# Signal Generator R&S®SML

## Economy at its best

- 9 kHz to 1.1 GHz/2.2 GHz/3.3 GHz
- SSB phase noise: −128 dBc (1 Hz) (at f = 1 GHz, Δf = 20 kHz)
- Setting times <10 ms
- High level accuracy (deviation <0.5 dB at levels >−120 dBm)

- High reliability through electronic attenuator
- Digital frequency and level sweep
- AM/FM/φM
- Optional pulse modulator with integrated pulse generator

- Optional stereo coder with analog and digital audio inputs
- Versatile test system consisting of the R&S®SML with the R&S®SML-B5 and the Audio Analyzer R&S®UPL
- 3-year calibration cycle

**ROHDE&SCHWARZ**

# Unequalled universality

## Frequency

◆ 9 kHz to 1.1 GHz/2.2 GHz/3.3 GHz
◆ 0.1 Hz frequency resolution

## Level

◆ −140 dBm to +13 dBm
  (+19 dBm overrange)
◆ High level accuracy (deviation <0.5 dB
  at levels >−120 dBm)
◆ Level setting without overshoots
◆ Electronic attenuator
◆ Non-interrupting level setting

## Spectral purity

◆ SSB phase noise <−122 dBc (1 Hz),
  typ. −128 dBc (1 Hz)
  (f = 1 GHz, carrier offset 20 kHz)
◆ Broadband noise <−140 dBc (1 Hz),
  typ. −150 dBc (1 Hz)
  (f = 1 GHz, carrier offset >2 MHz)

## Speed

◆ Setting times <10 ms for frequency
  and level

## Modulation

◆ AM/FM/φM as standard
◆ Simultaneous AM, FM/φM and
  pulse modulation
◆ Optional pulse modulator with
  integrated pulse generator
  (R&S®SML-B3)

## Low cost of ownership

◆ 3-year calibration cycle
◆ Low purchase price
◆ High reliability through electronic
  attenuator (wear-free)
◆ Service-friendly (continuous selftest,
  access to internal test points)
◆ Options OCXO (R&S®SML-B1),
  pulse modulator (R&S®SML-B3) and
  Stereo/RDS Coder (R&S®SML-B5)
  retrofittable

## Size

◆ Compact size:
  427 mm × 88 mm × 450 mm
◆ Low weight: <8.5 kg

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# Applications ...

## Lab and R&D: versatile

### High spectral purity
Owing to its low phase noise, the R&S®SML is ideally suited to replace LOs.

### Versatile modulation modes
The R&S®SML in conjunction with the optional Pulse Modulator R&S®SML-B3 handles all analog types of modulation. AM, FM/φM and pulse modulation can be used simultaneously. TDMA signals or amplitude variations in the case of FM, for example, can thus be simulated.

### High and precise output level
The R&S®SML has plenty of power in reserve so level loss produced by the test setup can be easily compensated. Its high output level makes the R&S®SML an ideal source for driving high-level mixers.

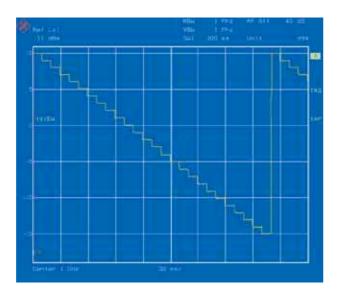### Excellent modulation characteristics
The DC-coupled FM allows the R&S®SML to be used as an accurate VCO.
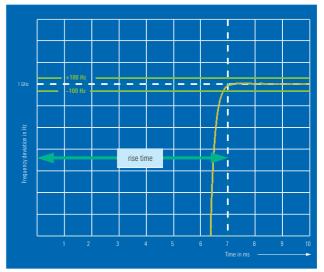
## Example: receiver measurements

◆ Sensitivity measurements require a signal generator with high level accuracy. This is particularly true at low output levels. With its sophisticated calibration technique, the R&S®SML features high level accuracy (<0.5 dB at levels >−120 dBm).

◆ Squelch measurements call for continuous level setting. Non-interrupting level variation by typ. 30 dB makes the R&S®SML the ideal choice for squelch measurements.

◆ Low spurious, low broadband noise and above all excellent SSB phase noise are prerequisites for using a signal generator as an interference source. With typ. −128 dBc (1 Hz) SSB phase noise (at f = 1 GHz, Δf = 20 kHz), spurious suppression of typ. −76 dBc and broadband noise of typ. −150 dBc (1 Hz), the R&S®SML easily meets even the most exacting requirements.

**The R&S®SML offers all features required of a state-of-the-art general-purpose signal generator: wide frequency range, large variety of modulation functions and high reliability – at an extremely attractive price. The fields of application of the R&S®SML are virtually unlimited in development, servicing or production where it is used as a flexible signal source in automatic test systems. The R&S®SML benefits both from our long-standing experience in the field of signal generators and the latest technology. Its uses are as versatile as its functionalities.**

◆ The mechanical design of the R&S®SML ensures excellent RF shielding of its casing. This is particularly important for measurements on highly sensitive receivers with built-in antenna such as pagers.



*Level sweep within 25 dB range.*



*Settling upon frequency change from 100 MHz to 1 GHz.*

## Servicing:
## robust, compact, lightweight

### Mobility
The R&S®SML is lightweight and compact and therefore very easy to transport.

### Flexible control
In service environments, an IEC/IEEE interface is not always available for controlling the generator. This is no problem for the R&S®SML since it can also be driven via a standard RS-232-C interface.

### Protection against overvoltage
The integrated overvoltage protection of the RF input protects the R&S®SML against very high external voltages such as may occur during transceiver measurements.

## Production:
## fast, accurate, reliable

### Accuracy
Measurement uncertainty can be split into the part from the instrument and that introduced by the test setup. With lower uncertainty of the generator, greater tolerances can be allowed for the setup. If the low level deviation of the analyzer is used to allow for higher DUT tolerances,

the result will be a marked reduction in manufacturing rejects – an advantage that pays off immediately.

### Speed
Speed is of prime importance in production. And this is precisely one of the strong points of the R&S®SML, with a setting time of <10 ms for frequency and level.

### Reliability
A signal generator used in production must have high reliability. The R&S®SML meets this requirement for example through the use of a completely wear-free electronic attenuator. Should a fault nevertheless occur, the continuous self-diagnostics of the R&S®SML prevent expensive erroneous measurements.

### Output level
In production test systems, the signal is taken to the DUT (device under test) via switches and cables, thus leading to level losses. These losses can be easily compensated by the high output power of the R&S®SML.

### Dimensions
Space is often at a premium in production. The compact size of the R&S®SML makes it ideal for use in such environments.
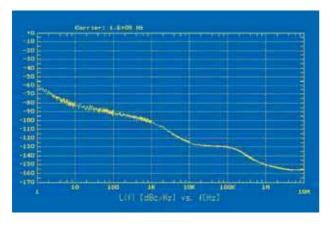
### Example: component test

◆ To obtain reliable information on component quality, high level accuracy and precise reproducibility of the output level are called for. The R&S®SML fully meets these requirements owing to the level deviation of <0.5 dB (at levels >−120 dBm) and high reproducibility.
◆ With unrivalled short times (<10 ms) for frequency and level setting, the R&S®SML enables fast testing and is ideal for use in production.
◆ Overshoots in case of level change may damage or destroy the DUT. This cannot happen with the R&S®SML since it operates without any overshoots.
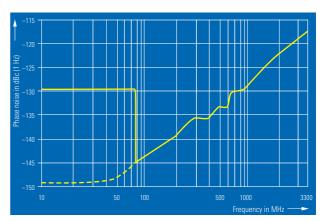
## EMS measurements

### Non-interrupting level setting without overshoots
EMS measurements call for non-interrupting level setting, which should moreover be performed without any overshoots. The R&S®SML operates free of overshoots and offers a wide dynamic range of typ. 30 dB for non-interrupting level variation (with Attenuator Mode Fixed).



*Typical SSB noise at 1 GHz (with OCXO option R&S®SML-B1).*



*Typical SSB phase noise versus carrier frequency (carrier offset 20 kHz); dashed line: Extended Divider Range mode.*
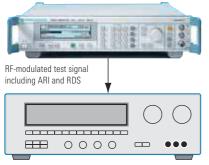
### Wide frequency range

The R&S®SML has a lower frequency limit of 9 kHz as standard and thus fully covers the frequency range required for EMC measurements.

## Reference source

The R&S®SML allows the mode of frequency generation to be selected. In the Extended Divider Range mode, the RF signal is generated by frequency division. The excellent values obtained in this mode for SSB phase noise are comparable with the high-grade crystal oscillators normally used as reference sources from 10 MHz to 30 MHz.

Compared to crystal oscillators, the R&S®SML provides the following benefits:

◆ Frequency can be set in 0.1 Hz steps and synchronized to an external reference
◆ All functions can be remotely controlled via the IEC/IEEE bus or serial interface

*SSB phase noise at 9.5 MHz output frequency, extended divider range activated, 1 Hz measurement bandwidth.*

| Offset from carrier | SSB phase noise, typical values |
|---|---|
| 1 Hz | −95 dB |
| 10 Hz | −120 dB |
| 100 Hz | −130 dB |
| 1 kHz | −138 dB |
| 10 kHz | −148 dB |

Signal Generator R&S®SML+Stereo/RDS Coder R&S®SML-B5

RF-modulated test signal including ARI and RDS

FM stereo tuner

*Audio signals produced by the built-in LF generator of the R&S®SML.*

## Generation of stereo and RDS signals

FM stereo broadcasting is still the major audio medium – especially in the automobile sector, where millions of car radios are produced every year. With its integration into mobile radio telephones, FM broadcasting becomes even more significant. For testing FM stereo receivers, audio test signals are modulated onto an RF carrier and measured after demodulation by the DUT. For the car radio sector, automotive radio information (ARI) has to be generated in addition. Test signals are also needed for the radio data system (RDS), which has been established in many countries for a long time.

### Stereo/RDS Coder R&S®SML-B5
The optional Stereo/RDS Coder R&S®SML-B5 meets all the above requirements. Built into instruments of the Signal Generator Family R&S®SML, the solution is based on equipment featuring an excellent price/performance ratio as well as top-class specifications and providing full coverage of the frequency range in question.

### Audio signals produced by internal LF generator
The internal LF generator, which is suitable for simple receiver tests, is part of the basic configuration of the R&S®SML. It generates sinusoidal signals at fixed frequencies, thus allowing basic functional tests to be carried out without an external signal (see figure on left).
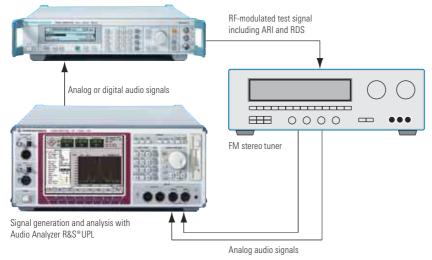
### Combination with the Audio Analyzer R&S®UPL
The stereo/RDS coder can also work with external signals applied to its analog and digital modulation inputs. Combining the Signal Generator R&S®SML and the Audio Analyzer R&S®UPL (data sheet PD 0757.2238) creates a general-purpose test system for FM tuners (see figure on next page).

The great advantage is the automatic synchronization of measurement results. Just as in other two-port audio measurements, the test signals are produced in the generator section of the Audio Analyzer R&S®UPL, routed through the modulator and the DUT, and measured in the analyzer section of the R&S®UPL. Since generation and analysis are optimally timed, measurement times are considerably shorter than with separately operating instruments.

### Use in production
Combining the Signal Generator R&S®SML and the Audio Analyzer R&S®UPL enables measurements to be automated. The Universal Sequence Control R&S®UPL-B10 allows complete test programs to be generated and run on the R&S®UPL, in which case the Signal Generator R&S®SML with the R&S®SML-B5 option is remote-controlled via the IEC 60625 or RS-232-C interface. In most production environments, the complete test set can be run under an external controller.

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Signal Generator R&S®SML+Stereo/RDS Coder R&S®SML-B5



RF-modulated test signal including ARI and RDS

Analog or digital audio signals

FM stereo tuner

Signal generation and analysis with Audio Analyzer R&S®UPL

Analog audio signals

*Audio signals are generated and measured in the Audio Analyzer R&S®UPL; automatic synchronization substantially reduces the measurement time.*

## Analog and digital audio inputs

The R&S®SML-B5 has separate analog inputs for left and right. In combination with the Audio Analyzer R&S®UPL, measurements are possible in the operating modes L, R, R = L, and R = −L. A digital audio input in S/P DIF format is available alternatively. The R&S®UPL can additionally generate different signals for left and right in this format. It is possible to set one channel to a fixed frequency while sweeping the second channel through a frequency band, for example.

## Generation of ARI and RDS signals

The R&S®SML-B5 outputs stereo multiplex as well as ARI and RDS signals. It is possible to choose between traffic announcement identification and standardized area identification A to F. The RDS traffic program or RDS traffic announcement can be switched on and

All functions of the Stereo/RDS Coder R&S®SML-B5 can of course be remote-controlled.

Use of the Audio Switcher R&S®UPZ is recommended for measurements on car radios or surround receivers with more than two audio outputs, as shown in the figure on the right. For more information about the Audio Switcher R&S®UPZ, see data sheet PD 0758.1170.

### Interruption-free pilot tone

The R&S®SML-B5 option was designed especially for use in test systems. With other signal generators, the stereo pilot tone is briefly interrupted if the output data has to be recalculated (e.g. when the audio frequency changes). The connected tuner loses synchronization and has to switch to the stereo mode again with each frequency change, so overall measurement time may increase dramatically. This disadvantage does not occur with the R&S®SML-B5 since the audio signal is modulated onto the RF carrier independently of pilot tone generation, and consequently the pilot tone is not switched off.
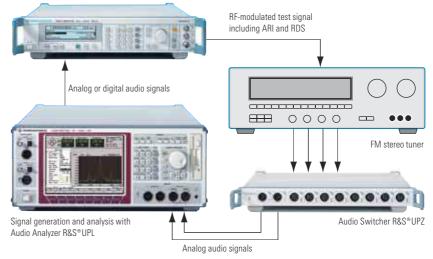
Signal Generator R&S®SML+Stereo/RDS Coder R&S®SML-B5



RF-modulated test signal including ARI and RDS

Analog or digital audio signals

FM stereo tuner

Signal generation and analysis with Audio Analyzer R&S®UPL

Audio Switcher R&S®UPZ

Analog audio signals

*The Audio Switcher R&S®UPZ for automated measurements on more than two audio outputs.*

*Signal output by the stereo/RDS coder prior to FM modulation with ARI and RDS information.*

off. Up to five different RDS sequences can be loaded. With a length of up to 64000 characters per sequence, future RDS applications (e.g. radio text) can also be tested.

## EasyWheel

◆ One-hand operation with EasyWheel
◆ All settings simple and self-explanatory
◆ High-contrast LCD
◆ User-assignable menu keys
◆ Online help including IEC/IEEE-bus commands



*Simply select the desired menu with the spin-wheel and click the button to open the submenu.*

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# Specifications

Specifications apply under the following conditions:
15 minutes warmup time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and total calibration performed.
Data designated "nominal" apply to design parameters and are not tested.
Data designated "overrange" are not warranted.
Warranted specs do not apply to the Extended Divider Range mode.

## Frequency

| | |
|---|---|
| Range | 9 kHz to 1.1 GHz |
| R&S®SML01 | 9 kHz to 1.1 GHz |
| R&S®SML02 | 9 kHz to 2.2 GHz |
| R&S®SML03 | 9 kHz to 3.3 GHz |
| Resolution | 0.1 Hz |
| Resolution of synthesis (standard, f <1.1 GHz) | <0.5 µHz |
| Setting time (for an offset of $<1 \times 10^{-7}$ or <90 Hz for f ≤76 MHz) after IEC/IEEE-bus delimiter | <10 ms |

## Reference frequency

| | Standard | Option R&S®SML-B1 |
|---|---|---|
| Aging (after 30 days of operation) | $<1 \times 10^{-6}$/year | $<1 \times 10^{-7}$/year or $<5 \times 10^{-10}$/day |
| Temperature drift (0°C to 55°C) | $<1 \times 10^{-6}$ | $<2 \times 10^{-8}$ |
| Output for internal reference<br>  Frequency<br>  Output voltage, V rms, sinewave<br>  Source impedance | 10 MHz<br>>0.5 V into 50 Ω<br>50 Ω | |
| Input for external reference<br>  Frequency<br>  Permissible frequency drift<br>  Input voltage, V rms, sinewave<br>  Input impedance | 10 MHz<br>$5 \times 10^{-6}$<br>0.5 V to 2 V into 50 Ω<br>50 Ω | |

## Spectral purity

| | |
|---|---|
| Spurious signals<br>Harmonics (for f >100 kHz)[1]<br>R&S®SML01<br>R&S®SML02/03 | <br><br><−30 dBc at levels ≤+10 dBm<br><−30 dBc at levels ≤+8 dBm |
| Subharmonics<br>  f ≤1.1 GHz<br>  f >1.1 GHz | <br>none<br><−50 dBc |
| Nonharmonics<br>(carrier offset >10 kHz)<br>  f ≤1.1 GHz<br>  f >1.1 GHz to 2.2 GHz<br>  f >2.2 GHz to 3.3 GHz | <br><br><−70 dBc<br><−64 dBc<br><−58 dBc |
| Broadband noise[2] (f = 1 GHz, carrier offset >2 MHz, 1 Hz bandwidth) | <−140 dBc, typ. −150 dBc |
| SSB phase noise (f = 1 GHz, 20 kHz carrier offset, 1 Hz bandwidth) | <−122 dBc, typ. −128 dBc |
| Residual FM, rms (f = 1 GHz)<br>  0.3 kHz to 3 kHz<br>  0.03 kHz to 20 kHz | <br><4 Hz, typ. 1 Hz<br><10 Hz, typ. 3 Hz |
| Residual AM, rms (0.03 kHz to 20 kHz) | <0.02% |

## Level

| | |
|---|---|
| Range | −140 dBm to +13 dBm[2][3]<br>(overrange +19 dBm) |
| Resolution | 0.1 dB |
| Level accuracy[2][4] (level >−120 dBm)<br>R&S®SML01 (for f >100 kHz)<br>R&S®SML02/03<br>  100 kHz to ≤2 GHz<br>  f >2 GHz | <br><0.5 dB<br><br><0.5 dB<br><0.9 dB |

| | |
|---|---|
| Frequency response at 0 dBm[2][4]<br>R&S®SML01 (for f >100 kHz)<br>R&S®SML02/03<br>  100 kHz to ≤2 GHz<br>  f >2 GHz | <br><0.5 dB, typ. 0.3 dB<br><br><0.7 dB<br><1.0 dB |
| Characteristic impedance | 50 Ω |
| VSWR<br>R&S®SML01<br>R&S®SML02/03<br>  100 kHz to 1.5 GHz<br>  f >1.5 GHz | <br><1.5<br><br>1.6<br>2.3 |
| Setting time (IEC/IEEE bus), f >100 kHz | <10 ms, typ. 5 ms |
| Non-interrupting level setting (for f >100 kHz)[5] | 20 dB, overrange 30 dB |

## Overvoltage protection

safeguards unit against externally applied RF power and DC voltage (50 Ω source)

| | |
|---|---|
| Max. permissible RF power<br>  f ≤2.2 GHz<br>  f >2.2 GHz | <br>50 W<br>25 W |
| Max. permissible DC voltage | 35 V |

## Internal modulation generator

| | |
|---|---|
| Frequency range<br>  Resolution | 0.1 Hz to 1 MHz<br>0.1 Hz |
| Frequency accuracy | same as for reference frequency + $2.4 \times 10^{-3}$ Hz |
| Frequency response (up to 500 kHz, level >100 mV) | <0.5 dB |
| THD (up to 100 kHz, level 4 V, $R_L$ = 600 Ω) | <0.1% |
| Open-circuit voltage $V_p$ (LF connector)<br>  Resolution<br>  Setting accuracy (at 1 kHz) | 1 mV to 4 V<br>1 mV<br>1% of $V_p$ + 1 mV |
| Output impedance | approx. 10 Ω |
| Frequency setting time (after reception of last IEC/IEEE-bus character) | <10 ms |

## Simultaneous modulation

AM, FM/φM and pulse modulation

## Amplitude modulation[6]

| | |
|---|---|
| Operating modes | internal, external AC/DC, internal/external two-tone |
| Modulation depth | 0% to 100%,<br>settable modulation depth continuously decreasing between +7 dBm and +13 dBm[7] while adhering to AM specifications; a status message is output when modulation depth is too high |
| Resolution | 0.1% |
| Setting accuracy at AF = 1 kHz (m <80%)[8] | <4% of reading +1% |
| AM distortion[8] at AF = 1 kHz<br>  m = 30%<br>  m = 80% | <br><1%<br><2% |
| Modulation frequency range (<3 dB) | DC/10 Hz to 50 kHz |
| Incidental φM at AM (30%), AF = 1 kHz | <0.2 rad |
| Modulation input EXT<br>  Input impedance<br>  Input voltage $V_p$ for set modulation depth | <br>>100 kΩ<br><br>1 V |

## Frequency modulation

| Operating modes | internal, external AC/DC, internal/external two-tone |
|---|---|
| Frequency deviation | |
| 9 kHz to 76 MHz | 0 Hz to 1 MHz |
| >76 MHz to 151.3125 MHz | 0 Hz to 125 kHz |
| >151.3125 MHz to 302.625 MHz | 0 Hz to 250 kHz |
| >302.625 MHz to 605.25 MHz | 0 Hz to 500 kHz |
| >605.25 MHz to 1.2105 GHz | 0 Hz to 1 MHz |
| >1.2105 GHz to 1.818 GHz | 0 Hz to 2 MHz |
| >1.818 GHz to 2.655 GHz | 0 Hz to 3 MHz |
| >2.655 GHz to 3.300 GHz | 0 Hz to 4 MHz |
| Resolution | <1% of set deviation, minimum 10 Hz |
| Setting accuracy (at AF = 1 kHz) | <4% of reading + 20 Hz |
| FM distortion (at AF = 1 kHz and 50% of max. deviation) | <0.2%, typ. 0.1% |
| Modulation frequency range (<3 dB), standard/wide | DC/10 Hz to 100 kHz/500 kHz |
| Incidental AM (at AF = 1 kHz, f >10 MHz, 40 kHz deviation) | <0.1% |
| Stereo modulation at 40 kHz useful deviation, AF = 1 kHz, RF = 87 MHz to 108 MHz | (for external multiplex signal) |
| Crosstalk attenuation | >50 dB |
| S/N ratio unweighted, rms | >70 dB |
| S/N ratio weighted, rms | >70 dB |
| Distortion | <0.2%, typ. 0.1% |
| Carrier frequency offset at FM DC | typ. 0.1% of set deviation |
| Modulation input EXT | |
| Input impedance | >100 kΩ |
| Input voltage $V_p$ for set deviation (nominal value) | 1 V |

## Phase modulation

| Operating modes | internal, external AC/DC, internal/external two-tone |
|---|---|
| Phase deviation[9] | |
| 9 kHz to 76 MHz | 0 rad to 10 (2) rad |
| >76 MHz to 151.3125 MHz | 0 rad to 1.25 (0.25) rad |
| >151.3125 MHz to 302.625 MHz | 0 rad to 2.5 (0.5) rad |
| >302.625 MHz to 605.25 MHz | 0 rad to 5 (1) rad |
| >605.25 MHz to 1.2105 GHz | 0 rad to 10 (2) rad |
| >1.2105 GHz to 1.818 GHz | 0 rad to 20 (4) rad |
| >1.818 GHz to 2.655 GHz | 0 rad to 30 (6) rad |
| >2.655 GHz to 3.300 GHz | 0 rad to 40 (8) rad |
| Resolution | <1%, min. 0.001 rad |
| Setting accuracy at AF = 1 kHz | <4% of reading + 0.02 rad |
| Phase distortion (at AF = 1 kHz and 50% of maximum deviation) | <0.2%, typ. 0.1% |
| Modulation frequency range (−3 dB), standard/wide | DC/10 Hz to 100 kHz/500 kHz |
| Modulation inputs EXT | |
| Input impedance | >100 kΩ |
| Input voltage $V_p$ for set deviation (nominal value) | 1 V |

## Pulse modulation (with option R&S®SML-B3)

| Operating modes | internal, external |
|---|---|
| On/off ratio | >90 dB |
| Rise/fall time (10%/90%) | <20 ns, typ. 10 ns |
| Pulse repetition frequency | 0 Hz to 2.5 MHz |
| Pulse delay | typ. 50 ns |
| Video crosstalk ($V_p$) | <30 mV |
| Modulation input PULSE | |
| Input level | TTL level (HCT) |
| Input impedance | 10 kΩ or 50 Ω, selectable with internal link |

## Pulse generator (with option R&S®SML-B3)

| Operating modes | automatic, externally triggered, external gate mode, single pulse, double pulse, delayed pulse (externally triggered) |
|---|---|
| Active trigger edge | positive or negative |
| Pulse period | 100 ns to 85 s |
| Resolution | 5 digits, min. 20 ns |
| Accuracy | $<1 \times 10^{-4}$ |
| Pulse width | 20 ns to 1 s |
| Resolution | 4 digits, min. 20 ns |
| Accuracy | $<(1 \times 10^{-4} + 3 \text{ ns})$ |
| Pulse delay | 20 ns to 1 s |
| Resolution | 4 digits, min. 20 ns |
| Accuracy | $<(1 \times 10^{-4} + 3 \text{ ns})$ |
| Double-pulse spacing | 20 ns to 1 s |
| Resolution | 4 digits, min. 20 ns |
| Accuracy | $<(1 \times 10^{-4} + 3 \text{ ns})$ |
| Trigger delay | typ. 50 ns |
| Jitter | <10 ns |
| PULSE/VIDEO output | TTL signal ($R_L \geq 50 \Omega$) |

## Stereo/RDS Coder (with option R&S®SML-B5)

The specifications apply to RF frequencies in the range 66 MHz to 110 MHz.

| Stereo modes | |
|---|---|
| Internal with modulation generator | L, R, R = L, R = −L |
| External analog (via L and R inputs) or external digital (via S/P DIF input) | L, R, R = L, R = −L, R ≠ L |
| | internal generation of ARI/RDS signals, 5 user-selectable RDS data sets, simultaneous generation of MPX, ARI and RDS signals possible |
| MPX frequency deviation | 0 Hz to 80 kHz |
| Resolution | 10 Hz |
| L, R signal | |
| AF frequency range | 20 Hz to 15 kHz |
| AF frequency response (referenced to 500 Hz) | |
| AF = 20 Hz to 40 Hz | <0.3 dB |
| AF = 40 Hz to 15 kHz | <0.2 dB |
| Stereo crosstalk attenuation (at AF = 1 kHz) | >50 dB |
| Distortion (at 67.5 kHz MPX frequency deviation, AF = 1 kHz) | <0.1%, typ. 0.05% |
| S/N ratio[10] (stereo/RDS signal) | |
| ITU-R weighted (quasi-peak) | >60 dB, typ. 63 dB |
| ITU-R unweighted (rms) | >70 dB, typ. 74 dB |
| A-weighted (rms) | >70 dB, typ. 76 dB |
| Preemphasis | off, 50 µs, 75 µs |
| Pilot tone | |
| Frequency | 19 kHz ±2 Hz |
| Deviation | 0 Hz to 10 kHz |
| Resolution | 10 Hz |
| Phase (relative to 38 kHz phase) | 0° to ±5° |
| Resolution | 0.1° |
| ARI/RDS subcarrier frequency | 57 kHz ±6 Hz |
| ARI frequency deviation | 0 Hz to 10 kHz |
| Resolution | 10 Hz |
| RDS frequency deviation | 0 Hz to 10 kHz |
| Resolution | 10 Hz |

| ARI/RDS | functions (directly selectable by menu or remote control) |
|---|---|
| ARI identification | selection of traffic announcement identification (DK) or area identification (BK), OFF, DK, BK, DK + BK |
| ARI BK | selection of standardized area identification A to F |
| RDS traffic program | traffic program off/on |
| RDS traffic announcement | traffic announcement off/on |
| RDS data set | selection of RDS data set 1 to 5 |
| Maximum data length | 64 kByte, can be loaded via IEC 60625 or RS-232-C interface |

| Analog modulation inputs L, R | 2 × BNC |
|---|---|
| Input impedance | 600 Ω or 100 kΩ |
| Input voltage $V_p$ for selected deviation (nominal value) | 1 V |

| Digital modulation input S/P DIF | BNC |
|---|---|
| Input impedance | 75 Ω |
| Input voltage $V_{pp}$ | 1 V (400 mV to 5 V) |

## Sweep
digital in discrete steps

| RF sweep, AF sweep | |
|---|---|
| Operating modes | automatic, single-shot, manually or externally triggered, linear or logarithmic user-selectable |
| Sweep range | user-selectable |
| Step width (lin) | user-selectable |
| Step width (log) | 0.01% to 100% |
| Level sweep | |
| Operating modes | automatic, single-shot, manually or externally triggered, logarithmic user-selectable |
| Sweep range | user-selectable |
| Step width (log) | user-selectable |
| Step time | 10 ms to 1 s |
| Resolution | 0.1 ms |

## Memory for device settings

| Storable settings | 100 |
|---|---|

## Remote control

| System | IEC 60625 (IEEE 488) and RS-232-C |
|---|---|
| Command set | SCPI 1995.0 |
| Connector | Amphenol, 24-pin and 9-pin |
| IEC/IEEE-bus address | 0 to 30 |
| Interface functions | SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C0 |

## General data

| Temperature loading | |
|---|---|
| Specs complied with between | 0°C and 55°C; meets EN 60068-2-1: 1995-03 and EN 60068-2-2: 1994-08 |
| Storage temperature range | −40°C to +70°C |

| Climatic resistance | |
|---|---|
| Damp heat | 95% relative humidity at +25°C/+40°C cyclically; meets EN 60068-2-30: 2000-02 |

| Mechanical resistance | |
|---|---|
| Vibration, sinusoidal | 5 Hz to 150 Hz, max. 2 g at 55 Hz, max. 0.5 g between 55 Hz and 150 Hz, meets EN 60068-2-6: 1996-05, EN 61010-1 and MIL-T-28800D, class 5 |
| Vibration, random | 10 Hz to 300 Hz, acceleration 1.2 g (rms) |
| Shock | 40 g shock spectrum, meets MIL-STD-810E and MIL-T-28800D, class 3/5 |

| Electromagnetic compatibility | meets EN 61000-6-3 and EN 61000-6-4 (EMC directive of EU) |
|---|---|
| Susceptibility to radiated interference | 10 V/m |
| Power supply | 100 V to 120 V (AC), 50 Hz to 400 Hz, 200 V to 240 V (AC), 50 Hz to 60 Hz, autoranging, max. 200 VA |
| Safety | meets EN 61010-1, UL 3111-1, CSA 22.2 No. 1010-1 |
| Dimensions (W × H × D) | 427 mm × 88 mm × 450 mm |
| Weight | 8.5 kg when fully equipped |

[1] With option R&S®SML-B3 only for f >20 MHz.
[2] With Attenuator Mode Auto.
[3] −140 dBm to +11 dBm at f ≤5 MHz, f >3 GHz for R&S®SML02 and R&S®SML03.
[4] Temperature range 20°C to 30°C.
[5] With Attenuator Mode Fixed.
[6] With Attenuator Mode Auto, f ≥100 kHz.
[7] +5 dBm to +11 dBm at f ≤5 MHz, f >3 GHz.
[8] With option R&S®SML-B3 only for f >10 MHz.
[9] Values in brackets apply to wide modulation bandwidth.
[10] Generator without preemphasis, receiver with deemphasis.

## Ordering information

| Signal Generator | R&S®SML01 | 1090.3000.11 |
|---|---|---|
| | R&S®SML02 | 1090.3000.12 |
| | R&S®SML03 | 1090.3000.13 |

| **Accessories supplied** | | |
|---|---|---|
| Power cable, user manual | | |

| **Options** | | |
|---|---|---|
| Reference Oscillator OCXO | R&S®SML-B1 | 1090.5790.02 |
| Pulse Modulator | R&S®SML-B3 | 1090.5403.02[1] |
| Stereo/RDS Coder | R&S®SML-B5 | 1147.8805.02[1] |
| Rear Connectors for AF, RF | R&S®SML-B19 | 1090.5303.02[1] |

| **Recommended extras** | | |
|---|---|---|
| Service Kit | R&S®SML-Z2 | 1090.5203.02 |
| 19" Rack Adapter | R&S®ZZA-211 | 1096.3260.00 |
| Transport Bag | R&S®ZZT-214 | 1109.5119.00 |
| Service Manual, Modules | | 1090.3123.24 |

[1] Factory-fitted only.

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