

R&S® CMA180 RADIO TEST SET

Specifications



Data Sheet
Version 08.00

ROHDE & SCHWARZ

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CONTENTS

Definitions	4
At a glance	5
General technical specifications	6
RF generator	6
RF analyzer	12
Spectrum measurements	17
I/Q recorder (R&S®CMA-K220 option)	19
AF generator (AF1 OUT, AF2 OUT)	19
AF analyzer (AF1 IN, AF2 IN)	19
AF oscilloscope (R&S®CMA-K120 option)	20
Digital interface, unbalanced	21
VoIP support (R&S®CMA-K610 option)	21
Search routines	21
Digital standards	22
For all digital standard generators and analyzers	22
DMR generator (prerequisite: R&S®CMA-B110B/D option)	22
DMR analyzer (R&S®CMA-K300, R&S®CMA-K305 option)	22
NXDN generator (prerequisite: R&S®CMA-B110B/D option)	22
NXDN analyzer	22
APCO/P25 generator (prerequisite: R&S®CMA-B110B/D option)	22
APCO/P25 analyzer	22
POCSAG generator (R&S®CMA-KG260 option, prerequisite: R&S®CMA-B110B/D option)	23
TETRA analyzer (R&S®CMA-K300, R&S®CMA-K305 option)	23
ZigBee generator (R&S®CMA-KG250 option, prerequisite: R&S®CMA-B110B/D option)	23
User defined generator (R&S®CMA-K210 option)	23
Timebase	24
General data	25
Accessories	28
R&S®CMA-Z020A transport case	28
R&S®CMA-Z025A	28
R&S®CMA-Z053A external power supply (prerequisite: R&S®CMA-S054M option)	28
R&S®CMA-B060A battery compartment (prerequisite: R&S®CMA-S054M option)	28
R&S®CMA-Z061A Li-ion battery (prerequisite: R&S®CMA-S054M option, R&S®CMA-B060A option)	29
R&S®CMA-Z062A Li-ion battery charger for R&S®CMA-Z061A Li-ion battery	29
R&S®CMA-Z600A AF impedance matching unit (prerequisite: R&S®CMA180)	29
R&S®CMA-Z680A antenna set	31
R&S®CMA-Z651A 600 Ω set	31

Ordering information	32
Recommended extras.....	33
Recommended extras for manual operation	33
Service options	34

Definitions

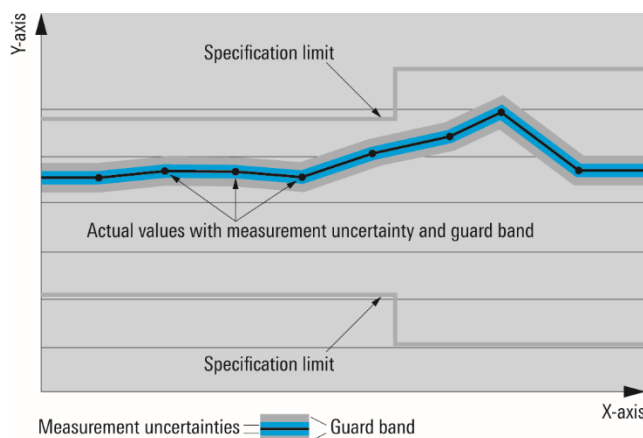
General

Product data applies under the following conditions:

Three hours storage at ambient temperature followed by 30 minutes warm-up operation
 Specified environmental conditions met
 Recommended calibration interval adhered to
 All internal automatic adjustments performed, if applicable

Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as $<$, \leq , $>$, \geq , \pm , or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



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.

At a glance

With its frequency range from 100 kHz to 3 GHz, the R&S®CMA180 is ideal for testing all common analog and digital radio systems. Input levels up to 150 W are no problem for the R&S®CMA180. The flexible internal switching capabilities for the audio and RF paths make the R&S®CMA180 suitable for a wide range of test requirements. Users can configure the internal generators, external audio sources, filters and measurements according to the given application. In the predefined test scenarios for receiver, transmitter and duplex tests, the RF and audio paths are preconfigured. This saves time and eliminates configuration errors for standard test cases.

The R&S®CMA180 features a built-in sweeping spectrum analyzer. Extensive configuration options make this analyzer a universal tool for testing all types of DUTs. The spectrum analyzer has two operating modes: full span and user-defined spans. The zero span mode enables analysis in the time domain. In combination with the triggers, it is possible, for instance, to display transients. The built-in tracking generator makes it easy to determine the frequency response of RF components.

The R&S®CMA180 can generate test signals for digital radio standards. Signal content can be configured to match test requirements. Signals can carry audio test tones or pseudo random bit sequences (PRBS), for example. Signaling parameters such as DMR color code can be configured on the instrument's intuitive GUI. The integrated vector signal analyzer demodulates digital signals and delivers results, including eye diagrams and symbol distribution. R&S®CMArun is available for test sequence control. It provides a graphical user interface for programming a test sequence. Individual settings and measurement tasks can be configured and arranged in a specific sequence. Sequences, loops and conditional queries help users easily create and execute complex test sequences. Each setting and measurement value is logged and then summarized and stored in a report. For measurements with limit values, pass or fail indicators can be displayed.

Its outstanding signal quality makes the R&S®CMA180 an extremely versatile radio tester for aircraft. The R&S®CMA180 can analyze ILS, VOR and marker beacon signals for aircraft landing systems as well as airborne radio signals. Equipped with a battery and antenna, the R&S®CMA180 is a standalone instrument that is ideal for aircraft maintenance. The R&S®CMA180 incorporates a VoIP generator and analyzer in line with EUROCAE ED-137B/C. The VoIP interface is fully integrated in the R&S®CMA180.

The R&S®CMA180 can be equipped with an AC power supply for operation at 110 V to 250 V or a DC power supply for operation at 10 V to 30 V. Equipped with a DC power supply, the R&S®CMA180 can also be powered via a vehicle's power supply. The DC power supply can be connected to an external AC/DC converter for AC operation at 110 V to 250 V. An optional battery pack ensures maximum mobility and turns the R&S®CMA180 with DC power supply into a portable tester that can be brought directly to the DUT.

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
RF OUT	2700 MHz to 3000 MHz	< 2.0 dB
	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 $T_{amb} \leq +25$ °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 $f_{\text{nonharmonic}} = 2659.9375 \text{ MHz} - f_{\text{carrier}}$, except $f_{\text{nonharmonic}} = 2 \cdot f_{\text{carrier}} - 2659.9375 \text{ MHz}$, except $f_{\text{nonharmonic}} = 2659.9375 \text{ MHz}$	> 55 dB
	2000 MHz to 3000 MHz, except $f_{\text{nonharmonic}} = 7362.5 \text{ MHz} - 2 \cdot f_{\text{carrier}}$, except $f_{\text{nonharmonic}} = 2 \cdot f_{\text{carrier}} - 3681.25 \text{ MHz}$, except $f_{\text{nonharmonic}} = 4702.5625 \text{ MHz} - f_{\text{carrier}}$	> 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
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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/multi tone/noise/square with additional subtone/CTCSS tone/ DCS tone	
Frequency range	basic tone	1 Hz to 21 kHz
	square wave, bandwidth limited to 21 kHz	1 Hz to 4 kHz
	subtone	1 Hz to 2 kHz
	resolution, single tone/dual tone	0.1 Hz
	resolution, others	1 Hz
Multitone	CTCSS tone	tone 1 (67 Hz) to tone 50 (254.1 Hz)
	frequency range	1 to 20 selectable tones with individual frequencies and levels 1 Hz to 21 kHz
Noise		FFT 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
Selcall	digit pause	0 ms to 3000 ms
	standard	CCIR, EAA, EIA, ZVEI I/II/III, DZVEI, PZVEI
	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
Free dialing	digit pause	0 ms to 3000 ms
	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
SELCAL	digit pause	0 ms to 3000 ms
	dual tones	
	frequency range	297.5 Hz to 1553.1 Hz, predefined (A to S) or user defined
	resolution	0.1 Hz
	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/D option)

Memory size	R&S®CMA-B110B	1.024 Gbyte
	R&S®CMA-B110D	4.096 Gbyte
Word length	I	16 bit
	Q	16 bit
	marker	4 bit to 16 bit
Sample length	R&S®CMA-B110B, with 8-bit marker	up to 214.7 Msample
	R&S®CMA-B110D, with 8-bit marker	up to 858.9 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	0.02°

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

² Total modulation depth not to exceed 100 %.

Marker beacon		
Output level range and uncertainty		see general technical specifications
Frequency bands		75 MHz
Marker tone	modulation frequency	400 Hz, 1300 Hz, 3000 Hz (selectable) 0 Hz to 10 kHz (variable)
	modulation depth ²	0 % to 100 %
1020 Hz auxiliary tone (IDENT)	modulation frequency	0 Hz to 21 kHz
	modulation depth ²	0 % to 100 %

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 $T_{amb} \leq +30\text{ °C}$	100 W
	max. allowed input power for 1 min (typ.), recovery time necessary, at $T_{amb} \leq +30\text{ °C}$	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.

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		
RF COM	second harmonic	
	$f_{in} = 1\text{ MHz to }1000\text{ MHz}$, $f_{selected} = 2\text{ MHz to }2000\text{ MHz}$, input power near expected nominal power setting	< -30 dB
	$f_{in} = 1000\text{ MHz to }1500\text{ MHz}$, $f_{selected} = 2000\text{ MHz to }3000\text{ MHz}$, input power near expected nominal power setting	< -30 dB
	third harmonic	
	$f_{in} = 1\text{ MHz to }666.7\text{ MHz}$, $f_{selected} = 3\text{ MHz to }2000\text{ MHz}$, input power near expected nominal power setting	< -50 dB
	$f_{in} = 666.7\text{ MHz to }1000\text{ MHz}$, $f_{selected} = 2000\text{ MHz to }3000\text{ MHz}$, 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 $f_{in} = 1318.46875 \text{ MHz} + f_{selected}$	< -55 dB
	2000 MHz to 3000 MHz, except $f_{in} = 3681.25 \text{ MHz} - f_{selected}$, except $f_{in} = 3681.25 \text{ MHz} - 0.5 \cdot f_{selected}$	< -45 dB

Inherent spurious response	without input signal, 1 MHz to 3000 MHz except $f_{in} = 2760.9375 \text{ MHz}$	
	expected nominal power setting $\leq -10 \text{ dBm}$	< -100 dBm
	expected nominal power setting $\leq -10 \text{ dBm}$, 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	<i>RBW</i> → 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, $\alpha = 0.1$
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 +20 °C to +35 °C, no overranging ^{4, 5}	
RF COM with high-power attenuator	1 MHz to 1000 MHz, > 13 dBm	< 0.4 dB

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

⁴ For suitable setting of expected nominal power.

⁵ Valid for a 12 month calibration interval, apply RF power ≥ 100 W for max. 1 min, ≥ 50 W for max. 2 minutes, with a duty cycle of 30 %.

Level uncertainty	in temperature range from 0 °C to +50 °C ⁶ , no overranging ⁷	
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

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

Find RF functionality		
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
Repetition mode		single shot, continuous
Timeout setting		0 s to 36000 s

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 %

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

⁷ For suitable setting of expected nominal power.

Phase modulation		
Modes		RMS, $\text{RMS} \cdot \sqrt{2}$, +PK, -PK, $\pm\text{PK}/2$
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		
Modes		SSB-USB, SSB-LSB frequency error, power (RMS), power (PEP)

THD+N and THD meter (distortion meter)

Frequency range		50 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		50 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		50 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

Distortion filter

Center frequency		50 Hz to 10.5 kHz
Bandwidth	constant or relative to frequency	narrow, wide

RF bandpass filter

Bandwidth	digital filter	8.33 kHz, 25 kHz, 50 kHz, 500 kHz
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RX sensitivity

RX sensitivity	for 10 dB SINAD, AF 1kHz, FM 2.4 kHz, RF bandpass filter 25 kHz	
	30 MHz to 2000 MHz	< -107 dBm (1 μ V)
	2000 MHz to 3000 MHz	< -104 dBm (2 μ V)

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
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Level range		see general technical specifications
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Level uncertainty		see general technical specifications
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Inherent spurious response		see general technical specifications
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Spurious response		see general technical specifications
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Harmonic response		see general technical specifications
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Phase noise		see general technical specifications
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Dynamic range		see general technical specifications
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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 zero span, depending on RBW and VBW	500 µs to 2000 s 80 µs to 2000 s
Detector		average, RMS, sample, min. peak, max. peak, auto peak
Trigger	frequency sweep zero span	free run 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
Filter type		Gauss, bandpass

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 SA on RF IN	RF OUT 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, possibility to replay I/Q records (with R&S®CMA-B110B/D option)	
Sample length		64 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 67108863 sample
	trigger source	free run, IF power, ext. TRIG IN
	trigger slope	rising, falling
Storage		HD/SSD, USB device
File format		IQ, R&Phi, wv (playback with ARB generator)

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 μ V to 5 V
Level resolution	RMS	10 μ V
Level uncertainty	at level \geq 1 mV and frequency \leq 10 kHz	\leq 1.5 % + resolution
THD+N	at level \geq 100 mV, into load \geq 600 Ω , measurement bandwidth 21.9 kHz	\leq 0.05 %
THD	at level \geq 100 mV, into load \geq 600 Ω , measurement bandwidth 21.9 kHz	\leq 0.025 %

Composite AF signals

Single tone/multitone/noise/square with additional subtone/CTCSS		see chapter internal modulation source
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AF analyzer (AF1 IN, AF2 IN)**AF1 IN/AF2 IN connectors**

Input impedance		100 k Ω 15 pF
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AF voltmeter

Frequency range	AC coupling	50 Hz to 21 kHz
Level range	AC coupling, RMS	50 μ V to 30 V
	DC coupling	-43 V to +43 V
Level resolution	at level < 1 mV	1 μ V
	at level \geq 1 mV	0.1 %
Level uncertainty	at 1 mV \leq level \leq 20 mV	< 1.3 % + resolution
	at 20 mV \leq level \leq 20 V	< 1.0 % + resolution

THD+N and THD meter

Measurement bandwidth		21 kHz
Frequency range		50 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		50 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		AF1 IN, AF2 IN, 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	AF IN	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
Trigger	modes	single, normal, automatic, free run
	trigger slope	rising, falling
	threshold AF IN	-43 V to +43 V
	threshold FM demod	-96 kHz to +96 kHz
	threshold AM demod	-100 % to +100 %
	threshold PM demod	-30 rad to +30 rad

AF frequency measurement

Signal source		AF1 IN, AF2 IN, demod
Frequency range		10 Hz to 21 kHz
Resolution		0.1 Hz

AF tones analyzer

Modes		DTMF, Selcall, SELCAL, free dialing
	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

VoIP support (R&S®CMA-K610 option)

VoIP support	in line with EUROCAE ED-137B	AF source → VoIP, VoIP → AF meas.
	PCM codec	A-law, μ -law, in line with ITU-T G.711
	signal level setting	0 to FS
	sources	AF1 GEN, AF2 GEN, AF1 IN, AF2 IN, SPDIF IN
	AF measurements	frequency, level, THD, THD+N, SINAD, S/N, audio spectrum

Search routines

RX sensitivity		reduces the RF level until signal quality reaches a specified value
RX IF bandwidth		shifts the RF frequency to find the receiver bandwidth
RX squelch		varies the RF level to find the squelch open and close level as well as the hysteresis
Switched SNR		switches the modulation on and off to measure SNR

Digital standards

For all digital standard generators and analyzers

Frequency range		see base unit specifications
Frequency resolution		see base unit specifications
Frequency uncertainty		see base unit specifications
Output level range		see base unit specifications
Level resolution		see base unit specifications
Level accuracy		see base unit specifications

DMR generator (prerequisite: R&S®CMA-B110B/D option)

Modulation		4FSK
	deviation	1.944 kHz
Signal content	test patterns	1031, silence, PRBS9, O.153, O.153 (Cal)
	color code	0 to 15
	source address	0 to 16777215
	group address	0 to 16777215
Modulation accuracy	FSK deviation error	< 1 %
	frequency error, RMS	< 1 %
	magnitude error, RMS	< 1 %

DMR analyzer (R&S®CMA-K300, R&S®CMA-K305 option)

Modulation uncertainty	FSK frequency error, RMS	< 1 %
	FSK deviation error	< 1 %
	magnitude error, RMS	< 1 %

NXDN generator (prerequisite: R&S®CMA-B110B/D option)

Modulation		4FSK (4800 bps/EHR, 9600 bps/EHR, 9600 bps/EFR)
Signal content	test patterns	1031, 1011, silence, PRBS9, PRBS15
	RAN	00 to 3F
	source unit ID	0000 to FFFF
	destination unit ID	0000 to FFFF
Modulation accuracy	FSK deviation error	< 1 %
	frequency error, RMS	< 1 %
	magnitude error, RMS	< 1 %

NXDN analyzer

Modulation uncertainty	FSK frequency error, RMS	< 1 %
	FSK deviation error	< 1 %
	magnitude error, RMS	< 1 %

APCO/P25 generator (prerequisite: R&S®CMA-B110B/D option)

Modulation		C4FM
Signal content	test patterns	1011, silence, interference, busy, idle, calibration
	NAC	000 to FFF
	TGID	0000 to FFFF
	source unit ID	000000 to FFFFFFFF
	emergency	on/off
Modulation accuracy	C4FM deviation error,	< 2 %
	frequency error, RMS	< 1 %
	magnitude error, RMS	< 1 %

APCO/P25 analyzer

Modulation uncertainty	FSK frequency error, RMS	< 1 %
	FSK deviation error	< 2 %
	Modulation fidelity	< 1 %

POCSAG generator (R&S®CMA-KG260 option, prerequisite: R&S®CMA-B110B/D option)

Modulation		2FSK
	deviation	0 to 100 kHz
	symbol rate	0 to 5000 symbol/s
Signal content	pager address	0 to 9999999
	function bits	00bin to 11bin
	pager type	numeric, alphanumeric, tone-only

TETRA analyzer (R&S®CMA-K300, R&S®CMA-K305 option)

Modulation uncertainty	EVM, RMS	< 0.5 %
	MER, RMS	> 46 dB
	magnitude error, RMS	< 1 %
	phase error, RMS	< 1°

ZigBee generator (R&S®CMA-KG250 option, prerequisite: R&S®CMA-B110B/D option)

Modulation		OQPSK
	deviation	135°
	symbol rate	1 Msymbol/s
Signal content	sequence no.	00 to FF
	destination PAN	0000 to FFFF
	destination address	0000 to FFFF
	source PAN	0000 to FFFF
	source address	0000 to FFFF
	payload	00 to FF
Modulation accuracy	EVM, RMS	< 1 %
	MER, RMS	> 40 dB
	magnitude error, RMS	< 1 %
	phase error, RMS	< 1 %

User defined generator (R&S®CMA-K210 option)

Modulation		4FSK
	deviation	-100 kHz to +100 kHz
	data rate	200 bit/s to 115200 bit/s
	pattern	PRBS6, PRBS9
	seed value	0H to 1FFH
	sequence length	0 to 9000 bit
	repetition	single, continuous
	pause	0 ms to 10000 ms
Modulation accuracy	for data rate ≤ 38400 bit/s	
	frequency error RMS	< 5 %
	magnitude error RMS	< 1 %
	FSK deviation error	< 1 %

Timebase

Timebase TCXO

Max. frequency drift	in temperature range from 0 °C to +50 °C ⁸	$\pm 1 \cdot 10^{-6}$
Max. aging	at +25 °C, after 14 days of continuous operation	$\pm 1 \cdot 10^{-6}$ /year

Timebase OCXO (R&S®CMA-B690A option)

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

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

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

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

⁸ With HD (R&S®CMA-S052B): +5 °C to +45 °C.

General data

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

AF connectors (front panel)		
AF1 IN, AF2 IN		BNC connectors
AF1 OUT, AF2 OUT		AF inputs
		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)		
		for AF generator and demodulator signals

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 3.0 type A connector
DVI	for external monitor	DVI-D connector
TRIG IN, TRIG OUT	trigger input/output	2 × BNC connector, 3.3 V TTL
SPDIF IN, SPDIF OUT	SPDIF input/output	2 × BNC connector, 3.3 V

CONTROL interface (rear panel)		
4 × OUT	level	D-Sub 25-pin connector
4 × IN/OUT	level	3.3 V TTL, max. 10 mA
2 × relay	switching voltage	3.3 V TTL, max. 10 mA
	switching current	max. 30 V
		max. 2 A

Display		
Size		22.8 cm TFT color display (9.0")
Resolution		800 × 480 pixel (WVGA resolution)
Pixel failure rate		< 1.1 × 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. 5 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 60068-2-78
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: <ul style="list-style-type: none"> EN 61326-1 (industrial environment) EN 61326-2-1 EN 55011 (class A)
	with R&S®CMA-S054M DC power supply	<ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> ECE R10 Rev 4, Suppl. 2
Electrical safety	EU: in line with Low Voltage Directive 2014/35/EC	applied harmonized standard: <ul style="list-style-type: none"> EN 61010-1
	USA/Canada	applied standards: <ul style="list-style-type: none"> 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	cCSA _{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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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		<ul style="list-style-type: none"> 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		
Rated voltage	R&S®CMA-S054B AC power supply	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		27 A to 9 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 x H x D, overall	360.5 mm x 195.4 mm x 351 mm (14.19 in x 7.69 in x 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
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Accessories

R&S®CMA-Z020A transport case

Hard case for R&S®CMA180 unit and accessories		with wheels, telescoping handle, carrying handles; watertight, black
Dimensions	W x H x D, overall	620 mm x 500 mm x 366 mm (24.6 in x 19.7 in x 14.4 in)
Weight		approx. 11 kg (24 lb)

R&S®CMA-Z025A

Soft case for R&S®CMA180 unit and accessories		with carrying handles, adjustable padded shoulder straps, side bag
Dimensions	W x H x D, overall	400 mm x 390 mm x 250 mm (15.7 in x 15.4 in x 9.8 in)
Weight		approx. 4 kg (9 lb)

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 with no load	see R&S®CMA-S054M DC power supply 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 x H x D, overall	210 mm x 85 mm x 46 mm (8.26 in x 3.34 in x 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 x H x D, overall	345.2 mm x 45.6 mm x 239.7 mm (13.59 in x 1.80 in x 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 ⁹
Dimensions	W x H x D, overall, single battery	77.6 mm x 23 mm x 151 mm (3.1 in x 0.9 in x 5.9 in)
Weight	single battery	approx. 0.43 kg (0.96 lb)

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 x H x D, overall	400 mm x 127 mm x 203 mm (15.8 in x 5.0 in x 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.)

⁹ 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.

AF IN BALANCED connector

Input from DUT		XLR female connector
Modes	switchable XLR pin 1 switchable	balanced/unbalanced 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 for IN HIGH with AF IN attenuation for 600 Ω/300 Ω/150 Ω/50 Ω for 600 Ω/300 Ω/150 Ω/50 Ω with AF IN attenuation	50 μV to 7 V 500 μV to 30 V 50 μV to 7 V 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 storage temperature range	+0 °C to +50 °C -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		
Vibration	nonoperating mode 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
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Dimensions	W × H × D, overall	217 mm × 156 mm × 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

R&S®CMA-Z651A 600 Ω set

Coax series resistor	for AF OUT	600 Ω (nom.)
Coax parallel resistor	for AF IN	600 Ω (nom.)

Ordering information

Designation	Type	Order No.
Radio test set	R&S®CMA180	1173.2000K18
Selections		
Hard disk	R&S®CMA-S052C	1173.5100.04
Solid-state disk	R&S®CMA-S052P	1173.5100.17
AC power supply	R&S®CMA-S054B	1173.5151.03
DC power supply	R&S®CMA-S054M	1173.5151.14
Hardware options		
Baseband generator, 4 Gbyte	R&S®CMA-B110D	1173.5751.05
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
FSK generator	R&S®CMA-K210	1209.8654.02
I/Q recorder	R&S®CMA-K220	1209.6200.02
Signal analyzer base	R&S®CMA-K300	1320.7951.02
Signal analyzer digital	R&S®CMA-K305	1320.7939.02
Signal analyzer analog	R&S®CMA-K310	1320.7945.02
VoIP support in line with ED137B/C	R&S®CMA-K610	1209.7058.02
ZigBee generator	R&S®CMA-KG250	1209.7506.02
POCSAG generator	R&S®CMA-KG260	1209.7487.02
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
Analog tests, EXT1	R&S®CMA-KT052	1209.7412.02
Battery lifetime test	R&S®CMA-KT061	1209.6300.02
VOR/ILS tests	R&S®CMA-KT130	1209.7393.02
DMR/APCO/NXDN tests	R&S®CMA-KT200	1209.8619.02
R&S®Series4100 radio test, R&S®CMArun	R&S®CMA-KT410	1209.7764.02
R&S®Series4200 radio test, R&S®CMArun	R&S®CMA-KT420	1209.6422.02
R&S®Series4400 radio test, R&S®CMArun	R&S®CMA-KT440	1209.7358.02
VoIP support	R&S®CMA-KT610	1209.7335.02
Waveforms		
Waveform library, GPS tests	R&S®CMA-KV140	1209.5855.02
Waveform library, GLONASS tests	R&S®CMA-KV141	1209.7206.02
Waveform library, Galileo tests	R&S®CMA-KV142	1209.7229.02
Waveform library, Beidou tests	R&S®CMA-KV143	1209.7241.02
APCO fading tests	R&S®CMA-KV240	1209.7087.02
Waveforms, with R&S®WinIQSIM2™		
LTE tests, R&S®WinIQSIM2™	R&S®CMA-KW500	1209.8677.02
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
TETRA Rel2 tests, R&S®WinIQSIM2™	R&S®CMA-KW668	1209.6874.02

Designation	Type	Order No.
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 (N, BNC, D-Sub)	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
Radio adapter box and cables	R&S®CMA-Z421A	1209.8831.02
AF impedance matching unit	R&S®CMA-Z600A	1173.6406.02
R&S®CMA VoIP kit	R&S®CMA-Z610A	1209.7293.02
Feedthrough termination, BNC, 600 Ω (2 × parallel)	R&S®CMA-Z650A	1209.6700.02
600 Ω set, BNC (1 × serial, 1 × parallel)	R&S®CMA-Z651A	1209.7170.02
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, ¼, T350	R&S®ZZA- KN10	1175.3091.00
R&S®NRPxxx power sensors	R&S®NRPxxx	Please contact your local Rohde & Schwarz sales office.
R&S®FSH-Z14/-Z44 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)
50 W load	R&S®CTH-Z30	1207.1700.02
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 Accredited Calibration Coverage, one year	R&S®AW1	
Extended Warranty with Accredited Calibration Coverage, two years	R&S®AW2	
Extended Warranty with Accredited Calibration Coverage, three years	R&S®AW3	
Extended Warranty with Accredited Calibration Coverage, four years	R&S®AW4	

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

Repairs carried out during the contract term are free of charge ¹⁰. 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 ¹⁰ and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

Extended warranty with accredited calibration (AW1 to AW4)

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 ¹⁰ and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

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

¹⁰ Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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

Rohde & Schwarz

The Rohde & Schwarz electronics group offers innovative solutions in the following business fields: test and measurement, broadcast and media, secure communications, cybersecurity, monitoring and network testing. Founded more than 80 years ago, the independent company which is headquartered in Munich, Germany, has an extensive sales and service network with locations in more than 70 countries.

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ISO 9001

Certified Environmental Management

ISO 14001

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