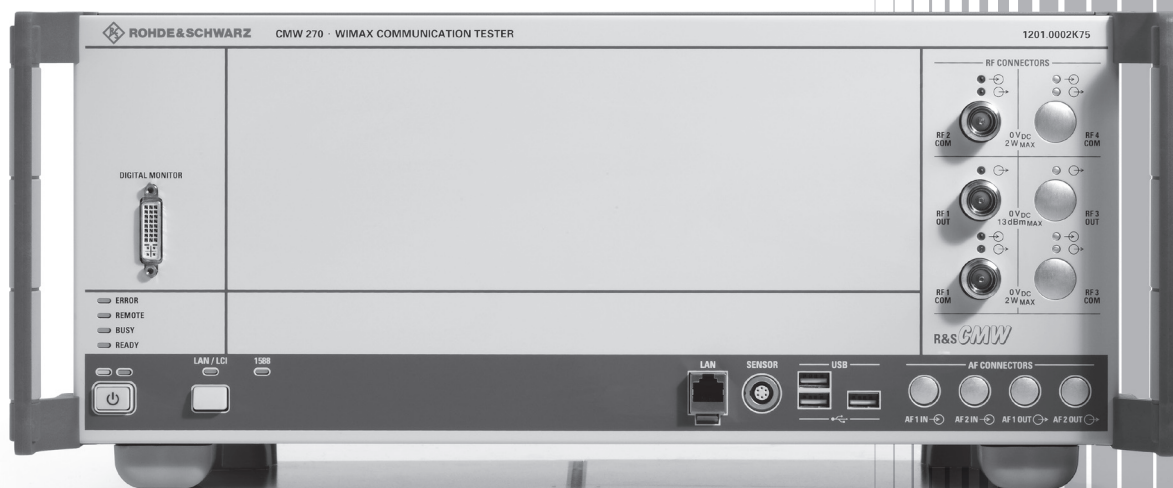


R&S® CMW270 WiMAX Communication Tester Specifications



75 Years of
Driving
Innovation

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General technical specifications

RF generator

Frequency range		70 MHz to 6000 MHz
Frequency resolution		0.1 Hz
Frequency uncertainty		same as timebase + frequency resolution

Output level range		
RF1 COM, RF2 COM	70 MHz to 100 MHz continuous wave (CW) peak envelope power (PEP) overranging (PEP)	-130 dBm to -15 dBm up to -15 dBm up to -10 dBm
	100 MHz to 3300 MHz continuous wave (CW) peak envelope power (PEP) overranging (PEP)	-130 dBm to -5 dBm up to -5 dBm up to 0 dBm
	3300 MHz to 6000 MHz continuous wave (CW) peak envelope power (PEP) overranging (PEP)	-120 dBm to -15 dBm up to -15 dBm up to -10 dBm
	maximum input DC level	0 V DC
RF1 OUT	70 MHz to 100 MHz continuous wave (CW) peak envelope power (PEP) overranging (PEP)	-120 dBm to -2 dBm up to -2 dBm up to +3 dBm
	100 MHz to 3300 MHz continuous wave (CW) peak envelope power (PEP) overranging (PEP)	-120 dBm to +8 dBm up to +8 dBm up to +13 dBm
	3300 MHz to 6000 MHz continuous wave (CW) peak envelope power (PEP) overranging (PEP)	-110 dBm to -2 dBm up to -2 dBm up to +3 dBm
	maximum input DC level	0 V DC

Output level uncertainty	in temperature range +20 °C to +35 °C, no overranging	
RF1 COM, RF2 COM	output level >-120 dBm	
	70 MHz to 100 MHz	<1.2 dB ¹
	100 MHz to 3300 MHz 3300 MHz to 6000 MHz	<0.6 dB ¹ <1.2 dB ¹
RF1 OUT	output level >-110 dBm	
	70 MHz to 100 MHz	<1.6 dB ¹
	100 MHz to 3300 MHz 3300 MHz to 6000 MHz	<0.8 dB ¹ <1.6 dB ¹

Output level uncertainty	in temperature range +5 °C to +45 °C, no overranging	
RF1 COM, RF2 COM	output level >-120 dBm	
	70 MHz to 100 MHz	<2.0 dB ¹
	100 MHz to 3300 MHz 3300 MHz to 6000 MHz	<1.0 dB ¹ <2.0 dB ¹
RF1 OUT	output level >-110 dBm	
	70 MHz to 100 MHz	<2.0 dB ¹
	100 MHz to 3300 MHz 3300 MHz to 6000 MHz	<1.0 dB ¹ <2.0 dB ¹

¹ Valid for a 12-month calibration interval.

Output level linearity with fixed RF output attenuator setting	in temperature range +20 °C to +35 °C, GPRF generator list mode, level range 0 dB to -30 dB	
RF1 COM, RF2 COM	no overranging	<0.2 dB, typ. <0.1 dB

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	
	output level ≥ -80 dBm	<0.01 dB
	output level < -80 dBm	<0.05 dB

VSWR		
RF1 COM, RF2 COM	70 MHz to 3300 MHz	<1.2
	3300 MHz to 5000 MHz	<1.5
	5000 MHz to 6000 MHz	<1.6
RF1 OUT	70 MHz to 3300 MHz	<1.5
	3300 MHz to 5000 MHz	<1.5
	5000 MHz to 6000 MHz	<1.6

Attenuation of 2nd harmonic		
RF1 COM, RF2 COM	70 MHz to 6000 MHz, $P < -10$ dBm	>30 dB
RF1 OUT	70 MHz to 6000 MHz, $P < 0$ dBm	>30 dB

Attenuation of 3rd harmonic		
RF1 COM, RF2 COM	70 MHz to 6000 MHz, $P < -10$ dBm	>40 dB
RF1 OUT	70 MHz to 6000 MHz, $P < 0$ dBm	>40 dB

Attenuation of nonharmonics	>5 kHz offset from carrier, for output level > -40 dBm	
	400 MHz to 3300 MHz, except $f_{\text{nonharmonics}} = 3900 \text{ MHz} - f_{\text{carrier}}$, except $f_{\text{nonharmonics}} = 3900 \text{ MHz}$	>60 dB
	3300 MHz to 3600 MHz	>25 dB
	3600 MHz to 6000 MHz, except $f_{\text{nonharmonics}} = 2 \times f_{\text{carrier}} - 6400 \text{ MHz}$	>40 dB

Phase noise	single sideband, 70 MHz to 3300 MHz	
Carrier offset	≥ 1 MHz	< -120 dBc, 1 Hz

Phase noise	single sideband, 3300 MHz to 6000 MHz	
Carrier offset	≥ 1 MHz	< -117 dBc, 1 Hz

Signal-to-noise ratio	70 MHz to 3300 MHz	
RF1 COM, RF2 COM	5 MHz offset from carrier, for output level > -30 dBm	>95 dB, typ. >101 dB, 1 kHz

Signal-to-noise ratio	3300 MHz to 6000 MHz	
RF1 COM, RF2 COM	5 MHz offset from carrier, for output level > -30 dBm	>92 dB, 1 kHz

Modulation source: arbitrary waveform generator (ARB) (R&S® CMW-B110A option)

Memory size		1.024 Gbyte
Word length	I Q marker	16 bit 16 bit 4 bit to 16 bit
Sample length	with 4 bit marker	up to 227.55 Msample
Sample rate	minimum maximum	400 Hz 100 MHz

RF analyzer

VSWR		
RF1 COM, RF2 COM	70 MHz to 3300 MHz 3300 MHz to 5000 MHz 5000 MHz to 6000 MHz	<1.2 <1.5 <1.6

Inherent spurious response	without input signal, 70 MHz to 6000 MHz, except: 4000 MHz, 4800 MHz, 5600 MHz, 6000 MHz	<-100 dBm
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Spurious response	70 MHz to 3300 MHz 3300 MHz to 3700 MHz, except $f_{in} = 6400 \text{ MHz} - f_{selected}$, except $f_{in} = 6400 \text{ MHz} - 0.5 \times f_{selected}$ 3700 MHz to 6000 MHz, except $f_{in} = 6400 \text{ MHz} - 0.5 \times f_{selected}$	<-55 dB <-40 dB <-40 dB
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Harmonic response	2nd harmonic	
RF1 COM, RF2 COM	$f_{in} = 70 \text{ MHz to } 1650 \text{ MHz}$, $f_{selected} = 140 \text{ MHz to } 3300 \text{ MHz}$	<-30 dB
	$f_{in} = 1650 \text{ MHz to } 3000 \text{ MHz}$, $f_{selected} = 3300 \text{ MHz to } 6000 \text{ MHz}$	<-30 dB

Harmonic response	3rd harmonic	
RF1 COM, RF2 COM	$f_{in} = 70 \text{ MHz to } 1100 \text{ MHz}$, $f_{selected} = 210 \text{ MHz to } 3300 \text{ MHz}$	<-50 dB
	$f_{in} = 1100 \text{ MHz to } 2000 \text{ MHz}$, $f_{selected} = 3300 \text{ MHz to } 6000 \text{ MHz}$	<-50 dB

Phase noise	single sideband, 70 MHz to 3300 MHz	
Carrier offset	$\geq 1 \text{ MHz}$	<-120 dBc, 1 Hz

Phase noise	single sideband, 3300 MHz to 6000 MHz	
Carrier offset	$\geq 1 \text{ MHz}$	<-117 dBc, 1 Hz

Power meter

Frequency range		70 MHz to 6000 MHz
Frequency resolution		0.1 Hz
Resolution bandwidths		Gaussian, 1 kHz to 10 MHz, in 1/3/5 steps, bandpass, 1 kHz to 30 MHz, in 1/3/5 steps, RRC, $\alpha = 0.1$

Expected nominal power setting range	for ADC full scale	
RF1 COM, RF2 COM	70 MHz to 100 MHz 100 MHz to 3300 MHz 3300 MHz to 6000 MHz	-37 dBm to +42 dBm ² -47 dBm to +42 dBm ² -37 dBm to +42 dBm ²

² The maximum permissible continuous power is +34 dBm due to thermal limits.

Level range		
RF1 COM, RF2 COM	70 MHz to 100 MHz continuous power (CW) peak envelope power (PEP)	-74 dBm ³ to +34 dBm up to +42 dBm ⁴
	100 MHz to 3300 MHz continuous power (CW) peak envelope power (PEP)	-84 dBm ³ to +34 dBm up to +42 dBm ⁴
	3300 MHz to 6000 MHz continuous power (CW) peak envelope power (PEP)	-74 dBm ³ to +34 dBm up to +42 dBm ⁴
	maximum input DC level	0 V DC

Level uncertainty	in temperature range +20 °C to +35 °C	
RF1 COM, RF2 COM	70 MHz to 100 MHz	<1.0 dB ⁵
	100 MHz to 3300 MHz	<0.5 dB ⁵
	3300 MHz to 6000 MHz	<1.0 dB ⁵

Level uncertainty	in temperature range +5 °C to +45 °C	
RF1 COM, RF2 COM	70 MHz to 100 MHz	<1.2 dB ⁵
	100 MHz to 3300 MHz	<0.7 dB ⁵
	3300 MHz to 6000 MHz	<1.2 dB ⁵

Level linearity with fixed expected nominal power setting	in temperature range +20 °C to +35 °C, level range 0 dB to -40 dB	
RF1 COM, RF2 COM		<0.3 dB

Level resolution		0.01 dB
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Level repeatability	typical values after 1 h warm-up time, always returning to same level and frequency, no temperature change, insignificant time change	
	input level ≥ -40 dBm	<0.01 dB
	input level < -40 dBm	<0.03 dB

Dynamic range	70 MHz to 3300 MHz, <i>RBW</i> → 1 kHz, with fixed expected nominal power setting	>100 dB
Expected nominal power setting for full dynamic range		
RF1 COM, RF2 COM		-8 dBm to +42 dBm ⁴

Dynamic range	3300 MHz to 6000 MHz, <i>RBW</i> → 1 kHz, with fixed expected nominal power setting	>97 dB
Expected nominal power setting for full dynamic range		
RF1 COM, RF2 COM		+2 dBm to +42 dBm ⁴

³ *RBW* → 1 kHz.

⁴ The maximum permissible continuous power is +34 dBm due to thermal limits.

⁵ Valid for a 12-month calibration interval.

Timebase

Timebase TCXO

Max. frequency drift	in temperature range +5 °C to +45 °C	$\pm 1 \times 10^{-6}$
Max. aging	at +25 °C, after 14 days of continuous operation	$\pm 1 \times 10^{-6}$ /year

Timebase basic OCXO (R&S® CMW-B690A option)

Max. frequency drift	in temperature range +5 °C to +45 °C	$\pm 5 \times 10^{-8}$
Retrace	at +25 °C, after 24 hours power ON/ 2 hours power OFF/1 hour power ON	$\pm 2 \times 10^{-8}$
Max. aging	at +25 °C, after 10 days of continuous operation	$\pm 1 \times 10^{-7}$ /year $\pm 1 \times 10^{-9}$ /day
Warm-up time	at +25 °C, the frequency is in the range that is 10 times the frequency drift ($\pm 5 \times 10^{-7}$)	approx. 10 min

Timebase highly stable OCXO (R&S® CMW-B690B option)

Max. frequency drift	in temperature range +5 °C to +45 °C, referenced to +25 °C	$\pm 5 \times 10^{-9}$
	with instrument orientation	$\pm 1 \times 10^{-9}$
Retrace	at +25 °C, after 24 hours power ON/ 2 hours power OFF/1 hour power ON	$\pm 5 \times 10^{-9}$
Max. aging	at +25 °C, after 10 days of continuous operation	$\pm 3 \times 10^{-8}$ /year $\pm 5 \times 10^{-10}$ /day
Warm-up time	at +25 °C, the frequency is in the range that is 10 times the frequency drift ($\pm 5 \times 10^{-8}$)	approx. 10 min

Reference frequency inputs/outputs

Synchronization input		BNC connector REF IN, rear panel
Frequency	sinewave	10 MHz to 80 MHz, step: 1 Hz
	squarewave (TTL level)	1 MHz to 80 MHz, step: 1 Hz
Max. frequency variation		$\pm 10 \times 10^{-6}$
Input voltage range		0.5 V to 2 V, rms
Impedance		50 Ω

Synchronization output 1		BNC connector REF OUT 1, rear panel
Frequency		10 MHz from internal reference or frequency at synchronization input
Output voltage		>1.4 V, peak-to-peak
Impedance		50 Ω

WiMAX specifications – mobile station test

Standard		IEEE 802.16e-2005, OFDMA
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WiMAX RF generator (prerequisite: R&S® CMW-B110A option)

Arbitrary waveform file	in line with IEEE 802.16e-2005, OFDMA average power	WIMAX_DL_3BURST_46_5MS.WV
Frequency range	WiMAX band 1 WiMAX band 2 WiMAX band 3	2300 MHz to 2800 MHz 3300 MHz to 3800 MHz 5100 MHz to 5850 MHz
Output level range	waveform file used: WIMAX_DL_3BURST_46_5MS.WV (PAR = 11.1 dB)	see general technical specifications
Output level uncertainty	waveform file used: WIMAX_DL_3BURST_46_5MS.WV, with level offset of -0.146 dB	see general technical specifications
Output level resolution		see general technical specifications

Signal quality		
Error vector magnitude (EVM)	ID_Cell = 0, permbase = 0, prbs_id = 0, cp = 1/8, BW = 10 MHz, bursts: FCH, DL-MAP, data PN15, modulation type and coding rate QPSK ½; waveform file used: WIMAX_DL_3BURST_46_5MS.WV	<-40 dB, rms

WiMAX RF analyzer (R&S® CMW-KM700 option)

Standard		IEEE 802.16e-2005, OFDMA
FFT size		512, 1024
Bandwidth		3.5 MHz, 5 MHz, 7 MHz, 8.75 MHz, 10 MHz
Link direction		uplink, downlink
Subcarrier allocation		DL PUSC, UL PUSC

Frequency range	WiMAX band 1 WiMAX band 2 WiMAX band 3	2300 MHz to 2800 MHz 3300 MHz to 3800 MHz 5100 MHz to 5850 MHz
Level setting		manual mode
Level range	RF1 COM, RF2 COM	-40 dBm to +27 dBm, rms

Statistics		
Statistical count		1 to 1000
Values		current, average, minimum, maximum

Trigger		
Trigger level	settable	down to -20 dB
Trigger source	internal	power trigger

Measured parameters	numeric results	subframe rms power, crest factor, error vector magnitude (all carriers, pilot carriers, data carriers), frequency error, I/Q imbalance gain, I/Q imbalance quadrature, spectrum flatness, relative
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Power measurement

Subframe rms power		
Level uncertainty	RF1 COM, RF2 COM, WiMAX band 1, band 2 and band 3	add 0.15 dB to RF analyzer level uncertainty (see general technical specifications) ⁶

Modulation analysis

Error vector magnitude		
Measurement range		from inherent EVM up to -12 dB
Inherent EVM	WiMAX band 1 UL -15 dBm ≤ input level ≤ +27 dBm -40 dBm ≤ input level < -15 dBm WiMAX band 2 UL -15 dBm ≤ input level ≤ +27 dBm -35 dBm ≤ input level < -15 dBm WiMAX band 3 UL -15 dBm ≤ input level ≤ +27 dBm -35 dBm ≤ input level < -15 dBm WiMAX band 1 DL -15 dBm ≤ input level ≤ +27 dBm WiMAX band 2 DL -15 dBm ≤ input level ≤ +27 dBm WiMAX band 3 DL -15 dBm ≤ input level ≤ +27 dBm	<-40 dB, rms ⁶ <-36 dB, rms ⁶ <-38 dB, rms ⁶ <-35 dB, rms ⁶ <-38 dB, rms ⁶ <-35 dB, rms ⁶ <-38 dB, rms ⁶ <-36 dB, rms ⁶ <-36 dB, rms ⁶
Measurement length		1 frame, multiframe
Resolution		0.01 dB

Frequency error		
Measurement range	FFT size 512, BW = 3.5 MHz FFT size 512, BW = 5 MHz FFT size 1024, BW = 7 MHz FFT size 1024, BW = 8.75 MHz FFT size 1024, BW = 10 MHz	-3.9063 kHz to +3.9063 kHz -5.468 kHz to +5.468 kHz -3.9063 kHz to +3.9063 kHz -4.8828 kHz to +4.8828 kHz -5.468 kHz to +5.468 kHz
Frequency measurement uncertainty		<10 Hz + drift of timebase, see general technical specifications ⁶
Resolution		0.01 Hz

I/Q imbalance		
Inherent I/Q gain imbalance		<0.1 dB ⁶
I/Q gain imbalance resolution		0.001 dB
Inherent I/Q quadrature imbalance		<0.1° rms ⁶
I/Q quadrature imbalance resolution		0.001°

Spectrum measurements

Spectrum flatness, relative		
Level uncertainty	inner carriers: spectral lines from $-N_{used}/4$ to -1 and spectral lines from 1 to $N_{used}/4$ outer carriers: spectral lines from $-N_{used}/2$ to $-N_{used}/4$ and spectral lines from $N_{used}/4$ to $N_{used}/2$ neighbor subcarrier deviation	<0.6 dB ⁶ <0.9 dB ⁶ <0.2 dB ⁶
Resolution		0.01 dB

⁶ Averaging across 100 bursts, UL signal definition: BW = 10 MHz, NFFT = 1024, all subchannels used, zone length: 34 DL, 18 UL.

WiMAX signaling (base station emulator; prerequisite: R&S[®] CMW-KS700, R&S[®] CMW-B200A, R&S[®] CMW-B270A options)

Standard		IEEE 802.16e
Physical layer mode		OFDMA
Frequency range	WiMAX band 1 WiMAX band 2 WiMAX band 3	2300 MHz to 2800 MHz 3300 MHz to 3800 MHz 5100 MHz to 5850 MHz
Level setting		manual mode
Level reference	downlink	single data subcarrier power
Output level range		
RF1 COM, RF2 COM, RF1 OUT		see general technical specifications
	offset relative to peak envelope power (PEP)	
	preamble power	-17.7 dB ⁷
	single data subcarrier power	-51.2 dB ⁷
Output level uncertainty		see general technical specifications
Output level resolution		see general technical specifications

⁷ BW = 10 MHz, all subchannels used.

Signaling parameters (physical and MAC layers)

FFT size		1024
Bandwidth		10 MHz
Duplexing		TDD
Frame duration		5 ms
Cyclic prefix		1/8
Subcarrier allocation		DL PUSC, UL PUSC
Number of OFDMA symbols	downlink	26 to 35
Channel coding	FEC type	CC
Modulation	FEC code type: downlink	QPSK 1/2, QPSK 3/4, 16QAM 1/2, 16QAM 3/4, 64QAM 1/2, 64QAM 2/3, 64QAM 3/4,
	FEC code type: uplink	QPSK 1/2, QPSK 3/4, 16QAM 1/2, 16QAM 3/4,
Burst types		FCH, DL MAP, UL MAP, DCD, UCD, data region

PER measurement

Measurement range		0 % to 100 %
Data	downlink	all 0 all 1 bit pattern: 0101 bit pattern: 1010 pseudo random PN9 to PN23

Channel measurement

CINR, RSSI, MS TX power	provided by mobile station	
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General data

RF connectors (front panel)		Snap-N female, 50 Ω, compatible with N female connectors
RF1 COM, RF2 COM		combined RF input and RF output
RF1 OUT		RF output

Remote control interfaces (front panel)		
LAN		Ethernet RJ-45 connector, 100 Mbit/s

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

Further interfaces (front panel)		
USB	for keyboard, mouse, USB stick	3 × USB 2.0 type A connector
SENSOR		for R&S® NRP-Zxx power sensors
DIGITAL MONITOR	for external monitor	DVI-D connector

Further interfaces (rear panel)		
USB	for keyboard, mouse, USB stick	1 × USB 2.0 type A connector, 1 × USB 1.1 type A connector
TRIG A, TRIG B	trigger input/output	2 × BNC connector

Operating temperature range		+5 °C to +45 °C, in line with EN 60068-2-1 and -2
Storage temperature range		-25 °C to +60 °C, in line with EN 60068-2-1 and -2
Humidity	+40 °C, non-condensing	80 % relative humidity, in line with EN 60068-2-3
Electromagnetic compatibility		in line with EMC Directive 2004/108/EC, applied standard: EN 61326 (immunity for industrial environment; class B emissions)
Electrical safety		in line with IEC 61010-1: 2001 (ed. 2), EN 61010-1: 2001 (ed. 2), UL61010-1 (ed. 2), CAN C22.2 No. 61010-1-04

Mechanical resistance	non-operating mode	
Vibration, sinusoidal		in line with EN 60068-2-6, EN 61010-1, MIL-T-28800D class 5, 5 Hz to 150 Hz, max. 2 g at 55 Hz, 55 Hz to 150 Hz, 0.5 g const.
Vibration, random		in line with EN 60068-2-64, 10 Hz to 300 Hz, acceleration 1.2 g rms
Shock		in line with EN 60068-2-27, MIL-STD-810D 40 g shock spectrum

Power supply		power factor correction, in line with EN 61000-3-2
Input		100 V to 240 V $\pm 10\%$ (AC), max. 850 VA, 50 Hz to 60 Hz $\pm 5\%$
Power consumption	base unit, non-signaling	approx. 200 W

Dimensions	W × H × D, overall	465.1 mm × 197.3 mm × 517.0 mm 18.31 in × 7.77 in × 20.35 in
	for rackmounting	19" 1/1, 4 HU, 450
Weight	base unit	approx. 14 kg approx. 31 lb
	with typical options	approx. 18 kg approx. 40 lb
Calibration interval	12 months	recommended for highest accuracy, see specified RF generator and RF analyzer level uncertainty
	24 months	add 0.2 dB to specified RF generator and RF analyzer level uncertainty

Ordering information

Base unit

R&S®CMW270	base unit with following accessories: power cord, operating manual (quick start guide), comprehensive documentation on CD ROM	1201.0002K75
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Please find more ordering information about available options in the product brochure (PD 5213.8880.12) or ask your local Rohde & Schwarz expert to find the solution that is optimally suited to your needs.

Recommended extras for manual operation

R&S®PSL-Z10	mouse with USB interface, optical	1157.7060.04
R&S®PSL-Z2	keyboard with USB interface (US assignment)	1157.6870.04
R&S®PMC3	17" TFT monitor	1082.6004.12

Important information:

We recommend using only the above-mentioned original PC components from Rohde & Schwarz in connection with the R&S®CMW270. The interaction of all components is continuously tested.

Insufficient shielded PC components may lead to EMC problems which may disturb RF measurements results.

Recommended extras

R&S®ZZA-411	19" rack adapter	1069.3283.00
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Specifications apply under the following conditions:

Based on a 24-month calibration interval unless otherwise stated.

Data without tolerance limits is not binding.

During the production process, each instrument is calibrated in line with defined procedures. All measurement results, including measurement uncertainties of the calibration system, have to be within the published specification limits to release the individual instrument. The expanded measurement uncertainties of the calibration system used in the production process are determined with a coverage factor of $k = 2$ (normally approx. 95 % probability).

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Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Service & support

With 24-hour support worldwide and personal service contacts in over 70 countries, Rohde & Schwarz is present around the globe. The company stands for high quality, preventive service, and compliance with delivery schedules – no matter whether the task at hand is calibration or application support.

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For product brochure,
see PD 5213.8880.12
and www.rohde-schwarz.com
(serch term: CMW270)

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Data without tolerance limits is not binding | Subject to change

*0.14 €/min within German wireline network; rates may vary in other networks (wireline and mobile) and countries