) + R&S®CMA180 AF analyzer specifications
THD+N	at level ≥ 100 mV, for frequency 100 Hz to 10.5 kHz	< 0.05 % (typ.) + R&S®CMA180 AF analyzer specifications
CMRR	balanced mode	> 65 dB (typ.)

R&S®CMA-Z600A general data

Environmental conditions		
Temperature	operating temperature range	+0 °C to +50 °C
	storage temperature range	–40 °C to +71 °C, in line with MIL-PRF-28800F
Damp heat		5 % to 80 % rel. humidity, in line with MIL-PRF-28800F, in line with EN 600068-2-78
Classification		class 3 equipment, in line with MIL-PRF 28800F

Product conformity		
Electromagnetic compatibility	EU: in line with EMC Directive 2004/108/EC	applied harmonized standards: • EN 61326-1 (industrial environment) • EN 61326-2-1 • EN 55011 (class A)
Electrical safety		applied harmonized standard: • IEC/EN 61010-1
RoHS	EU: in line with Directive 2011/65/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment	

Mechanical resistance	nonoperating mode	
Vibration	sinusoidal	in line with EN 60068-2-6, 5 Hz to 55 Hz, 0.15 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const.
	random	in line with EN 60068-2-64, 10 Hz to 300 Hz, acceleration 1.2 g RMS
Shock		in line with MIL-STD-810E, method 516.4, procedure I, 40 g shock spectrum

Power rating	with delivered USB type A/type B cable 0.5 m	USB type B connector
Rated voltage		5 V DC (±5 %)
Power consumption		max. 2.5 W

Altitude	operating	4600 m

Dimensions	W × H × D, overall	217 mm x 156 mm x 53.6 mm (8.53 in × 6.14 in × 2.11 in)
Weight	base unit without options	approx. 930 g (2.05 lb)

R&S®CMA-Z680A antenna set

Telescope antenna	type	BNC, articulated joint, length: 175 mm to 605 mm
	best frequency range, long	10 MHz to 1000 MHz
	best frequency range, short	300 MHz to 2700 MHz
Antenna with base	base	depth: 87 mm, height: 80 mm, M6, cable length: 3.6 m, FME, magnetic
	rod	M6, length: 275 mm
	best frequency range	150 MHz to 2700 MHz

Ordering information

Designation	Type	Order No.
Radio Test Set	R&S®CMA180	1173.2000K18
Selections		
Hard Disk	R&S®CMA-S052B	1173.5100.03
Solid-State Disk	R&S®CMA-S052N	1173.5100.15
AC Power Supply	R&S®CMA-S054B	1173.5151.03
DC Power Supply	R&S®CMA-S054M	1173.5151.14
Hardware options		
Baseband Generator	R&S®CMA-B110B	1173.5751.03
IEC/IEEE Bus Interface	R&S®CMA-B612A	1173.5800.02
OCXO Reference Oscillator	R&S®CMA-B690A	1173.5851.02
OCXO Reference Oscillator, high-performance	R&S®CMA-B690M	1173.5851.14
Battery Compartment	R&S®CMA-B060A	1209.5003.02
Software options		
SA, TG, Scope, Trans-Rec	R&S®CMA-K120	1173.6206.02
ILS/VOR Generator	R&S®CMA-K130	1209.5703.02
I/Q Recorder	R&S®CMA-K220	1209.6200.02
MMI Language Russian	R&S®CMA-KL007	1209.6468.02
MMI Language French	R&S®CMA-KL033	1209.6480.02
MMI Language Chinese	R&S®CMA-KL086	1209.6500.02
R&S®CMArun software options		
Analog Radio Tests, R&S®CMArun	R&S®CMA-KT051	1209.5603.02
R&S®Series4200 Radio Test, R&S®CMArun	R&S®CMA-KT420	1209.6422.02
Waveforms		
Waveform Library, GPS Tests	R&S®CMA-KV140	1209.5855.02
GPS Tests, R&S®WinIQSIM2™	R&S®CMA-KW620	1209.6222.02
Glonass Tests, R&S®WinIQSIM2™	R&S®CMA-KW621	1209.6245.02
Galileo Tests, R&S®WinIQSIM2™	R&S®CMA-KW622	1209.6268.02
Accessories		
Transit Case	R&S®CMA-Z020A	1209.5555.02
Soft Case	R&S®CMA-Z025A	1209.5510.02
Display Protective Cover	R&S®CMA-Z030A	1209.9796.00
External Power Supply	R&S®CMA-Z053A	1173.6058K00
Protection Caps	R&S®CMA-Z059A	1209.6445.02
Li-Ion Battery, two batteries	R&S®CMA-Z061A	1209.5303.02
Li-Ion Battery Charger	R&S®CMA-Z062A	1209.5355K02
R&S®Series4200 Radio Adapter	R&S®CMA-Z420A	1209.6522.02
AF Impedance Matching Unit	R&S®CMA-Z600A	1173.6406.02
Feedthrough Termination, BNC, 600 Ω	R&S®CMA-Z650A	1209.6700.02
DC Block, N Type, 10 MHz to 6 GHz	R&S®CMA-Z670A	1209.6780.02
Antenna Set	R&S®CMA-Z680A	1209.6745.02
Accredited Calibration (DKD)	R&S®CMA-ACA	1209.6368.02

For more ordering information about available options, see the R&S®CMA180 product brochure (PD 3606.9404.12) or contact your local Rohde & Schwarz expert.

Recommended extras

Designation	Type	Order No.
19" Rack Adapter, 4 HU, ¾, T350	R&S®ZZA- KN10	1175.3091.00
R&S®NRP-Zxx power sensors		
Three-Path Diode Power Sensor, 200 pW to 200 mW, 10 MHz to 8 GHz	R&S®NRP-Z11	1138.3004.02
Three-Path Diode Power Sensor, 60 nW to 30 W, 10 MHz to 18 GHz	R&S®NRP-Z24	1137.8502.02
Thermal Power Sensor, 300 nW to 100 mW, DC to 18 GHz	R&S®NRP-Z51	1138.0005.03
R&S®NRT-Zxx power sensors		Please contact your local Rohde & Schwarz sales office.
RF Shield Box	R&S®CMW-Z10	1204.7008.02
Antenna Coupler, up to 6 GHz	R&S®CMW-Z11	1204.7108.02
Audio Accessory	R&S®CMW-Z15	1204.7508.02
RF Cable, up to 6 GHz, N-N	R&S®CMW-Z110	1204.7608.02
Attenuator, 3/6/10/20/30 dB, 100 W, 50 Ω	R&S®RBU100	1073.8495.xx (xx = 03/06/10/20/30)
Handset	R&S®CMW-Z50	1208.7602.02
Headphones		0708.9010.00
XLR/BNC Adapter Set m/f	R&S®UP-Z1MF	1411.3306.02
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

Recommended extras for manual operation

Designation	Type	Order No.
Keyboard with USB Interface (US assignment)	R&S®RMS-KEY-US	3059.2815.03
Keyboard with USB Interface (DE assignment)	R&S®RMS-KEY-DE	3059.2815.02
Keyboard with USB Interface (FR assignment)	R&S®RMS-KEY-FR	3059.2815.04
Keyboard with USB Interface (RU assignment)	R&S®RMS-KEY-RU	3059.2815.08
Keyboard with USB Interface (CN assignment)	R&S®RMS-KEY-CN	3059.2815.09
Mouse, USB optical scroll mouse	R&S®RMS-MOUSE	3059.2821.02

Important information:
We recommend using only the above-mentioned original PC components from Rohde & Schwarz in connection with the R&S®CMA180. The interaction of all components is continuously tested.
Insufficiently shielded PC components can lead to EMC problems that disturb RF measurements results.

Service options

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	

Extended warranty with a term of one to four years (WE1 to WE4)
Repairs carried out during the contract term are free of charge [8]. Necessary calibration and adjustments carried out during repairs are also covered.

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 [8] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

For product brochure, see PD 3606.9404.12 and www.rohde-schwarz.com

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

Service that adds value

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

About Rohde&Schwarz

The Rohde&Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, radiomonitoring and radiolocation. Founded more than 80 years ago, this independent company has an extensive sales and service network and is present in more than 70 countries. The electronics group is among the world market leaders in its established business fields. The company is headquartered in Munich, Germany. It also has regional headquarters in Singapore and Columbia, Maryland, USA, to manage its operations in these regions.

Sustainable product design

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

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R&S®CMA180 Radio Test Set

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