Signal Generator SMX

0.1 to 1000 MHz

Cost-effective,

system-compatible

universal signal source

Uses, characteristics

Signal Generator SMX is a cost-effective, fully system-compatible synthesizer with excellent signal characteristics and comprehensive basic configuration. It is an economical solution for universal use in laboratory and production. Its spectral purity allows for instance in-channel and blocking measurements on AM, FM and SSB receivers.

Main features

- Overload protection up to 30 W
- Nonvolatile memory for 40 complete instrument setups
- Modulation generator with four fixed frequencies
- Precise output level from –137 to +13 dBm
- Oven-controlled reference oscillator for extremely high frequency accuracy (option SMX-B1)
- AF synthesizer as an internal modulation source; can be used as an AF signal source for external applications (option SMX-B2)

Frequency

The wide frequency range is produced without a doubler. Underranging is possible down to a lower limit of 10 kHz, overranging upto 1005 MHz.

Level

The low total level error of less than ±1.5 dB ensures accurate and reproducible sensitivity measurements. There are no transients upon level changes. The SMX features non-interrupting level setting over a range of 10 dB.

Spectral purity

Low residual FM, low SSB phase noise and excellent suppression of nonharmonic spurious signals are the outstanding features of the SMX in this class of equipment and price range.

Modulation

The modulation capabilities of the SMX include AM, FM and pulse modulation (separate, combined, internal or external). For two-tone modulation, the internal and external sources can be switched on simultaneously.

Frequency modulation is possible up to high modulation frequencies and even with maximum deviation; frequency response is flat. The Low Rate FM Modification Kit (SCM-U1) ensures extremely low sag for digital modulations thanks to the very small low-end limit frequency. With simultaneous AM and FM, modulation depth and deviation can be set separately; different modulation sources can be selected. AM and FM ensure high accuracy and low distortion.

With pulse modulation full level accuracy is preserved. The RF envelope shows rise/fall times of 2 µs, the on/off ratio is 40 dB. The standard modulation generator with four fixed frequencies or the optional AF synthesizer are available as modulation sources. The AF synthesizer is also used as an AF signal source for external applications with an output level of 1 V and phase-continuous frequency change in less than 10 ms.

Operation

Carrier frequency, modulation and output levels with selectable units as well as supplementary information can be simultaneously indicated on the illuminated LCD displays. The step keys allow each parameter to be varied in any preset step size. Up to 40 complete instrument setups can be stored in a nonvolatile memory.

The RF level can be switched off while the 50-Ω source impedance remains effective. By setting a frequency offset, the converted frequency can be directly entered and indicated on the SMX in LO applications.

Specifications

Frequency

Range	100 kHz to 1000 MHz
Underrange and overrange	10 kHz to 1005 MHz
Resolution of indication	
f <100 MHz	10 Hz
100 MHz <f <500 MHz	50 Hz
f >500 MHz	100 Hz
Setting time	
with AM and CW	approx. 60 ms
with FM	approx. 120 ms
Frequency error f ≥31.25 MHz	$<1x10^{-7}$ (max. 45 Hz)
f <31.25 MHz	<12 Hz

Reference frequency	standard	OCXO oscillator
Aging (after 30 days of operation)	$2x10^{-6}$/year	$<1x10^{-9}$/day
Temperature effect	$2.5x10^{-6}$/ 0 to 50	$<2x10^{-9}$/ °C

Input/output for external/ internal reference frequencies	10 MHz

Level

Range	–137 to +13 dBm
Total error	<±1.5 dB
Frequency response at 0 dBm output level	<1 dB
Characteristic impedance	50 Ω
VSWR	<1.5 (level ≤0 dBm) <1.8 (level >0 dBm)
Setting time	<25 ms
Non-interrupting level setting	0 to –10 dB

Spectral purity

Spurious signals	
Harmonics	<–30 dBc (for level <10 dBm)
Residual AM, rms (0.03 to 20 kHz]	<0.02% (f ≥8 MHz)
Nonharmonic spurious signals at >5 kHz from carrier	see line a in table below
Residual FM, rms	
0.3 to 3 kHz (CCITT)	see line b in table below
0.03 to 20 kHz	see line c in table below
SSB phase noise (carrier offset 20 kHz, 1 Hz bandwidth) guaranteed	see line d in table below
typical	see line e in table below

f<	31.25	125	250	500	1000	MHz
a	<-60	<-72	<-72	<-66	<-60	dBc
b	<3	<2	<2	<4	<8	Hz
c	<8	<5	<5	<10	<20	Hz
d	<–130	<–130	<–128	<–122	<–116	dBc
e	-136	-136	-134	-128	-122	dBc

Broadband noise (carrier offset >2 MHz, 1 Hz bandwidth) f ≥31.25 MHz	typ. –145 dBc

Amplitude modulation

Modes	INT, EXT, INT + EXT
Modulation depth	0 to 99%
Setting error at 1 kHz (80%)	<4% ±0.5%
AM distortion at 1 kHz	
0 to 30% AM	<1 %
30 to 80% AM	<2%
Modulation frequency	
AM EXT	DC to 50 kHz
AM INT	0.4/1/3/15 kHz
AM INT with option SMX-B2	10 Hz to 50 kHz
Modulation frequency response	
up to 15 kHz	typ. 0.1 dB
up to 50 kHz	typ. 0.5 dB
Incidental φM with AM (30%), AF 1 kHz	<0.2 rad
Modulation input	100 kn, link-selectable to 600 Ω
AM overrange	level-dependent in level range from +7 to +13 dBm

Frequency modulation

Modes: INT, EXT, INT + EXT

f<	31.25	62.5	125	250	500	1000	MHz
Max. deviation	100	50	100	200	400	800	kHz

Setting error (at f_{mod} = 1 kHz]	<7% of set value
FM distortion at 1 kHz and 50% of maximum deviation	<0.5% (typ. 0.1 %)
Modulation frequency	
FM EXT	20 Hz to 500 kHz
FM INT	0.4/1/3/15 kHz
FM INT with option SMX-B2	20 Hz to 100 kHz
Modulation frequency response from 100 Hz to 100 kHz	<1 dB
Incidental AM at f_{mod} = 1 kHz, 40 kHz deviation	<0.1 %
Modulation input	100 kn, link-selectable to 600 n

Low Rate FM (Modification Kit SCM-U1)

Mode	EXT
3-dB bandwidth	<3 Hz to >500 kHz
Sag	typ. 30% with 12 Hz squarewave
Maximum deviation	same as with normal FM

Pulse modulation

Mode	external
Pulse on/off ratio	40 dB
Rise/fall time 10% to 90%	2 µs
Max. repetition frequency	50 kHz
Min. pulse width	50 µs
Modulation input	100 kn, link-selectable to 600 n

AF Synthesizer (Option SMX-B2)

Frequency	10 Hz to 100 kHz
Readout	3-digit
Frequency error	$<4x10^{-5}$
Level error at 1 kHz	<±3% (typ. 1 %)
Distortion	<0.1 % (typ. 0.03%)
Phase-continuous frequency change, response time between setting command and frequency change	<10 ms

Remote control

System	IEC625-1 (IEEE488)
Connector	24-contact Amphenol
Remote-controlled functions	all manual settings except power switch and spinwheel (not SMX)
Interface functions	listener and talker, SH1, AH1, T6, L4, SR1, RL1, PPO, DC1, DTO, CO

Overload protection

Protects the instrument against externally applied (50-n source) RF power and DC voltage	
Max. permissible RF power	30 W
Max. permissible DC voltage	35 V
Max. pulse loading capacity (pulse width <10 µs)	1 mWs or 150 V_p

General data

Power supply	100/120/220/240 V ±10%, 47 to 440 Hz, max. 90 VA
Dimensions (W x H x D)	435 mm x 147 mm x 460 mm
Weight	12.5 kg

Ordering information

Signal Generator	SMX	0826.4517.52
Options		
Reference Oscillator	SMX-B1	0826.9519.02
AF Synthesizer	SMX-B2	0826.9619.02
Low Rate FM Modification Kit	SCM-U1	0804.1615.02
Extras		
Rear-panel connectors for RF, AF	SMX-Z10	0827.0250.02
Service Kit	SMX-Z2	0827.0150.02