



Signal Generator SMT

For receiver and EMS measurements
5 kHz to 1.5/3/6 GHz

New: 6 GHz

Signal Generator SMT covers the complete range of conventional analog receiver measurements up to 6 GHz. The SMT affords exceptionally high signal quality for a generator in this price category, as well as outstanding level accuracy, a wide variety of modulation

and signal generation modes, customized configuration, and great ease of operation. Features such as programmable RF, LF and level sweeps as well as the correction of external frequency response make the SMT an ideal source for EMS measurements.

- AM, FM, ϕ M, pulse modulation
- Broadband FM and ϕ M
- Options for signal generation:
 - pulse generator
 - LF generator
 - multifunction generator, eg for stereo and VOR/ILS signals



ROHDE & SCHWARZ

Signal Generator SMT

Types of modulation

- Broadband FM from DC to 8 MHz, deviation up to 40 MHz
- Amplitude modulation
- Phase modulation from DC to 2 MHz

Standard functions

- Convenient RF, LF and level sweeps
- Memory sequence function for automatic measurements
- Programmable level correction for compensation of external frequency response

Innovative operating concept

- Large, backlit LCD for simultaneous display of all relevant settings
- All submenus and current instrument

ment status clearly arranged on the display

- On-line help system, thus no need to consult a manual

LF generator option

- Sinewave signals from 0.1 Hz to 500 kHz
- Triangular and squarewave signals up to 50 kHz
- Noise generator with 500 kHz bandwidth
- Multitone signals in conjunction with standard fixed-frequency generator or second LF generator option

Multifunction generator option

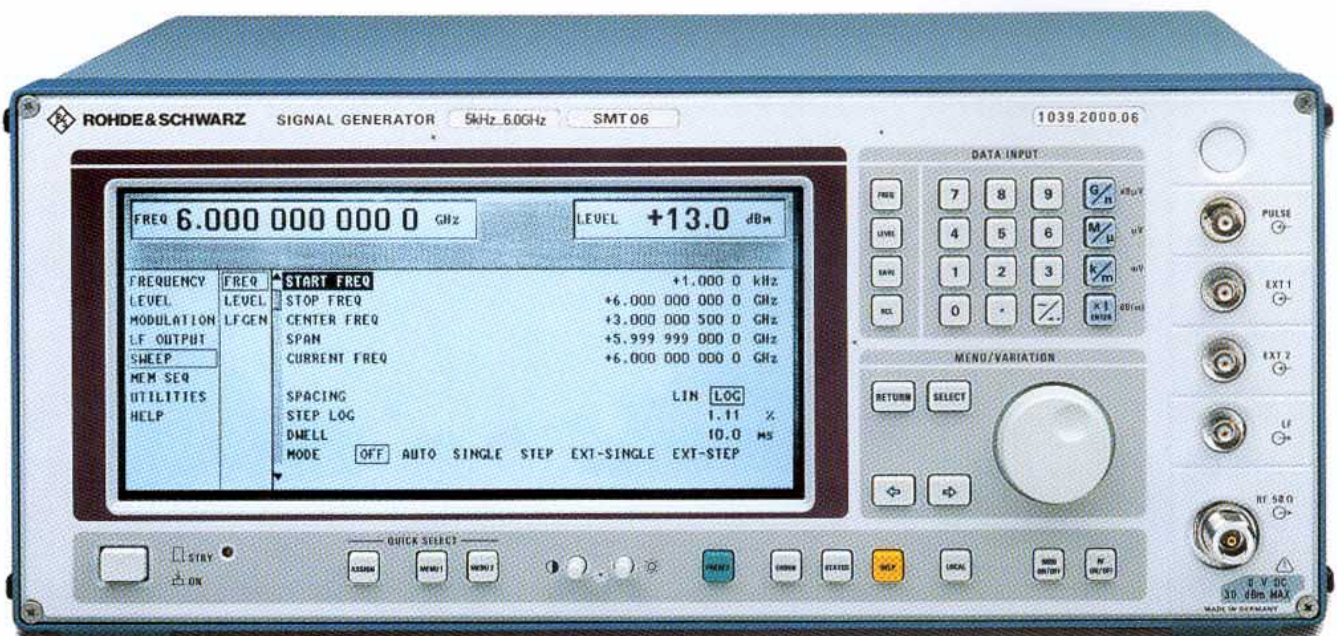
- VOR/ILS signal generator for tests on VOR/ILS receivers
 - phase resolution 0.01°
 - DDM resolution 0.0001
- Stereo signal generator for measurements on FM broadcast transmitters and radio receivers
 - stereo separation >50 dB
 - unweighted S/N ratio >76 dB

Pulse generator option

- Single, delayed, double pulses
- Pulse width 20 ns to 1 s

Pulse modulator option

- Ideal for radar applications
- Rise/fall time <10 ns
- On/off ratio >80 dB
- Pulse frequencies up to 10 MHz





The ideal EMS signal source

With a specified lower frequency limit of 5 kHz (underrange down to 1 kHz), the SMT fully covers the frequency range for EMS measurements stipulated by IEC 801.

The digital, step-by-step sweep function with preselectable start and stop frequency, span, step width and step time enables the convenient testing of wide frequency ranges. The sweep function can also be used for the RF level and AF frequency.

The frequency response of cables, amplifiers, TEM cells, etc can be compensated already in the signal generator by means of a level correction function. Complicated external level controls or test routines are superfluous.

Excellent RF characteristics at a reasonable price

For high-accuracy measurements on AM, FM and SSB receivers, the signal source must be superior to the DUT. The low residual FM and SSB phase noise of the SMT make it suitable for in-channel and blocking measurements even on high-end receivers. The small level error of <1 dB in the frequency range ≤ 1.5 GHz allows high-precision sensitivity measurements.

Minimum RF emissions – for sensitive DUTs

Measurements on highly sensitive receivers such as pagers not only require high signal quality but also extremely high RF shielding of the signal source. Elaborate shielding measures keep RF emissions of the SMT to a minimum, ie <0.1 μ V, induced in a two-turn loop 25 mm in diameter in the immediate vicinity of the instrument.



Characteristics and features

High-grade modulation characteristics

A wealth of modulation modes, the user-selectable combination of various types of modulation and a multitude of modulation sources make the SMT a highly flexible instrument for use in development, production and repair of radio equipment.

AM

The modulation frequency range is DC to 100 kHz. Among the outstanding AM characteristics of the SMT are its extremely low distortion and flat frequency and phase response – characteristics that play a particularly important role in measurements on VOR/ILS receivers, for example.

Broadband FM

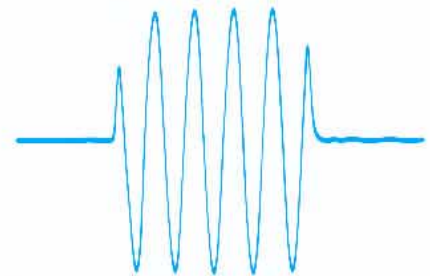
The modulation frequency range is DC to 8 MHz. Maximum deviation is 40 MHz (at 6 GHz carrier frequency). In the FM DC mode, high carrier frequency accuracy is ensured through the use of a special control circuit. There is virtually no drift. The SMT can thus generate highly accurate FSK signals as required for tests on radiopagers. The use of an external Gaussian filter permits GFSK signals in line with the DECT standard to be generated.

Broadband ϕ M

Phase modulation ranges from DC to 2 MHz. This wide span opens up fields of application for which most signal generators do not qualify, for instance tests on phase-sensitive circuits or the generation of PSK modulation with freely selectable phase deviation up to 20 rad.

Pulse modulation (option)

Its high-quality pulse modulation, featuring an on/off ratio better than 80 dB and a rise/fall time shorter than 10 ns, make the SMT an ideal choice for radar applications. The pulse generator option allows pulsed signals to be produced independent of an external source.



Pulse modulation of 50-MHz carrier

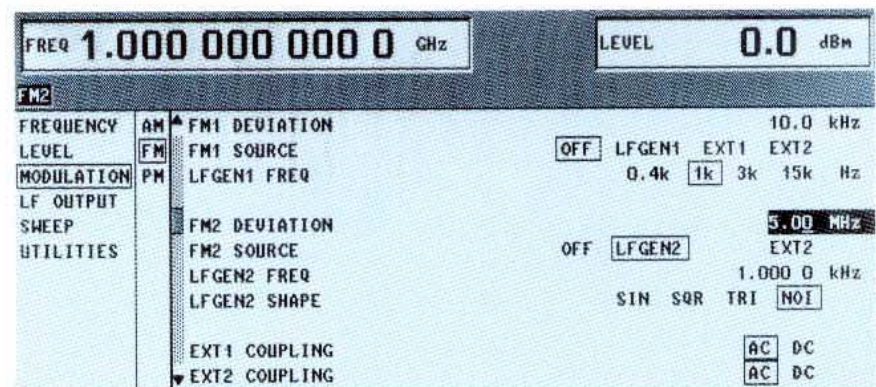
Memory sequence function for automatic measurements

For frequently repeated measurement series, eg frequency response measurements or sequences of different types of single measurements, the memory sequence function affords a convenience otherwise obtained only by means of processor control. Up to 50 instrument settings can be stored in a non-volatile memory. After programming the sequence of measurements and the step time in a list, the automatic test run can be started.

A wealth of functions – yet easy to operate

As a rule, the more functions provided in a unit, the more complex the operation. This certainly applies to conventional signal generators with multi-function keys and a variety of special functions.

But not with the SMT: operation is extremely easy thanks to a well thought-out operating concept featuring a large LCD display and menu guidance. All parameters selectable for a specific function are arranged in hierarchical order in a single display. Help texts for the individual functions mean that it is often unnecessary to consult a manual.



The FM modulation menu shows the clear-cut representation of selectable parameters and current instrument status on the display. Each setting can be made quickly and easily by means of the spinwheel and a few keys

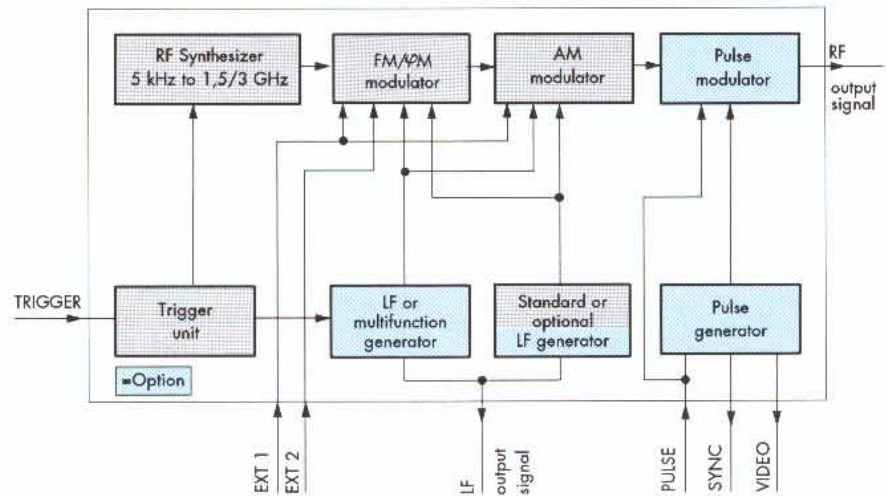
Configurable to user's requirements

AM, FM, ϕ M and pulse modulation can be used with various internal and external modulation sources. The SMT can be tailored to suit specific applications by means of optional modules. These can also be retrofitted quickly and easily at a later date.

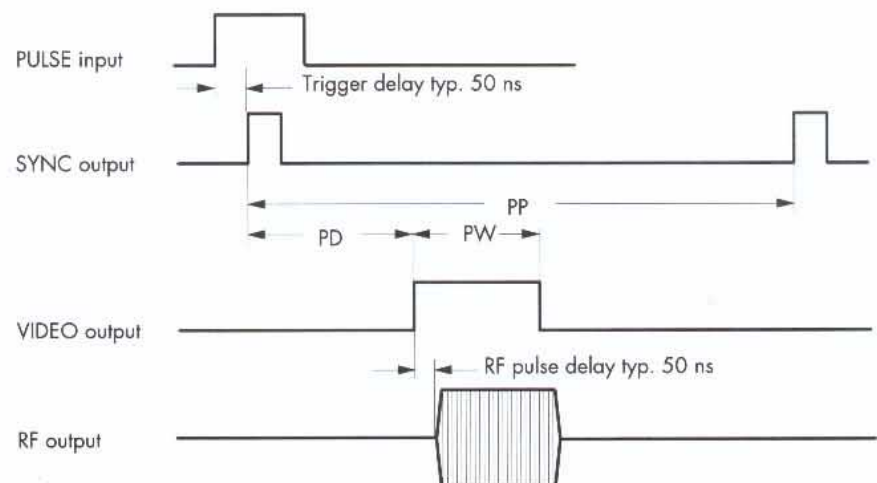
The **LF generator**, which can be fitted in addition to the fixed-frequency LF generator provided as standard, is a synthesizer up to 500 kHz. Besides sinewave, squarewave and triangular signals, it also supplies a noise signal. If two optional LF generators are fitted in a unit, multitone signals can be generated internally.

The **multifunction generator** with a frequency range from DC to 1 MHz produces the same signals as the optional LF generator and, in addition, **stereo** multiplex and **VOR/ILS** modulation signals. The multifunction generator option makes the SMT suitable even for highly demanding measurements on FM stereo and navigation receivers.

The **pulse generator** provides single and double pulses as required for radar receiver testing. The pulse repetition period (PP), pulse width (PW) and pulse delay (PD) (see diagram) can be set with high accuracy and resolution.



The multifunction generator also supplies VOR/ILS signals for tests on navigation receivers



Specifications

Frequency

Range
5 kHz to 1.5 GHz (SMT02)
5 kHz to 3 GHz (SMT03)
5 kHz to 6 GHz (SMT06)

Underrange
(specs not binding)

down to 1 kHz

Resolution

0.1 Hz

Setting time after IEC/IEEE-bus
delimiter to within
 $<1 \times 10^{-7}$ for $f > 67.5$ MHz and
 <70 Hz for $f < 67.5$ MHz

<20 ms

Phase offset

adjustable in steps of 1°

Reference frequency

Aging (after 30 days of operation)

Standard

1×10^{-6} /year

Option SM-B1

$<1 \times 10^{-9}$ /day

Temperature effect (0 to 55 °C)

2×10^{-6}

$<5 \times 10^{-8}$

Warm-up time

—

10 min

Output for internal reference

Frequency

10 MHz

Level (EMF, sinewave)

1 V_{rms}

Source impedance

50 Ω

Input for external reference

Frequency

5 or 10 MHz

Permissible frequency error

3×10^{-6}

Input level

0.1 to 2 V_{rms}

Input impedance

200 Ω

Electronic tuning (TUNE)

Input voltage range

1×10^{-7} /V

Input impedance

± 10 V

10 kΩ

Spectral purity

Spurious signals

Harmonics

level ≤ 10 dBm¹⁾

level without overrange

<-30 dBc

<-26 dBc

Subharmonics

$f < 1.5$ GHz

none

$f > 1.5$ GHz

<-40 dBc

$f > 3$ GHz

<-34 dBc

Nonharmonics at >10 kHz

from carrier

$f < 1.5$ GHz

<-80 dBc

$f > 1.5$ GHz

<-74 dBc

$f > 3$ GHz

<-68 dBc

Broadband noise for CW¹⁾

at >10 MHz from carrier,

1-Hz bandwidth

$f \leq 3$ GHz

<-140 dBc (typ. <-145 dBc)

$f > 3$ GHz

<-134 dBc (typ. <-139 dBc)

SSB phase noise 20 kHz from carrier at

1-Hz bandwidth, FM/PM deviation

$<1\%$ of maximum deviation

<67.5 MHz

<-120 dBc

80 MHz

<-139 dBc

125 MHz

<-134 dBc

250 MHz

<-128 dBc

500 MHz

<-122 dBc

1000 MHz

<-116 dBc

2000 MHz

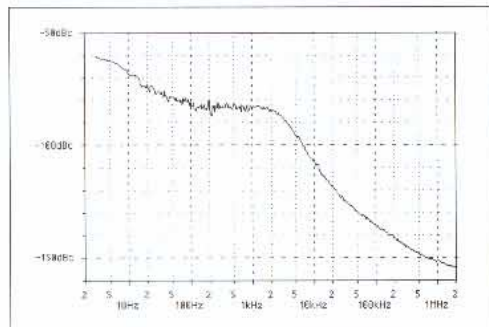
<-110 dBc

3000 MHz

<-109 dBc

6000 MHz

<-103 dBc



Typical SSB phase noise at 1 GHz (CW)

Residual FM, rms,
at carrier frequency

<67.5 MHz

67.5 to 187.5 MHz

187.5 to 375 MHz

375 to 750 MHz

750 to 1500 MHz

1500 to 3000 MHz

3000 to 6000 MHz

0.3 to 3 kHz (CCITT) **0.03 to 20 kHz**

<4 Hz

<10 Hz

<1 Hz

<3 Hz

<2 Hz

<5 Hz

<4 Hz

<10 Hz

<8 Hz

<20 Hz

<16 Hz

<40 Hz

<32 Hz

<80 Hz

Residual AM, rms (0.03 to 20 kHz)¹⁾ $<0.02\%$

Level

Range

-144 to $+13$ dBm

Overrange

(specs not binding)

up to 16 dBm

Resolution

0.1 dB

Total error for levels >-127 dBm¹⁾

$f < 1.5$ GHz

<1 dB

$f > 1.5$ GHz

<1.5 dB

$f > 3$ GHz

<2 dB

Level flatness at 0 dBm¹⁾

$f \leq 3$ GHz

<1 dB

$f > 3$ GHz

<1.5 dB

Output impedance

50 Ω

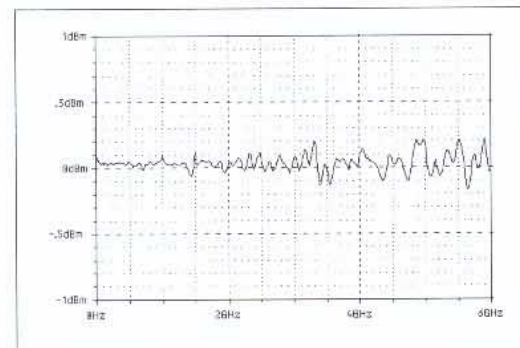
VSWR ¹⁾	$f \leq 3$ GHz	$3 \text{ GHz} < f \leq 5 \text{ GHz}$	$f > 5 \text{ GHz}$
Level >0 dBm	<2	<2	<2
Level >0 dBm and option SM-B9 fitted (SMT06)	<2	<2	<2.5
Level ≤ 0 dBm	<1.5	<2	<2

Setting time (IEC/IEEE bus)

<25 ms (<10 ms with electronic
level setting)

Non-interrupting level setting
(ATTENUATOR MODE FIXED)
Setting range

23 dB



Typical level frequency response at 0 dBm

Overvoltage protection

protects the unit from externally applied RF power (50-Ω source) and DC voltages

Max. RF power

50 W (SMT02/03)

1 W (SMT06)

Max. DC voltage

35 V (SMT02/03)

0 V (SMT06)

Simultaneous modulation	any combination of AM, FM (ϕM) and pulse modulation	EXT1, EXT2 modulation inputs Input impedance Input voltage for selected deviation, AF= 10 Hz to 100 kHz	>100 k Ω 1 V _P (high/low indication for inaccuracy >3%)
Amplitude modulation Operating modes Modulation depth	internal, external AC/DC 0 to 100% modulation depths meeting AM specifications linearly decrease on increasing the level from 7 to 13 dBm; a status message will be output if the modulation depth is too great 0.1% <4% of reading $\pm 1\%$	Pulse modulation Operating modes Frequency range Max. output level Harmonics On/off ratio Rise/fall time (10/90%) Pulse repetition rate Pulse delay Video feedthrough PULSE modulation input Input level Input impedance	with option SM-B3, SM-B8 or SM-B9 external; internal with Pulse Generator SM-B4 50 MHz to 1.5 GHz (SM-B3) 50 MHz to 3.0 GHz (SM-B8) 50 MHz to 6.0 GHz (SM-B9) 10 dBm (SM-B3) 9 dBm (SM-B8) 8 dBm (SM-B9) <-30 dBc for levels ≤ 5 dBm >80 dB <10 ns 0 to 10 MHz typ. 50 ns <-30 dBc TTL (HCT) 50 Ω or 10 k Ω
Resolution Setting error at 1 kHz ($m < 80\%$) ¹⁾ AM distortion at 1 kHz ¹⁾ m=30% m=80% Modulation frequency range Modulation frequ. response ($m=60\%$) ¹⁾ 20 Hz (DC) to 50 kHz Incidental ϕM with 30% AM, AF = 1 kHz EXT 1 modulation input Input impedance Input voltage for selected modulation depth	<1% <2% DC to 100 kHz <1 dB <0.2 rad ($f \leq 3$ GHz) <2 rad ($f > 3$ GHz) >100 k Ω 1 V _P (high/low indication for inaccuracy >3%)	Internal modulation generator Frequency Open-circuit voltage LF generator Waveforms Frequency range sinewave, noise triangular, squarewave Resolution Frequency error Frequency response (sinewave) up to 100 kHz up to 500 kHz Distortion (20 Hz to 100 kHz) Open-circuit voltage Resolution Setting error at 1 kHz (sinewave) Frequency setting time	0.4/1/3/15 kHz $\pm 3\%$ 1 V _P $\pm 1\%$ ($R_{out} = 10 \Omega$, $R_L > 200 \Omega$) option SM-B2 sinewave, triangular, squarewave, noise 0.1 Hz to 500 kHz 0.1 Hz to 50 kHz 0.1 Hz <1 $\times 10^{-4}$ <0.3 dB <0.5 dB <0.1% (level >0.5 V) 1 mV _P to 4 V _P ($R_{out} = 10 \Omega$, $R_L > 200 \Omega$) 1 mV 1% + 1 mV <10 ms (after receipt of last character from IEC/IEEE bus)
Frequency modulation Operating modes	internal, external AC/DC, two tone with two separate channels FM1 and FM2	Multifunction generator Waveforms Frequency range sinewave, noise triangular, sawtooth, squarewave Resolution Frequency error Frequency response (sinewave) up to 100 kHz up to 1 MHz Distortion (20 Hz to 100 kHz) Open-circuit voltage Resolution Setting error at 1 kHz Frequency setting time	option SM-B6 sinewave, triangular, sawtooth, squarewave, noise, stereo MPX signals, VOR/ILS modulation signals 0.1 Hz to 1 MHz 0.1 Hz to 50 kHz 0.1 Hz same as for reference frequency <0.3 dB <0.5 dB <0.1% (level >0.5 V) 1 mV _P to 4 V _P ($R_{out} = 10 \Omega$, $R_L > 200 \Omega$) 1 mV 1% + 1 mV <10 ms (after receipt of last character from IEC/IEEE bus)
Max. deviation at carrier frequency <130 MHz 130 to 187.5 MHz 187.5 to 375 MHz 375 to 750 MHz 750 to 1500 MHz 1500 to 3000 MHz 3000 to 6000 MHz Resolution Setting error at AF= 1 kHz (FM AC) FM distortion at AF= 1 kHz and 10% max. deviation Modulation frequency range, FM1 FM2 Modulation frequency response 20 Hz (DC) to 100 kHz Incidental AM at AF= 1 kHz, f > 1 MHz, deviation = 40 kHz Stereo modulation at 40 kHz deviation, AF= 1 kHz, RF= 88 to 108 MHz Stereo separation Unweighted S/N ratio (rms) Weighted S/N ratio (rms) Distortion Carrier frequency offset with FM DC ²⁾ EXT1, EXT2 modulation inputs Input impedance Input voltage for selected deviation, AF = 10 Hz to 100 kHz	5 MHz 1.25 MHz 2.5 MHz 5 MHz 10 MHz 20 MHz 40 MHz <1%, min. 10 Hz <3% of reading + 20 Hz <0.3%, typ. 0.1% DC to 100 kHz DC to 8 MHz <0.5 dB <0.1% >50 dB ²⁾ >76 dB >70 dB <0.2% <0.1% of deviation >100 k Ω 1 V _P (high/low indication for inaccuracy >3%)	Stereo multiplex signal Stereo operating modes Frequency range of L, R signal Preemphasis Pilot-tone frequency Pilot-tone phase Resolution Stereo separation Distortion Carrier suppression (38 kHz) Settings selectable for ARI ³⁾ (ARI = broadcast information for motorists) Area identification Traffic announcement identification Additional signals (RDS, RDS+ARI)	with multifunction generator R, L, R=L, R=-L, ARI (pilot tone/MPX signal can be connected to LF socket) 0.1 Hz to 1.5 kHz 50 μ s, 75 μ s 19 kHz ± 1 Hz 0 to 360° 0.1° >60 dB <0.1% (L, R = 1 kHz) >65 dB A, B, C, D, E, F on/off application via EXT 1 input
Phase modulation Operating modes	internal, external AC/DC, two tone with two separate modulation channels $\phi M1$ and $\phi M2$		
Max. deviation (broadband ϕM only with $\phi M2$) <130 MHz 130 to 187.5 MHz 187.5 to 375 MHz 375 to 750 MHz 750 to 1500 MHz 1500 to 3000 MHz 3000 to 6000 MHz Resolution Setting error at AF= 1 kHz Distortion at AF= 1 kHz and max. deviation Modulation frequency range, $\phi M1$ $\phi M2$	Narrowbw. ϕM, bandw. 100 kHz 50 rad 12.5 rad 25 rad 50 rad 100 rad 200 rad 400 rad <1%, min. 0.001 rad <[3% of reading + 0.01 rad] <0.5%, typ. 0.1% DC to 100 kHz DC to 2 MHz Broadbw. ϕM bandw. 2 MHz 2.5 rad 0.625 rad 1.25 rad 2.5 rad 5 rad 10 rad 20 rad		

VOR modulation signal¹⁾

Settings

Phase
Phase resolution
Bearing error (RF output,
108 to 118 MHz)
FM error (deviation 480 Hz)

with multifunction generator
30 Hz (VAR, REF)/9.96-kHz FM
carrier, FM deviation, COM/ID tone
0 to 360°
0.01°

<0.05°
<1 Hz

ILS modulation signal¹⁾

Settings

DDM setting range
DDM resolution
DDM error (RF output)
Localizer (108 to 112 MHz)
Glide slope (329 to 335 MHz)

with multifunction generator
90-Hz, 150-Hz tone, COM/ID tone,
marker beacon
0 to ± 0.8
0.0001

<0.0004 + 2% of DDM reading
<0.0008 + 2% of DDM reading

Pulse generator

Operating modes

Active trigger edge
Pulse repetition period
Resolution
Accuracy
Pulse width
Resolution
Accuracy
Pulse delay
Resolution
Accuracy
Double pulse
Resolution
Accuracy
Trigger delay
PULSE modulation input
Input level
Input impedance
Sync output
Video output

option SM-B4
single pulse, delayed pulse,
double pulse
positive or negative
100 ns to 85 s
5-digit, min. 20 ns
same as for reference frequency
20 ns to 1 s
4-digit, min. 20 ns
5% of reading ± 5 ns
40 ns to 1 s
4-digit, min. 20 ns
5% of reading -10 to +20 ns
60 ns to 1 s
4-digit, min. 20 ns
5% of reading -10 to +20 ns
typ. 50 ns

TTL (HCT)
50 Ω or 10 k Ω
TTL level (HC), 40 ns pulse width
TTL level (HC)

Sweep

RF sweep, LF sweep
Operating modes

digital, in discrete steps
LF sweep with option SM-B2
automatic, single-shot, manual or
externally triggered, linear or
logarithmic

freely selectable
0.01 to 100%

Sweep range and
step width (lin)
step width (log)
Level sweep
Operating modes

automatic, single-shot, manual or
externally triggered, logarithmic

Sweep range
Step width
Step time
Resolution
Markers
MARKER output signal

0.1 to 20 dB
0.1 to 20 dB
10 ms to 5 s
0.1 ms
3, freely selectable
TTL/HC logic signal, selectable
polarity
0 to 10 V
TTL/HC logic signal, selectable
polarity

X output
BLANK output signal

Memory for instrument settings

Storable settings
Memory sequence modes

50
automatic, single-shot, manual or
externally triggered
50 ms to 60 s
1 ms

Step time
Resolution

Remote control

System
Instruction set
Connector
IEC/IEEE-bus address
Interface functions

IEC 625 (IEEE 488)
SCPI 1993.0
24-contact Amphenol
0 to 30
SH1, AH1, T6, L4, SR1, RL1, PP1,
DC1, DT1, C0

General data

Power supply

90 to 132 V (AC), 47 to 440 Hz,
180 to 265 V (AC), 47 to 440 Hz,
autosetting to AC voltage,
max. 300 VA,
safety class I VDE 0411
(IEC 348)

Electromagnetic compatibility

Standards met

German Postal Decree 243/1991,
EN 55011 (VDE 0875 T11), class B,
VDE 0875, interference suppression
level K, MIL-STD 461 B
– RE 02 radiated emissions
– CE 03 conducted emissions
– CS 01/02 conducted
susceptibility

RF emissions (f < 1 GHz)

<0.1 μ V (induced in a two-turn loop
25 mm in dia at a distance of 25 mm
from any surface of the enclosure)
10 V/m

Radiated susceptibility

Ambient conditions

Operating temperature range
Storage temperature range
Humidity

0 to 55 °C⁴⁾
–40 to +70 °C
DIN IEC 68-2-30, +40 °C

Mechanical stress

Shock

to MIL-STD 810 D,
40 g shock spectrum
to DIN IEC 68-2-6, 5 to 55 Hz
10 m/s² rms, 10 to 300 Hz

Vibration, sine wave
Vibration, noise

Dimensions (W x H x D)

435 mm x 192 mm x 350 mm

Weight

20 kg for fully equipped unit

Ordering information

Order designations

Signal Generator SMT02
1039.2000.02
Signal Generator SMT03
1039.2000.03
Signal Generator SMT06
1039.2000.06

Accessories supplied

power cable, operating manual

Options

Reference Oscillator OCXO	SM-B1	1036.7599.02
LF Generator ⁵⁾	SM-B2	1036.7947.02
Pulse Modulator for SMT02 ⁵⁾⁶⁾	SM-B3	1036.6340.02
Pulse Modulator for SMT03 ⁵⁾⁶⁾	SM-B8	1036.6805.02
Pulse Modulator for SMT06 ⁵⁾⁶⁾	SM-B9	1039.5100.02
Pulse Generator (only with option SM-B3 or SM-B8/SM-B9)	SM-B4	1036.9310.02
Multifunction Generator ⁵⁾	SM-B6	1036.7760.02
Rear Connectors for RF and AF	SMT-B19	1039.4003.02

Recommended extras

19" Rack Adapter	ZZA-94	0396.4905.00
Service Kit	SM-Z2	1039.3520.02
SMT Service Manual		1039.3359.24



¹⁾ Does not apply to non-interrupting level setting
(ATTENUATOR MODE FIXED and USER CORR).

²⁾ Applies to a period of one hour after calibration and with temperature
variations <5°C.

³⁾ In the ARI mode, L = R = OFF.

⁴⁾ Contrast of LCD display degraded at high temperatures.

⁵⁾ A second optional modulation generator (SM-B2 or SM-B6) can be fitted
only if no pulse modulator (SM-B3, SM-B8 or SM-B9) is fitted.

⁶⁾ Retrofit by authorized service centers only.

Minimum maintenance requirements

Calibration

Calibration of the unit is required every three years at the earliest. Calibration values are loaded via the RS-232-C or IEC/IEEE-bus interface to ensure frequency and level accuracy to specifications. The unit neither needs to be opened, nor are any mechanical adjustments to be made.

Self-diagnostics

For maintenance and calibration, precise data on the instrument status are needed. Using the built-in test equipment, the SMT supplies these data without any extra equipment required.

Self-test for enhanced reliability

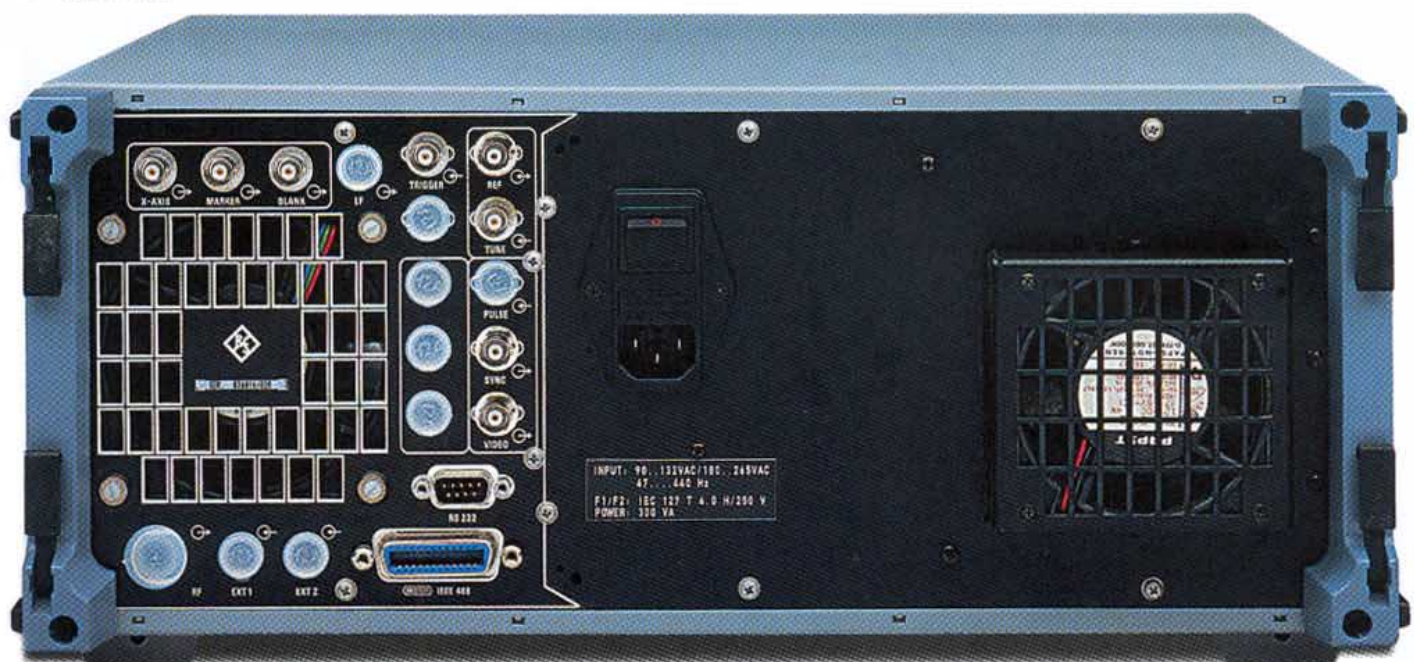
The signal generator status is continuously monitored. The SMT indicates malfunctions and deviations from nominal values by means of a message on the display.

Built-in test equipment

The signal generator can be fully checked without any extra test equipment required and without opening the unit. There are 65 test points covering all crucial areas in signal generation such as RF signal levels and control circuit monitoring voltages. When a test point is called up via the keyboard or the IEC/IEEE bus, its number and value appear on the display. The source of error can thus easily be identified in the event of a malfunction.

A diagnostic and adjustment program for process controllers compatible with the industry standard (included in Service Kit SM-Z2) enables the automatic evaluation and logging of the instrument status. Adjustments can easily and rapidly be made without any extra test equipment required. During the several days of burn-in following production, the SMT is continuously checked through with the aid of this program. This ensures that an extremely reliable instrument tested throughout the entire temperature range will be supplied to the customer.

Rear panel of SMT





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