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Signal Generator SME

SME02: 5 kHz to 1.5 GHz

SME03: 5 kHz to 3 GHz

SME03E: 5 kHz to 2.2 GHz

SME06: 5 kHz to 6 GHz

For digital communication with all types of modulation of mobile radio

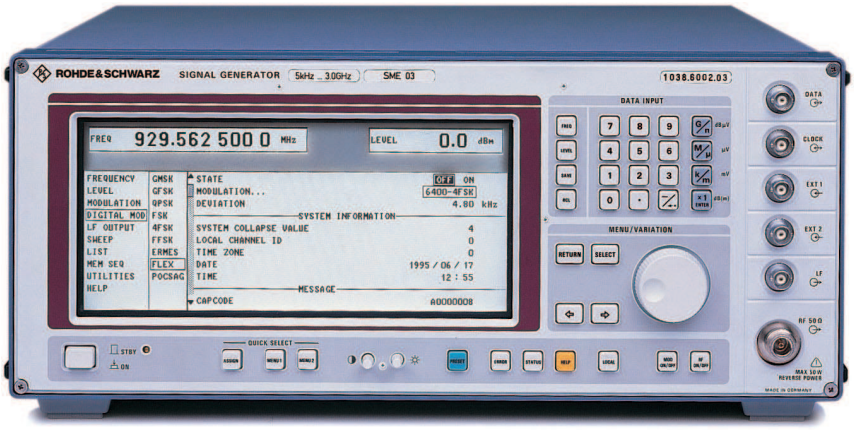

Photo 42212

Brief description

The SME supplies the complex signals required for the development and testing of digital mobile radio receivers. It is capable of generating all signals used in the main digital radio networks in line with relevant standards regarding the type of modulation, data format, TDMA structure and frequency hop patterns. The SME is completely at home also in the analog signal world of conventional signal generators.

SME02, SME03 and SME06 are identical except for the frequency range. Economy Signal Generator SME03E has been designed as an especially economical solution for applications involving digitally modulated signals. The large variety of options available allows the SME to be tailored to the specific needs of the user.

Main features

- All common digital modulation modes provided in one unit
- Great ease of operation thanks to a novel menu concept
- No external modulation and data sources required
- User-programmable data sequences and TDMA structure
- RF, LF and level sweep
- Ultra-low RF leakage for measurements on highly sensitive pagers
- List mode: programmable measurement sequence for up to 4096 frequency and level combinations, setting time <0.5 ms (not SME03E)

Overview of options

Designation, functions		Option
Reference Oscillator OCXO: aging <1 x10^{-9}/day		SM-B1
LF Generator: supplies sinewave, noise 0.1 Hz to 500 kHz, triangular, squarewave 0.1 Hz to 50 kHz signals		SM-B2
Pulse Modulator: on/off ratio >80 dB, rise/fall time <10 ns	SME02: SME03E,SME03: SME06	SM-B3 SM-B8 SM-B9
Pulse Generator: only in conjunction with SM-B3/SM-B8/SM-B9; provides single, delayed and double pulses		SM-B4
FM/φM Modulator: FM DC to 2 MHz, φM DC to 100 kHz		SM-B5
Multifunction Generator: produces stereo multiplex and VOR/ILS signals, as well as sinewave, noise 0.1 Hz to 1 MHz, triangular, sawtooth, squarewave 0.1 Hz to 50 kHz signals		SM-B6
DM Coder: generates FSK, FFSK, 4FSK, GFSK, GMSK, QPSK, π/4 QPSK, π/4 DQPSK, O-QPSK; user-programmable data sequences and PRBS		SME-B11*
DM Memory Extension 8 Mbit: expands the 8-kbit memory of the DM Coders to 8 Mbit (data only); required for fitting SME-B41 and SME-B42		SME-B12
FLEX Protocol: generates call signals to FLEX standard for testing pagers		SME-B41
POCSAG Protocol: generates call signals to POCSAG standard for testing pagers		SME-B42
Rear Connectors for RF and LF: to replace front-panel connectors		SMT-B19

* Already included in basic model of SME03E

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Specifications in brief

Frequency

Range	SME02/03	5 kHz to 1.5/3 GHz
	SME03E/06	5 KHz to 2.2/6 GHz
Resolution		0.1 Hz
Setting time		
after IEC/IEEE-bus delimiter		<10 ms
after trigger pulse in list mode		<500 µs
Phase offset		adjustable in steps of 1°

Reference frequency	standard	option SM-B1
Aging (after 30 days of operation	1×10^{-6}/year	$<1 \times 10^{-9}$/day
Temperature effect (0 to 55°C)	2×10^{-6}	$<5 \times 10^{-8}$

Spectral purity

Spurious signals

Harmonics	<–30 dBc, <–26 dBc with SM-B3/-B8/-B9
Nonharmonics at	
>5 kHz from carrier, f <1.5 GHz	<–80 dBc

SSB phase noise at 20 kHz from carrier, 1 Hz bandwidth,
FM/φM deviation <5% of max. deviation

<93.75 MHz	125 MHz	250 MHz	0.5 GHz	1 GHz	2 GHz	3 GHz	6 GHz
<–129	<–140	<–137	<–132	<–126	<–120	<–116	<–116 dBc

Residual FM, rms (f = 1 GHz)	
0.3 to 3 kHz (CCITT)	<1 Hz
0.03 to 20 kHz	<4 Hz

Level	–144 to +13 dBm
Resolution	0.1 dB
Accuracy for levels >–127dBm	
f <1.5 GHz	±1 dB
f >1.5 GHz	±1.5 dB
f >3 GHz	±2 dB
Level frequency response at 0 dBm	1 dB, typ. 0.3 dB

Overload protection

protects the unit from externally applied RF power (50 Ω source) and DC voltage, SME02 and 03: ≤50 W/ 35 V; SME06: ≤1 W/0 V

Simultaneous modulation

any combination of AM, FM (φM), pulse modulation and DM (DM = FSK, 4FSK, FFSK, GFSK, GMSK or QPSK)

Frequency modulation	with option SM-B5
Operating modes	internal, external AC/DC, two-tone with two separate channels FM1 and FM2
Maximum deviation	depending on carrier frequency: 500 kHz (<130 MHz) to 4 MHz (6 GHz)
Setting error at AF = 1 kHz	<3% of reading + 20 Hz
FM distortion at AF = 1 kHz and 50% of max. deviation	<0.5%, typ. 0.05%
Modulation frequency range	
for maximum deviation	DC to 500 kHz
for <25% of max. deviation	DC to 2 MHz
Carrier frequency offset with FM	depending on carrier frequency: <50 Hz (f_c <93.75 MHz) to <100/200 Hz (f_c 1.5/3 GHz) +1% of deviation

Phase modulation	with option SM-B5
Operating modes	internal, external AC/DC, two-tone with two separate channels φM1 and φM2
Maximum deviation	depending on carrier frequency: 5 rad (f_c <130 MHz) to 40 rad (f_c 6 GHz)
Setting error at AF = 1 kHz	<3% of reading + 0.01 rad
Distortion at AF = 1 kHz and 50% of max. deviation	<1%
Modulation frequency range	DC to 100 kHz

Digital modulation	with option SME-B11, standard in SME03E
Modulation modes	FSK, 4FSK, FFSK, GFSK, GMSK, QPSK, π/4 DQPSK
Operating modes	internal, external
Internal data generator	programming of data, level switching and burst output
Storage capacity	3 x 8192 bit
Frequency accuracy	same as reference frequency
PRBS (pseudo-random bit sequence)	selectable lengths: 2^9–1, 2^{15}–1, 2^{20}–1, 2^{21}–1 or 2^{23}–1
FSK	to Cityruf, POCSAG, FLEX specs
Shift, filtered	4/4.5/4.8 kHz
unfiltered	0.01 to 400 kHz, maximum shift depending on carrier frequency
Data rate, filtered	0.05 to 90 kbit/s
unfiltered	0.05 to 1900 kbit/s
FFSK	to Cityruf, POCSAG specifications
Shift	1.5/2/3/3.5/4/4.5 kHz
Data rate	0.05 to 90 kbit/s
4FSK	to APCO25, ERMES, FLEX, MODACOM specifications
Shift	0.01 to 400 kHz, maximum shift depending on carrier frequency
Data rate	1 to 24.3/27 to 48.6 kbit/s
GFSK	to CT2, CT3, DECT specifications
Shift	18/160/288 kHz as well as non-standard shifts
Data rate	10 to 585/640 to 1170 kbit/s
GMSK	to CDPD, GSM1800, DSRR, GSM, MC9, MD24 to MD192, MOBITEX8000 specifications
Data rate	2.4/3.6/4/4.8/6/8/9.6/10/12/ 16/19.2/270.833/1000 kbit/s
QPSK, π/4 DQPSK	to APCO25, MSAT, NADC, PDC, TETRA, TFTS specifications
for f >3 GHz	not specified
Data rate	1 to 24.3/27 to 48.6 kbit/s
Filter	√cos0.35/0.4/0.5/0.6 cos0.2/0.35/0.4/0.5/0.6

Amplitude modulation, pulse modulation, internal modulation generator, LF generator, multifunction generator, stereo multiplex signal, VOR modulation signal, ILS modulation signal, pulse generator and sweep see SMT, page 198

List mode	automatic, single-shot, manual,
(not SME03E)	externally triggered
Max. number of channels	2000
Step time	1 ms to 1 s

Remote control	IEC 625 (IEEE 488)
Command set	SCPI 1992.0

General data	
Power supply	90 to 132/180 to 265 V, 47 to 440 Hz, autosetting to AC voltage, max. 300 VA
Dimensions (W x H x D)	435 mm x 192 mm x 460 mm
Weight	25 kg for fully equipped unit

Ordering information

Signal Generator	SME02	1038.6002.02
	SME03	1038.6002.03
	SME03E	1038.6002.13
	SME06	1038.6002.06
Options		
Reference Oscillator OCXO	SM-B1	1036.7599.02
LF Generator	SM-B2	1036.7947.02
Pulse Modulator for SME02	SM-B3	1036.6340.02
for SME03	SM-B8	1036.6805.02
for SME06	SM-B9	1039.5100.02
Pulse Generator (only in combination with SM-B3, SM-B8 or SM-B9)	SM-B4	1036.9310.02
FM/φM Modulator	SM-B5	1036.8489.02
Multifunction Generator	SM-B6	1036.7760.02
DM Coder	SME-B11	1036.8720.02
DM Memory Extension (8 Mbit)	SME-B12	1039.4090.02
FLEX Protocol	SME-B41	1039.5645.02
POCSAG Protocol	SME-B42	1039.5745.02
Rear Connectors for RF and LF	SME-B19	1039.3907.02

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