

R&S® CMA180 Radio Test Set Specifications



CONTENTS

| | |
|--|----------|
| Definitions | 4 |
| Introduction | 5 |
| General technical specifications | 6 |
| RF generator | 6 |
| <i>Modulation</i> | 9 |
| <i>Amplitude modulation</i> | 9 |
| <i>Frequency modulation</i> | 9 |
| <i>Phase modulation</i> | 9 |
| <i>SSB modulation</i> | 9 |
| <i>FM stereo modulation</i> | 9 |
| <i>Internal modulation source</i> | 9 |
| <i>Modulation source: arbitrary waveform generator (ARB) (R&S® CMA-B110B option)</i> | 10 |
| <i>Interferer</i> | 10 |
| RF analyzer | 10 |
| <i>Power meter</i> | 12 |
| <i>RF frequency meter</i> | 13 |
| <i>Modulation deviation measurements</i> | 13 |
| <i>THD+N and THD meter (distortion meter)</i> | 14 |
| <i>SINAD meter</i> | 14 |
| <i>S/N meter</i> | 14 |
| <i>AF FFT analyzer</i> | 14 |
| <i>Audio filter, weighting</i> | 14 |
| Spectrum measurements | 15 |
| <i>FFT spectrum analyzer</i> | 15 |
| <i>RF swept spectrum analyzer (R&S® CMA-K120 option)</i> | 15 |
| AF generator (AF1 OUT, AF2 OUT) | 16 |
| <i>AF1 OUT/AF2 OUT connectors</i> | 16 |
| <i>AF sine-wave generator</i> | 16 |
| <i>Composite AF signals</i> | 16 |
| AF analyzer (AF1 IN, AF2 IN) | 17 |
| <i>AF1 IN/AF2 IN connectors</i> | 17 |
| <i>AF voltmeter</i> | 17 |
| <i>THD+N and THD meter</i> | 17 |
| <i>SINAD meter</i> | 17 |
| <i>Audio filter, weighting</i> | 17 |
| <i>Statistics</i> | 17 |
| Digital interface, unbalanced | 17 |
| <i>BNC rear panel connectors</i> | 17 |

| | |
|--|-----------|
| Timebase | 18 |
| <i>Timebase TCXO</i> | 18 |
| <i>Timebase OCXO (R&S®CMA-B690A option)</i> | 18 |
| <i>Timebase OCXO, high-performance (R&S®CMA-B690M option)</i> | 18 |
| <i>Reference frequency inputs/outputs</i> | 18 |
| General data | 19 |
| Accessories | 22 |
| R&S®CMA-Z053A external power supply (prerequisite: R&S®CMA-S054M option) | 22 |
| R&S®CMA-Z600A AF impedance matching unit (prerequisite: R&S®CMA180) | 22 |
| <i>From AF OUT UNBALANCED connector</i> | 22 |
| <i>AF OUT BALANCED connector</i> | 22 |
| <i>To AF IN UNBALANCED connector</i> | 22 |
| <i>AF IN BALANCED connector</i> | 23 |
| <i>R&S®CMA-Z600A general data</i> | 23 |
| Ordering information | 24 |
| Recommended extras | 24 |
| Recommended extras for manual operation | 24 |
| Service options | 25 |

Definitions

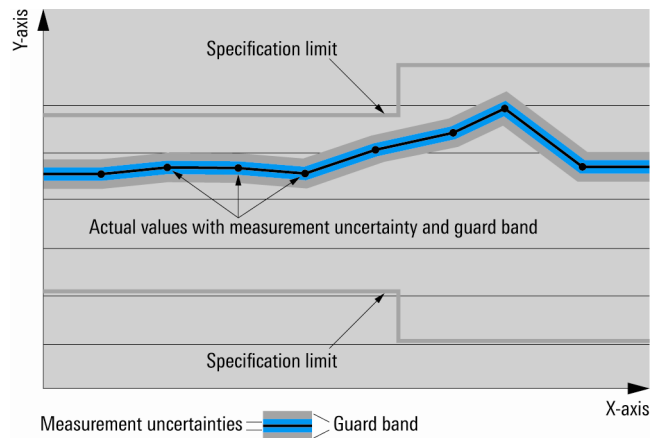
General

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 $<$, \leq , $>$, \geq , \pm , or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with $<$, $>$ or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: "parameter: value".

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Introduction

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. 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 |
| 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-S052A): +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 $f_{\text{nonharmonic}} = 2 \times f_{\text{carrier}} - 2659.9375 \text{ MHz}$, | > 55 dB |
| | 2000 MHz to 3000 MHz, except $f_{\text{nonharmonic}} = 7362.5 \text{ MHz} - 2 \times f_{\text{carrier}}$, except $f_{\text{nonharmonic}} = 2 \times f_{\text{carrier}} - 3681.25 \text{ MHz}$, 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 |
|-------------------|--|--|

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 with additional subtone/CTCSS tone | |
| Frequency range | basic tone | 0 Hz to 21 kHz |
| | subtone | 0 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 | 0 Hz to 21 kHz |
| Noise | | signal composite with flat frequency response 0 Hz to 21 kHz |

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 |

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 $T_{amb} \leq 30 \text{ }^{\circ}\text{C}$ | 100 W |
| | max. allowed input power for 1 min (typ.), necessary recovery time, at $T_{amb} \leq 30 \text{ }^{\circ}\text{C}$ | 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 | second harmonic | |
| RF COM | $f_{in} = 1 \text{ MHz to } 1000 \text{ MHz}$, $f_{selected} = 2 \text{ MHz to } 2000 \text{ MHz}$, 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 $f_{in} = 3681.25 \text{ MHz} - 0.5 \times f_{selected}$ | < -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 $> -10 \text{ dBm}$ | < -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 | $RBW \rightarrow 1 \text{ kHz}$, 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 μ s to 1 s (< step length) |
| | step length | 50 μ s 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) ² | |
| | peak envelope power (PEP) | up to 51.8 dBm (150 W) ² | |
| | 30 MHz to 2000 MHz | | |
| | continuous wave (CW) | up to 51.8 dBm (150 W) ² | |
| | peak envelope power (PEP) | up to 51.8 dBm (150 W) ² | |
| | 2000 MHz to 3000 MHz | | |
| | continuous wave (CW) | up to 51.8 dBm (150 W) ² | |
| | peak envelope power (PEP) | up to 51.8 dBm (150 W) ² | |
| | 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 | |

² Apply high power (> 100 W) for a limited time only (about 1 min).

| | | |
|--------------------------|--|----------|
| Level uncertainty | in temperature range from +20 °C to +35 °C, no overranging | |
| 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 ³ , no overranging | |
| RF COM with high-power attenuator | 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 | |
| RFCOM | level range from 0 dB to -24 dB | < 0.1 dB |

RF frequency meter

| | | |
|-------------------|--------------------------------------|------------------------|
| Frequency range | | 0.1 MHz to 2999 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, $\text{RMS}\sqrt{2}$, +PK, -PK, $\pm\text{PK}/2$ |
| 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 |

³ With HD (R&S®CMA-S052A): +5 °C to +45 °C..

| Amplitude modulation | | |
|-----------------------------|----------------------|---|
| Modes | | RMS, $\text{RMS} \cdot \sqrt{2}$, +PK, -PK, $\pm\text{PK}/2$, |
| 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, $\text{RMS} \cdot \sqrt{2}$, +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 | | 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, 3 kHz, 4 kHz, 15 kHz |
| Highpass | | off, 6 Hz, 50 Hz, 300 Hz |
| 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 |
|----------------------|--|--------------------------------------|

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 | 500 Hz 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 μ s 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 |

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 | | 10 μ V to 5 V |
| Level resolution | at level < 10 mV | 10 μ V |
| | at level \geq 10 mV | 0.1 % |
| 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 with additional subtone/CTCSS | | see chapter internal modulation source |
|---|--|--|

AF analyzer (AF1 IN, AF2 IN)

AF1 IN/AF2 IN connectors

| | | |
|-----------------|--|------------------------|
| Input impedance | | 100 k Ω 15 pF |
|-----------------|--|------------------------|

AF voltmeter

| | | |
|-------------------|-----------------------------------|----------------------|
| Frequency range | | 50 Hz to 21 kHz |
| Level range | | 50 μ V to 30 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 | | 100 Hz to 10.5 kHz |
| Level range | | 10 mV to 30 V |
| Resolution | | 0.01 % |
| Inherent distortion | at 100 mV \leq level \leq 20 V | < 0.05 % THD+N and < 0.025 % THD |
| Uncertainty | at 100 mV \leq level \leq 2 V | < 1 % + inherent distortion |
| | at 2 V \leq level \leq 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 | | 10 mV to 30 V |
| Resolution | | 0.1 dB |
| Uncertainty | at 100 mV \leq level \leq 2 V, at 2 V \leq level \leq 20 V | < 1 dB |

Audio filter, weighting

| | | |
|------------------|--|------------------------------------|
| Lowpass | | off, 3 kHz, 4 kHz, 15 kHz |
| Highpass | | off, 6 Hz, 50 Hz, 300 Hz |
| Weighting filter | | off, A-weighting, CCITT, C-message |

Statistics

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

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 ⁴ | $\pm 1 \times 10^{-6}$ |
| 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 ⁴ , referenced to +25 °C with instrument orientation | $\pm 5 \times 10^{-8}$ |
| Retrace | at +25 °C, after 24 hours power on/2 hours power off/1 hour power on | $\pm 5 \times 10^{-9}$ $\pm 2 \times 10^{-8}$ |
| 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 ⁴ , referenced to +25 °C 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 | $\pm 1 \times 10^{-9}$ $\pm 5 \times 10^{-9}$ |
| 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 |

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 |

⁴ With HD (R&S®CMA-S052A): +5 °C to +45 °C.

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 \times USB 2.0 type A connector |
| SENSOR | | for R&S [®] NRP-Zxx power sensors |
| PHONES | for headphones | 3.5 mm audio jack |
| | impedance | $\geq 16 \Omega$ |

| | | |
|----------------------------------|--|--|
| 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 \times USB 2.0 type A connector |
| DVI | for external monitor | DVI-D connector |
| TRIG IN, TRIG OUT | trigger input/output | 2 \times BNC connector |
| SPDIF IN, SPDIF OUT | SPDIF input/output | 2 \times BNC connector |

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

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

| | | |
|-----------------------|--------------------------------------|-----------|
| Storage memory | | |
| Hard disk | R&S [®] CMA-S052A selection | 480 Gbyte |
| Solid-state disk | R&S [®] CMA-S052M 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 SSD is written completely 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-S052A) | +5 °C to +45 °C |
| | operating temperature range with SSD (R&S®CMA-S052M) | 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 80% rel. humidity, in line with MIL-PRF-28800F and 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 2004/108/EC | applied harmonized standards: <ul style="list-style-type: none"> EN 61326-1 (industrial environment) EN 61326-2-1 EN 55011 (class A) |
| | EU: in line with Automotive directive (EMC) 2004/104/EC, last adapted by 2009/19/EC (with DC power supply R&S®CMA-S054M) | applied harmonized standard: <ul style="list-style-type: none"> EN 50498 |
| | Directive of United Nations relating to approval of vehicles with regard to EMC (with DC power supply R&S®CMA-S054M) | applied standard: <ul style="list-style-type: none"> ECE R10 Rev 4, Suppl. 2 |
| Electrical safety | EU: in line with Low Voltage Directive 2006/95/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 Nr.: 40039469 |
| | CSA – Canadian Standards Association | cCSA _{UL} mark – Certificate Nr.: 70002992 |
| RoHS | EU: in line with the directive for the restriction of the use of hazardous substances in electrical and electronic equipment 2011/65/EC | |

| Mechanical resistance | | |
|------------------------------|------------|---|
| Vibration | sinusoidal | <ul style="list-style-type: none"> 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. in line with MIL-PRF-28800F 5 Hz to 55Hz |
| | random | <ul style="list-style-type: none"> in line with EN 60068-2-64, 10 Hz to 300 Hz, acceleration 1.2 g RMS in line with MIL-PRF-28800F, 5 Hz to 500 Hz |
| Shock | | <ul style="list-style-type: none"> in line with MIL-PRF-28800F, 30 g in line with MIL-STD-810E method 516.4, procedure I, 45 Hz to 2000 Hz, max. 40 g |

| | | |
|---------------------|---------------------------------|-------------------------------|
| 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 accessory makes it possible to use the R&S® CMA180 with R&S® CMA-S054M option (DC power supply) at AC mains.

| | | |
|-------------------------------|---|---|
| Power rating | | |
| Rated voltage | | 100 V to 240 V AC ($\pm 10\%$) |
| Rated frequency | | 50 Hz to 60 Hz ($\pm 5\%$) |
| Rated current | | max. 4 A |
| Output voltage | | 24 V DC ($\pm 3\%$) |
| 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: <ul style="list-style-type: none"> EN 61000 EN 55022 class B |
| Electrical safety | EU: in line with Low Voltage Directive 2006/95/EC USA/Canada/Japan | applied harmonized standard: <ul style="list-style-type: none"> EN 60950-1 applied standards: <ul style="list-style-type: none"> 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-Z600A AF impedance matching unit (prerequisite: R&S® CMA180)

The R&S® CMA-Z600A accessory makes the conversion and matching of unbalanced/balanced audio system available.

With push buttons there are several operating modes and impedances selectable.

From AF OUT UNBALANCED connector

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

AF OUT BALANCED connector

| | | |
|-------------------|--|---|
| Output to DUT | | XLR connector male |
| Modes | switchable | balanced/unbalanced |
| | XLR pin 1 switchable | float/unfloat |
| Output impedance | switchable | 50 Ω , 150 Ω , 300 Ω , 600 Ω OUT LOW nom. 2 Ω |
| Frequency range | | 20 Hz to 21 kHz |
| Level range | for OUT LOW | 50 μ V to 5 V |
| | for 600 Ω /300 Ω /150 Ω | 50 μ V to 2.5 V |
| | for 50 Ω | 50 μ V to 1 V |
| Level uncertainty | at level \geq 100 mV | \leq 1 % (typ.) + R&S® CMA180 AF generator specifications |
| THD+N | at level \geq 100 mV, measurement bandwidth 21.9 kHz | \leq 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 | | nom. 3 Ω |

AF IN BALANCED connector

| | | |
|-------------------|--|---|
| Input from DUT | | XLR connector female |
| Modes | switchable | balanced/unbalanced |
| | XLR pin 1 switchable | float/unfloat |
| Input impedance | switchable | 50 Ω, 150 Ω, 300 Ω, 600 Ω, IN HIGH nom. 220 kΩ 50 pF |
| 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 60068-2-78 |
| 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: <ul style="list-style-type: none"> • EN 61326-1 (industrial environment) • EN 61326-2-1 • EN 55011 (class A) |
| Electrical safety | | applied harmonized standard: <ul style="list-style-type: none"> • IEC/EN 61010-1 |
| RoHS | EU: in line with the directive for the restriction of the use of hazardous substances in electrical and electronic equipment 2011/65/EC | |

| | | |
|------------------------------|-------------------|---|
| 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 |
|-----------------|-----------|--------|

| | | |
|-------------------|---------------------------|--|
| 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) |

Ordering information

| Designation | Type | Order No. |
|---|---------------|--------------|
| Radio Test Set | R&S®CMA180 | 1173.2000K18 |
| Selections | | |
| Hard Disk | R&S®CMA-S052A | 1173.5100.02 |
| Solid-State Disk | R&S®CMA-S052M | 1173.5100.14 |
| AC Power Supply | R&S®CMA-S054B | 1173.5151.03 |
| Options | | |
| Baseband Generator | R&S®CMA-B110B | 1173.5751.03 |
| OCXO Reference Oscillator | R&S®CMA-B690A | 1173.5851.02 |
| OCXO Reference Oscillator, high-performance | R&S®CMA-B690M | 1173.5851.14 |
| IEC/IEEE Bus Interface | R&S®CMA-B612A | 1173.5800.02 |
| Software options | | |
| SA, TG, Scope, Trans-Rec | R&S®CMA-K120 | 1173.6206.02 |
| Accessories | | |
| Transit Case | R&S®CMA-Z020A | 1209.5555.02 |
| Soft Case | R&S®CMA-Z025A | 1209.5510.02 |
| Display Protection Cover | R&S®CMA-Z030A | 1209.9796.00 |
| External Power Supply | R&S®CMA-Z053A | 1173.6058K00 |
| AF Impedance Matching Unit | R&S®CMA-Z600A | 1173.6406.02 |

For more ordering information about available options, please see the R&S®CMA180 product brochure (PD 3606.9404.12) or ask your local Rohde & Schwarz expert to find the solution that is optimally suited to your needs.

Recommended extras

| Designation | Type | Order No. |
|---|---------------|---------------------------------------|
| 19" Rack Adapter, 4 HU, ¼, 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 |
| 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 |
| 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®PSL-Z2 | 1157.6870.04 |

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 ⁵. Necessary calibration and adjustments carried out during repairs are also covered. Simply contact the forwarding agent we name; your product will be picked up free of charge and returned to you in top condition a couple of days later.

Extended warranty with calibration (CW1 to CW4)

Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs ⁵ 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

⁵ 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 is a leading supplier of solutions in the fields of test and measurement, broadcasting, secure communications, and radiomonitoring and radiolocation. Founded more than 80 years ago, this independent global company has an extensive sales network and is present in more than 70 countries. The company is headquartered in Munich, Germany.

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

Data without tolerance limits is not binding | Subject to change

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