

Signal Generators

SG 1000

The SG 1000 series of synthesized signal generators cover a wide range of carrier frequencies from 9 kHz to 1000 MHz with excellent spectral purity and comprehensive modulation facilities. Two different models of the SG 1000 series are available, an economical version with a switching time of 1 ms (BN 86204.000) between any frequencies and a high performance version with 1 μ s / 15 μ s (BN 86204.001) high-speed switching. Frequency changes less than 1 MHz are phase-continuous.

The operation of SG 1000 is very simple by a softkey menu selection of modes. All instrument settings and signal parameters can be entered by numeric keyboard, rotary control knob and increment-decrement keys. The step size may be varied by the user in a wide range. A backlight LCD display presents all measurement setup menus.

The SG 1000 stores up to 100 complete instrument settings in a non-volatile memory. Set up time is reduced by recalling previously stored settings.

Comprehensive modulation modes are provided for testing all types of receivers. In addition to AM, FM and PhM modulation the SG 1000 also provides pulse modulation which is required for EMI applications. An internal modulation oscillator from DC to 32 kHz (up to 100 kHz as option), an external signal or both of them can be used for modulation. The internal AF source generates a variety of waveforms, sine-wave, square-wave, triangle and saw-tooth. The POCSAG signalling encoder (option) allows a one-box solution for pager testing with various modes, tone-only, numeric and alphanumeric. All ASCII characters are generated in the alphanumeric mode.

The high-speed switching version of SG 1000 includes a sweep & hopping option. Hopping programs - any kind of frequency sequences or high-speed digital sweeps - are running via a programable and addressable memory bank. Up to 16,384 hopping locations can be loaded with individual frequency data. Loading is possible via front panel operation or from the IEEE-Bus interface. These hopping programs with free selectable start and stop address are running with the internal clock or controlled from an external clock.

Signal Generators SG 1000

Via the 50-pin hopping interface the user has directly access to the internal 14 bit address bus and can select any hopping address by remote control operation. This allows to program very complex and fast running frequency sequences required by production testing or in ATE applications. In the sweep mode the user is able to define up to 8192 steps. The step and pen-lift times are selectable in a wide range. The sweep is running in single or auto-continuous mode.

- ◆ Frequency range 9 kHz ... 1000 MHz
- ◆ AM, FM, PhM modulation
- ◆ Pulse modulation
- ◆ Output level - 137 dBm ... + 13 dBm
- ◆ Output level offset - 10 dB ... + 10 dB
- ◆ Korrekturwerte für Pegel speicherbar
- ◆ Ultra-fast frequency switching time
- ◆ High-speed digital sweep
- ◆ Frequency-hopping programs
- ◆ High spectral purity
- ◆ Low residual FM ≤ 0.1 Hz
- ◆ Low discrete spurious signals
- ◆ Highly-stable reference frequency (OCXO)
- ◆ IEEE-Bus and RS 232 interface
- ◆ POCSAG encoder for pager testing
- ◆ Built-in AF generator 0 Hz ... 100 kHz
- ◆ Memory for 100 instrument settings



Basic specifications SG 1000

Reference Frequency:

Frequency/Type: 10 MHz/OCXO
Temperature stability (+ 5 °C ... + 45 °C): $\leq 3 \times 10^{-8}$
Ageing: $\leq 2 \times 10^{-8}$ /month
Reference frequency output: 10 MHz; + 10 dBm
Reference frequency input: 10 MHz, 5 MHz, 2 MHz
..... $\pm 2 \times 10^{-7}$
Input level: 0 dBm ... + 8 dBm

Carrier Frequency:

Frequency range: 9 kHz ... 999.999 999 8 MHz
Resolution: f < 500 MHz ... 0.1 Hz
..... f \geq 500 MHz ... 0.2 Hz
Accuracy: ≤ 10 mHz + accuracy of reference frequency

Spectral purity:

Harmonics (level \leq + 13 dBm): ≤ -30 dBc
Sub-harmonics (f \geq 500 MHz): ≤ -65 dBc
(f < 500 MHz): none
Discrete spurious (f < 500 MHz): ≤ -72 dBc
(f \geq 500 MHz): ≤ -65 dBc
Residual-FM (CCITT, rms): ≤ 0.1 Hz
SSB-phase noise (10 kHz offset):
f < 500 MHz ≤ -126 dBc/Hz
f \geq 500 MHz ≤ -120 dBc/Hz
Noise floor: f < 500 MHz ≤ -138 dBc/Hz
..... f \geq 500 MHz ≤ -135 dBc/Hz

Output level:

CW, FM, PhM: - 137 dBm ... + 13 dBm
AM: - 137 dBm ... + 7 dBm
Resolution: 0.1 dB
Accuracy (- 40 dBm ... + 13 dBm): $\leq \pm 0.5$ dB
(- 137 dBm ... - 40 dBm): $\leq \pm 1.5$ dB
Variable without interrupt (CW, FM, PhM): 20 dB
(AM): 14 dB
Output level to be set to: dBm, dB μ V, μ V, mV, V
Output impedance: 50 Ω
VSWR (level \leq + 8 dBm): ≤ 1.5
Level offset range: ± 10.0 dB in 0.1 dB steps
Connector: N-socket

Modulation:

Modulation modes (AC/DC-coupling): AM, FM, PhM,
AM+FM, AM+PhM; pulse
Modulation sources: internal, external, external + internal

Amplitude modulation:

Modulation frequency range: 0 ... 100 kHz
Modulation depth m: 0 ... 99.99 %
Resolution: 0.025 %
Accuracy (m < 80 %, 1 kHz): $\leq \pm 5$ % of m
Distortion (m < 30 %, 1 kHz): ≤ 1 %
(m < 80 %, 1 kHz): ≤ 2 %
Frequency response (0 ... 75 kHz, m = 30 %): $\leq \pm 1$ dB

Frequency modulation:

Modulation frequency range: 0 ... 100 kHz
Frequency deviation (f < 500 MHz): 0 ... 500.0 kHz
Ranges: 0 ... 610 Hz; 2.4 kHz; 9.8 kHz;
39.1 kHz; 156.25 kHz; 500.0 kHz
Resolution: approx. 0.05 % of f.s.
Frequency deviation (f \geq 500 MHz): 0 ... 999.9 kHz
Ranges: 0 ... 1.22 kHz; 4.8 kHz; 19.6 kHz;
78.2 kHz; 312.5 kHz; 999.9 kHz
Resolution: approx. 0.05 % of f. s.
Accuracy (AF = 1 kHz): $\leq \pm 3$ % + 20 Hz
Distortion (deviation > 2.5 kHz, AF = 1 kHz): ≤ 0.1 %
Frequency response (0 ... 75 kHz, 50 kHz devi.): $\leq \pm 1$ dB

Phase modulation:

Modulation frequency range: 0 ... 100 kHz
Phase deviation (f < 500 MHz): 0 ... 49.99 rad
Ranges: 0 ... 0.8 rad; 3.14 rad; 12.6 rad; 49.9 rad
Resolution: approx. 0.05 % of f. s.
Phase deviation (f \geq 500 MHz): 0 ... 99.99 rad
Ranges: 0 ... 1.6 rad; 6.28 rad; 25.2 rad; 99.8 rad
Resolution: approx. 0.05 % of f. s.
Accuracy (AF = 1 kHz): $\leq \pm 3$ %
Distortion (AF = 1 kHz): ≤ 0.1 %
Frequency response (0 ... 75 kHz): $\leq \pm 3$ dB

Pulse modulation:

Carrier frequency range: 9 kHz ... 999.999 999 8 MHz
Control: external pulse, TTL pos. logic
On/off-ratio: ... 10 kHz < f < 10 MHz ≥ 70 dB
10 MHz < f < 700 MHz ≥ 60 dB
700 MHz < f < 1000 MHz ≥ 45 dB
Rise/fall-time (10 / 90 %): ≤ 5 ns
Pulse repetition rate: 0 ... 20 MHz

External modulation:

Input impedance: 1 M Ω
Nominal input voltage: 1 V_{pp}
Max. permissible input voltage: 5 V_{pp}
Connector: BNC-socket

AF-generator:

Frequency 0 ... 32 kHz
Frequency range (option): 0 ... 99.999 9 kHz
Frequency resolution: 0.01 Hz
Accuracy: $\leq \pm 2.3$ mHz + accuracy of ref. frequency
Output level: 1 mV_{rms} ... 4.095 V_{rms}
Distortion: (f \leq 20 kHz) ≤ 0.1 %
..... (f > 20 kHz) ≤ 1 %
Waveforms: sine-wave, f \leq 18 kHz: sawtooth +;
sawtooth -; triangle; square-wave
Source impedance: 600 Ω
Connector: BNC-socket

Basic specifications SG 1000

POCSAG encoder (Option):

Free access to carrier frequency, RF-level, deviation
Tone-only: tones (A, B, C, D)
Numeric: tone-II, tone-III, 0 ... 20 digits
Alphanumeric: tone-II, tone-III, max. lengths 80 characters,
freely editable text with all ASCII characters

General data:

Display: LCD-graphic display, 240 x 64 dots
Backlighting: LED's with 4 brightness settings
Internal memory: 100 complete instrument settings
Interfaces (Options): IEEE-Bus; RS 232

Power supply: 110 V/120 V, 220 V/240 V \pm 10 %
47 Hz ... 63 Hz; 100 VA (Stand-by 10 VA)
Electrical safety: EN 61010
EMC: CE-mark
Operating temperature: + 5 °C ... + 45 °C
Dimensions (W x H x D): 447 mm x 88 mm x 450 mm
Weight: approx. 13 kg

Supplied accessories:

1 ea. Power cord
1 ea. Operating manual
1 set Spare fuses

Additional specifications for SG 1000 - 1 ms switching time

Carrier Frequency:

Frequency range: 9 kHz ... 999.999 999 8 MHz
Resolution: f < 500 MHz ... 0.1 Hz
f \geq 500 MHz ... 0.2 Hz
Accuracy: \leq 10 mHz + accuracy of reference frequency
Switching time to a new frequency: 1 ms
Switching time via IEEE-Bus, fast-mode: \leq 10 ms

Ordering information:

Signal Generator SG 1000 BN 86204.000
1 ms switching time

Options:

IEEE-Bus BN 86204.201
RS 232 interface BN 86204.206
AF-generator 100 kHz BN 86204.204
POCSAG BN 86204.205

Accessory:

19"-adapter BN 86302.101

Additional specifications for SG 1000 - 15 μ s swichting time

Carrier Frequency:

Frequency range: 9 kHz ... 999.999 999 8 MHz
Resolution: f < 500 MHz ... 0.1 Hz
f \geq 500 MHz ... 0.2 Hz
Accuracy: \leq 10 mHz + accuracy of reference frequency
Switching time to a new frequency:
frequency step < \pm 500 kHz \leq 1 μ s
frequency step \geq \pm 500 kHz \leq 15 μ s

Switching time via memory bank:

frequency step < \pm 500 kHz \leq 2 μ s
frequency step \geq \pm 500 kHz \leq 20 μ s

Switching time via IEEE-Bus, fast-mode: \leq 10 ms

Hopping-mode:

Internal modes: single-run mode, auto-run continuous
mode, manually triggered or by external TTL-clock signal
External mode: direct access to the hopping addresses
via the external 14 bit address bus

Hopping addresses / freq.: prog. via IEEE-Bus 16384
Stored in a non-volatile memory: 1000
Step times-internal mode: setting range ... 100 μ s ... 10 s
Step times-external clock mode:

step < \pm 500 kHz ... > 2 μ s
step \geq \pm 500 kHz ... > 20 μ s

Interface: 50-pin socket, Sub-D

Ordering information:

Signal Generator SG 1000 BN 86204.001
15 μ s switching time

Options:

IEEE-Bus BN 86204.201
Sweep and Hopping BN 86204.203
RS 232 interface BN 86204.206
AF-generator 100 kHz BN 86204.204
POCSAG BN 86204.205

Accessory:

19"-adapter BN 86302.101