

Specifications of CMD50/52

RF generator 1

Frequency range	GSM900 band: 935.2 MHz to 959.8 MHz
Frequency error	same as time base
Resolution	GSM channel spacing: 200 kHz
Frequency setting time	≤3 ms for phase error <2°
Output level (RF IN/OUT) (RF OUT 2)	-33 dBm to -120 dBm +13 dBm to -77 dBm
Resolution	0.1 dB
Level error (RF IN/OUT) (RF OUT 2)	≤1.5 dB (≤1 dB at -104 dBm) ≤2 dB
Harmonics (RF IN/OUT)	<-30 dBc
Modulation	GMSK, B x T = 0.3
Phase error	≤4° rms, ≤10° peak

RF generator 2

Frequency range, frequency error, resolution, setting time, level resolution, harmonics, modulation and phase error	see RF generator 1
Maximum output level	
RF IN/OUT	-35 dBm
RF OUT 2	+11 dBm
Level error	
RF IN/OUT	≤1.5 dB
RF OUT 2	≤2 dB

Peak power meter (RF IN/OUT)

Frequency range	800 MHz to 1000 MHz
Measurement range	10 dBm to 47 dBm
Resolution	0.1 dB
Error in GSM band	
890.2 MHz to 914.8 MHz	≤0.5 dB + resolution (P > 13 dBm)
VSWR	≤1.3

GSM phase and frequency error measurement

Frequency range	with option CMD-B4 GSM900 band: 890.2 MHz to 914.8 MHz
Level range	
RF IN/OUT	10 dBm to 47 dBm
RF IN 2	-60 dBm to 0 dBm
Inherent phase error	<1.5° rms, <5° peak
Frequency measurement error	<5 Hz + time base

GSM burst power measurement

Frequency range	with option CMD-B4 GSM900 band: 890.2 MHz to 914.8 MHz
Reference level for full dynamic range	
RF IN/OUT	10 dBm to 47 dBm
RF IN 2	-37 dBm to 0 dBm
Absolute measurement error of peak power	
RF IN/OUT	see peak power meter
RF IN 2	≤1 dB
Resolution in active part of timeslot	0.1 dB

Burst analysis

with wide dynamic range	with option CMD-B42
Relative error of individual test sample	≤1.5 dB to 72 dB below peak power
Dynamic range	>72 dB
Measurement limit RF IN/OUT	<-36 dBm
RF IN 2	<-83 dBm

GSM specifications of CMD53/55/65

RF generator 1

Frequency range	GSM900 GSM1800 GSM1900 ²⁾	935.2 MHz to 959.8 MHz 1805.2 MHz to 1879.8 MHz 1930.2 MHz to 1989.8 MHz
Frequency error		same as time base
Resolution		GSM channel spacing: 200 kHz
Frequency setting time		≤3 ms for phase error <2°
Output level		
RF IN/OUT		-35/-37 ²⁾ dBm to -120 dBm
RF OUT 2 ¹⁾		+11/+9 ²⁾ dBm to -77 dBm
Resolution		0.1 dB
Level error	RF IN/OUT RF OUT 2	≤1.5 dB (≤1 dB at -104 dBm)
(RF IN/OUT)		≤2 dB
Harmonics	(RF IN/OUT)	<-30 dBc
Modulation		GMSK, B x T = 0.3
Phase error		≤4° rms, ≤10° peak

RF generator 2

Frequency range, frequency error, resolution, setting time, level resolution, harmonics, modulation and phase error	see RF generator 1
Maximum output level	
RF IN/OUT	-37/-39 ²⁾ dBm
RF OUT 2 ¹⁾	+9/+7 ²⁾ dBm
Level error	
RF IN/OUT	≤1.5 dB
RF OUT 2	≤2 dB

Peak power meter (RF IN/OUT)

Frequency range	800 MHz to 1000 MHz, 1700 MHz to 2000 MHz
Measurement range	
GSM900 band	0 dBm to 47 dBm
GSM1800/1900 band	0 dBm to 33 dBm
Resolution	0.1 dB
Error in GSM900 band	≤0.5 dB + resolution (P > 10 dBm)
GSM1800/1900 band	≤0.8 dB + resolution (P > 4 dBm)
VSWR	≤1.3

Phase/frequency error measurement with option CMD-B4

Frequency range	GSM900 GSM1800 GSM1900 ²⁾	890.2 MHz to 914.8 MHz 1710.2 MHz to 1784.8 MHz 1850.2 MHz to 1909.8 MHz
Level range		
RF IN/OUT		GSM900: 0 dBm to 47 dBm GSM1800/1900: 0 dBm to 33 dBm
RF IN 2 ³⁾		-60/-54 ²⁾ dBm to 0 dBm
Inherent phase error		<1.5° rms, <5° peak
Frequency measurement error		<5 Hz + time base

Burst power measurement

Frequency range	GSM900 GSM1800 GSM1900 ²⁾	with option CMD-B4 890.2 MHz to 914.8 MHz 1717.2 MHz to 1784.8 MHz 1850.2 MHz to 1909.8 MHz
Reference level for full dynamic range		
RF IN/OUT		GSM900: 10 dBm to 47 dBm GSM1800/1900: 0 dBm to 33 dBm
RF IN 2 ³⁾		-37/-31 ²⁾ dBm to 0 dBm
Absolute measurement error of peak power		
RF IN/OUT		GSM900: ≤0.5 dB + resolution (P > 10 dBm) GSM1800/1900: ≤0.8 dB + resolution (P > 4 dBm)
RF IN 2		GSM900: ≤1.3 dB GSM1800/1900: ≤1.5 dB
Resolution in active part of timeslot		0.1 dB

Burst analysis with high dynamic range

Relative error of individual test samples	≤1.5 dB to 72 dB below peak power
Dynamic range	>72 dB
Measurement limit RF IN/OUT	GSM900: <-36 dBm GSM1800: <-48 dBm GSM1900 ²⁾ : <-42 dBm
RF IN 2 ³⁾	GSM900: <-83 dBm GSM1800: <-85 dBm GSM1900 ²⁾ : <-79 dBm

¹ The maximum RF output level of the CMD65 in the GSM900/1800/1900

band is 2 dB lower than in the CMD5x basic unit

² In GSM1900 mode with option CMD-B19/-U19 fitted.

³ The sensitivity of the CMD65 in the GSM900/1800/1900 band is 2 dB lower than in the CMD5x basic unit.

GSM specifications of CMD50/52/53/55/65

GSM-specific spectrum measurements

Spectrum due to modulation

Test method	relative measurement, averaging
Filter bandwidth	30 kHz resolution filter
Measurement at an offset of	100, 200, 250, 400, 600, 800, 1000, 1200, 1400, 1600 and 1800 kHz
Dynamic range	better than required by GSM specification
with offset >400 kHz	max. 80 dB
Error	≤1.5 dB

Spectrum due to switching

Test method	absolute measurement, Max Hold over several measurements
Filter bandwidth	30 kHz resolution filter
Measurement at an offset of	400, 600, 1200, 1800 kHz
Dynamic range	better than required by GSM specification
for offset >400 kHz	80 dB max. with SW correction, 76 dB max. without SW correction
Error	≤1.5 dB (dynamic range <50 dBc) ≤2.5 dB (dynamic range 50 to 80 dBc)

with option CMD-B43

DECT specifications of CMD60/65

DECT signal generator

Frequency	1876.608 MHz to 1935.360 MHz, half channel spacing
Error	same as reference
Level range	
RF IN/OUT	–100 dBm to –40 dBm
RF OUT2	–40 dBm to +5 dBm (–20 dBm to +5 dBm when RFIN2 is active)
Burst switch-off	usable up to 7.5 dBm
Resolution	>30 dB
Error	0.1 dB
RF IN/OUT ⁴⁾	<1.5 dB
RF OUT2 ⁵⁾	<2.0 dB
Modulation	GFSK (B x T=0.5)
Error	<5% (at 288 kHz deviation)

DECT analyzer

Frequency	specifications are valid for N connector
Level (matching setting for external attenuation and expected power)	same as signal generator
RFIN/OUT	30 dBm to –65 dBm (for level meter), 30 dBm to –30 dBm (for broadband FM demodulator and signalling)
RFIN2	–35 dBm to –85 dBm (for level meter) –11 dBm to –55 dBm (for broadband FM, demodulator and signalling)
FM demodulator	for TX postprocessing and analog output
Range	0 kHz to 450 kHz deviation
Resolution	1 kHz
DC offset	<2 kHz
Residual deviation	
RF IN/OUT	<1.5 kHz PK, 95% confidence (+30 to –30 dBm), <5 kHz PK, 95% confidence (+30 to –10 dBm)
RF IN2	<1.5 kHz PK, 95% confidence (–11 dBm to –55 dBm), <5 kHz PK, 95% confidence (–11 dBm to –40 dBm)

Analog output
Level meter (transient response)

1 V p for 500 kHz deviation (linear) for TX postprocessing and analog output

Range

RF IN/OUT	+30 dBm to –65 dBm
RF IN2	–35 dBm to –85 dBm
Dynamic	70 dB [24 dBm at RFIN/OUT]
Resolution	0.5 dB

Error

RF IN/OUT ⁶⁾	≤1.5 dB + resolution (+30 dBm to +15 dBm)
RF IN2 ⁷⁾	≤2 dB + resolution in rest of range (–35 dBm to –51 dBm)
Analog output	≤2.5 dB + resolution in rest of range 28.3 mV/1 dB, 2.5 V at +30 dBm (standard internal attenuator setting), logarithmic

Analog DECT ADPCM interface

Output	balanced
Range	558 mV with 0 dBm0 on the PCM interface, 300 Hz to 3 kHz
Impedance	10 Ω typ.
S/N + THD	35 dB at full-range level
Passband ripple	0.5 dB
Input	balanced
Range	40 mV for 0 dBm0 on the PCM interface, 300 Hz to 3 kHz
Impedance	125 kΩ typ.
S/N + THD	35 dB at full-range level
Passband ripple	0.5 dB

DECT applications

Accuracy and stability of RF carrier	averaging 10, specs are valid for RFIN/OUT
Error	<2 kHz + reference
Accuracy and stability of timing	
Error	<0.075 μs + reference
Modulation part 1, 2, 4	
Error	approx. 11 kHz at minimum (202 kHz) approx. 13 kHz at maximum (403 kHz) permitted deviation
Frequency drift	
Error	approx. 1 kHz/ms
Normal transmit power	
Error	≤1.5 dB
Power versus time	
power	≤1.5 dB, 30 dBm to 5 dBm, ≤2 dB in rest of range
time	<0.075 μs + reference

4)

Frequency response	±0.2 dB typ.
Linearity	±0.3 dB typ.
Drift	±0.3 dB typ.

5)

Frequency response	±0.5 dB typ.
Linearity	±0.4 dB typ.
Drift	±0.5 dB typ.

6)

Frequency response	typ. ±0.5 dB typ.
Linearity	typ. ±0.3 dB typ.
Drift	typ. ±0.5 dB typ.

7)

Frequency response	typ. ±0.5 dB typ.
Linearity	typ. ±0.5 dB typ.
Drift	typ. ±0.5 dB typ.

Common specifications

DC voltmeter
Measurement range
Resolution
Error

for CMD50/53 as an option (CMD-B20)
0 V to ± 30 V
10 mV
 $\leq 2\%$ + resolution

DC ammeter
Operating modes

for CMD50/53 as an option (CMD-B20)
current averaging with GSM-adapted time constant, current peak measurement (maximum and minimum)

Measurement range
Common-mode rejection
Resistance
Resolution for current averaging
Resolution for peak measurement
Residual indication
(no current at input)
Error

0 A to ± 10 A
 ± 30 V
50 m Ω
1 mA/10 mA
10 mA

 ≤ 10 mA (at room temperature, common mode rejection voltage ± 10 V)
 $\leq 2\%$ + residual indication + resolution

AF Measurement Unit

AF generator
Frequency range
Frequency resolution
Frequency error
Level range
Level resolution

option CMD-B41

50 Hz to 10 kHz
0.1 Hz
same as time base + half resolution
10 μ V to 5 V
10 μ V at < 1 mV
1% at ≥ 1 mV
 $\leq 5\%$ at ≥ 1 mV
 $\leq 0.5\%$
20 mA
 $< 5 \Omega$

Level error
Distortion
Max. output current
Output impedance

AF voltmeter
Frequency range
Measurement range
Resolution

50 Hz to 10 kHz
0.1 mV to 30 V
100 μ V at < 10 mV
1% at ≥ 10 mV
 $\leq 5\%$ + resolution
1 M Ω

Error
Input impedance

Distortion meter
Frequency range
Input level range
Resolution
Inherent distortion
Error
Measurement bandwidth

300 Hz to 3 kHz
100 mV to 30 V
0.1% distortion
 $\leq 0.5\%$
 $\leq 5\%$ + inherent distortion
10 kHz

AF counter
Frequency range
Input level range
Resolution
Error
Input impedance

20 Hz to 10 kHz
10 mV to 30 V
 ≤ 1 Hz
same as reference + resolution
1 M Ω

IF counter
Frequency range
Input level range
Resolution
Error
Input impedance

10 kHz to 60 MHz
100 mV (rms) to TTL
1 Hz
same as reference + resolution
approx. 1 M Ω || 100 pF

Time and frequency reference

Time base TCXO
Nominal frequency
Max. frequency drift in temperature range 5°C to 35°C
Deviation due to aging

standard
10 MHz

 $\leq 1.5 \times 10^{-6}$
 $\leq 0.5 \times 10^{-6}$ per year (at 35°C)

Time base OCXO, version 1
Nominal frequency
Max. frequency uncertainty in temperature range 5°C to 45°C
Deviation due to aging (after 30 days of operation and under constant operating conditions)

option CMD-B1
10 MHz

$\pm 1 \times 10^{-7}$

 $\leq 5 \times 10^{-9}$ per day or
 $\leq 2 \times 10^{-7}$ per year
approx. 5 min at room temperature

Warm up time

Time base OCXO, version 2
Nominal frequency
Max. frequency uncertainty in temperature range 5°C to 45°C (referred to 25°C)
Deviation due to aging (after 30 days of operation and under constant operating conditions)

option CMD-B2
10 MHz

$\leq 5 \times 10^{-9}$

 $\leq 3.5 \times 10^{-8}$ per year
 $\leq 5 \times 10^{-10}$ per day
approx. 10 min

Warmup time (at 25°C)

Reference frequency inputs/outputs
Synchronization input:
Frequency (selectable)

option CMD-B3

GSM bit clock (270.8 kHz), 2/4/16 times GSM bit clock, 1 MHz to 13 MHz in 1 MHz steps, 2.048, 26, 39, 52 MHz

External reference, nominal
Frequency (CMD60)
Input impedance
Input voltage range

10 MHz
100 Ω
632 mV (pp) to 5 V (pp)

Synchronization output 1:
Frequency

10 MHz with internal reference or frequency at synchronization input with external reference
5 V (pp), $R_{out} = 50 \Omega$ (10 MHz signal)

Voltage

Synchronization output 2:
Frequency (selectable)

GSM bit clock, 2/4/16 times GSM bit clock, 1, 2, 4 or 13 MHz
5 V (pp), $R_{out} = 50 \Omega$

Voltage

Interfaces
IEEE/IEC-bus interface

option CMD-B61
interface to IEC 625-1/IEEE 488, SCPI-compatible command set RS-232-C (9-contact) Centronics (25-contact)

Other interfaces

General data
Operating temperature range
Storage temperature range
Electromagnetic compatibility

5°C to 45°C to DIN IEC 68-2-1/2
-40°C to +60°C
meets European EMC directive (89/336/EEC)

Mechanical resistance
Sinusoidal vibration

to DIN IEC 68-2-6, 5 Hz to 55 Hz, amplitude 0.15 mm, two cycles to DIN 40046, part 24, 10 Hz to 300 Hz, 10 m/s² rms, 5 min/axis to MIL-STD-810 D, 400 m/s², shock spectrum in 6 main axes 90 V to 265 V, 45 Hz to 440 Hz

Random vibration

Shock

Power supply
Power consumption

CMD 55: approx. 95 W
CMD 60: approx. 60 W
CMD 65: approx. 100 W
VDE 0411, class 1
435 mm x 192 mm x 363 mm
CMD 55: approx. 14 kg
CMD 60: approx. 12 kg
CMD 65: approx. 17 kg

Electrical safety
Dimensions (W x H x D)
Weight (without options)

Ordering information

Digital Radiocommunication Tester	CMD 50	1050.9008.50
	CMD 53	1050.9008.53
	CMD 52	1050.9008.52
	CMD 55	1050.9008.05
	CMD 60	1050.9008.60
	CMD 65	1050.9008.65
Accessories supplied	power cord, operating manual, fuses	
Calibration with Certificate	CMD-DCV2	0240.2193.08
Recommended extras		
GSM GPRS Test SIM Card (essential for BER measurements)	CRT-Z2	1039.9005.02
Formatted Memory Card (CMD-B62 required)	CMD-Z1	1059.5305.02
Handset	CMD-Z50	1059.4250.02
Antenna Coupler	CMU-Z10	1150.0801.02
Shielded Chamber for CMU-Z10	CMU-Z11	1150.1008.02
Rackmount Adapter	ZZA-94	0396.4905.00

For further CMD models ask your local representative

Different specifications for CMD53/55/65 with CMD-U13

The RF input 1 of the CMD53/55/65 with CMD-U13 is 10 dB more sensitive. Therefore the following specifications differ from those of an unmodified CMD

Peak power meter (RF IN/OUT)

Measurement range	-10 dBm to +37 dBm
Maximum RF power	+37 dBm
Error in GSM900 band	≤0.5 dB + resolution (P > -6 dBm)
Error in GSM1800/1900 band	≤0.8 dB + resolution (P > -6 dBm)

Phase and frequency error measurement

Level range (RF IN/OUT)	-10 dBm to +37 dBm
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Burst power measurement

Reference level range for full dynamic range (RF IN/OUT)	
GSM900:	0 dBm to +37 dBm
GSM1800/1900:	-10 dBm to +37 dBm

The CMD53/55/65 with CMD-U13 have a different output level range at RF OUT 2

RF generator 1

Output level range (RF OUT 2)	-35 (-37 ⁸) dBm to -120 dBm
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RF generator 2

Output level range (RF OUT 2)	-37 (-39 ⁸) dBm to -120 dBm
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Different specifications for CMD53/55/65 with CMD-U18

RF generator 1 (TCH)

Output level range (RF IN/OUT)	-120 dBm to -15/-17 ⁸ dBm
Level error (RF IN/OUT)	≤2 dB (-15/-17 ²) dBm to -35/-37 ⁸ dBm ≤1.5 dB (-35/-37 ²) dBm to -120 dBm ≤1.0 dB (at -104 dBm)
RF OUT 2	not available

RF generator 2 (BCCH)

Output level range (RF IN/OUT)	-120 dBm to -17/-19 ⁸ dBm
Level error (RF IN/OUT)	≤2 dB
RF OUT 2	not available

Analyzer

Level range (RF IN/OUT)	0 dBm to 40 dBm
Error peak power meter	GSM900: ≤0.5 dB + resolution GSM1800/1900: ≤0.8 dB + resolution

Different specifications for CMD53/65 with CMD-U20

Combined mode (BCCH and TCH in different GSM bands)

Level error of synthesizer 1	
RF IN/OUT	<3 dB
RF OUT 2	<3 dB
Level error of synthesizer 2	
RF IN/OUT	<3 dB
RF OUT 2	<3 dB

Certified Environmental System
ISO 14001
REG. NO 1954

Certified Quality System
ISO 9001
DQS REG. NO 1954

⁸) In GSM1900 mode with option CMD-B19/U19 fitted.