R&S® HMF2525
R&S® HMF2550
Arbitrary Function Generator
Technical Data

Key facts
- Frequency range: 10 µHz to 25 MHz [50 MHz]
- Triangle and ramp signal up to 10 MHz
- Pulse: frequency range from 100 µHz to 12.5 MHz [25 MHz]
- Output voltage: 5 mVpp to 10 Vpp (into 50 Ω load)
- DC offset: ± 5 mV to 5 V
- Output impedance steplessly adaptable (1 Ω to 10 kΩ)
- Total harmonic distortion: 0.04 % (f < 100 kHz)
- Waveform modes: sine, square, pulse, triangle, ramp and arbitrary waveforms (incl. standard curves: white noise, pink noise, cardiac, exponential rise and fall, etc.)
- Modulation modes: AM, FM, pulse, PWM, FSK (internal and external)
- Arbitrary waveform generator: 250 MSa/s, 14 bit, 256 kSa
- Easily create your own waveforms using standard PC software
- Oscillographic signal display
- Front USB to easily save and recall waveforms and settings, RS-232/USB dual interface for remote control
- BNC connectors: modulation input, sweep output, trigger (input, output), 10 MHz reference (input, output, ±1 ppm TCXO)
- Fanless design
## Technical Data

### R&S® Arbitrary Function Generator

**R&SHMF2525: 25MHz**

**R&SHMF2550: 50MHz**

*from firmware version 2.145*

### Device Characteristics

**All specifications valid into 50 Ω load**

#### Models

- **R&S®HMF2525**: 1 channel, frequency range to 25 MHz
- **R&S®HMF2550**: 1 channel, frequency range to 50 MHz

#### Waveforms

- **standard** sine, square, pulse, ramp, triangle
- **arbitrary waveforms** up to 256kSa
- **predefined waveforms** sine, square (50%), ramp (positive/negative), triangle (50%), noise (white/pink), cardinal sine, exponential (rise/fall)

#### Operation modes

- continuous, modulate, sweep, burst

#### Modulation types

- AM, FM, PM, FSK, PWM

#### Temperature stability

- 1x 10⁻⁶ (+18°C to +28 °C)
- Aging (after one year) ±1x 10⁻⁶ (+25 °C)

### Waveform Characteristics

#### Sine

- **Frequency range**
  - R&S®HMF2525: 10 µHz to 25 MHz
  - R&S®HMF2550: 10 µHz to 50 MHz

- **Amplitude flatness**
  - up to 10 MHz: ±0.15 dB
  - 10 MHz to 25 MHz: ±0.2 dB
  - above 25 MHz: ±0.4 dB

- **Harmonic distortion**
  - up to 100 kHz: < -70 dBc
  - 100 kHz to 10 MHz: < -55 dBc
  - 10 MHz to 25 MHz: < -40 dBc
  - above 25 MHz: < -37 dBc

- **Total harmonic distortion (THD)**
  - up to 100 kHz: 0.04% (typ.)

#### Square

- **Frequency range**
  - R&S®HMF2525: 10 µHz to 25 MHz
  - R&S®HMF2550: 10 µHz to 50 MHz

- **Rise and fall times**
  - 8 ns, fixed

- **Overshoot**
  - < 3% (typ.)

- **Symmetry**
  - duty cycle: 50%, accuracy: ±1% + 5 ns

- **Jitter**
  - <1 ns rms (typ.)

#### Jitter

- < 500 ps rms (typ.)

#### Ramp and Triangle

- **Frequency range**
  - R&S®HMF2525: 10 µHz to 5 MHz
  - R&S®HMF2550: 10 µHz to 10 MHz

- **Ramp symmetry**
  - 0% to 100%, resolution 0.1%
  - 0% ≈ negative ramp, 100% ≈ positive ramp, 50% ≈ triangle

- **Linearity**
  - up to 250 kHz: < 0.1% (typ.)
  - above 250 kHz: < 2% (typ.)

#### Arbitrary

- **Frequency range**
  - R&S®HMF2525: 10 µHz to 12.5 MHz
  - R&S®HMF2550: 10 µHz to 25 MHz

- **Waveform length**
  - up to 256kSa

- **Sample rate**
  - 250 MSa/s

- **Amplitude resolution**
  - 14 bits

- **Internal non-volatile memory**
  - up to 4 MB

### Output Characteristics

- **Waveform output**
  - BNC socket (front panel)

- **Output impedance**
  - 50 Ω

- **Signal output**
  - on, off, inverted

- **Overload protection**
  - short-circuit-proof, max. ±15 V of external voltage

#### Amplitude

- **Range**
  - 5 mVpp to 10 Vpp (into 50 Ω)
  - 10 mVpp to 20 Vpp (open circuit)

- **Resolution**
  - 1 mV or dBm, selectable

- **Accuracy**
  - ±1% of setting ±1 mVpp at 1 kHz

#### DC Offset

- **Range**
  - ±5 mV to 5 V (into 50 Ω)
  - ±10 mV to 10 V (open circuit)

- **Resolution**
  - 1 mV (into 50 Ω)

- **Units**
  - V

- **Accuracy**
  - ±2% of offset setting ±0.5% of amplitude setting ±2 mV ±1 mV / MHz

#### Burst

- **Waveform signals**
  - all (except pulse)

- **Type**
  - continuous, counted, gated

- **Count**
  - 1 to 50,000 cycles, infinite

- **Start/Stop phase**
  - 0° to 360° (sine only)

- **Trigger sources**
  - manual, internal or external trigger, via interface

- **Internal trigger period**
  - 1 µs to 500 s

#### Sweep

- **Waveform signals**
  - all (except pulse)

- **Type**
  - linear, logarithmic

- **Direction**
  - up (fstart < fend), down (fstart > fend)

- **Sweep time**
  - 1 ms to 500 s, resolution 1 ms
## Technical Data

**Accessories supplied:**
- Line cord, Operating manual, Software

**Recommended accessories:**
- R&S®H0732: Dual-Interface Ethernet/USB
- R&S®H0740: Interface IEEE-488 (GPIB), galvanically isolated
- R&S®H220: Adapter, BNC to 4mm banana
- R&S®H244: Attenuators 50 Ω (3/6/10/20 dB)
- R&S®H242: 19” Rackmount kit 2RU
- R&S®H272: IEEE-488 (GPIB) Cable 2m

### Modulation

<table>
<thead>
<tr>
<th>Modulation types</th>
<th>Waveform carrier</th>
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<tbody>
<tr>
<td>AM, FM, PM, FSK, PWM</td>
<td>sine, square (50 %), ramp (pos., neg.), triangle (50 %), noise (white, pink), cardinal sine, exponential (rise, fall), arbitrary up to 4,096 points</td>
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**Internal modulation frequency**
- 10 MHz to 50 kHz

**Amplitude modulation (AM)**
- Depth: 0% to 100%
- Source: internal (basic waveforms, arbitrary), external

**Frequency modulation (FM)**
- Deviation: 10 μHz to 10 MHz
- Source: internal (basic waveforms, arbitrary), external

**Phase modulation (PM)**
- Deviation: -180° to +180°
- Source: internal (basic waveforms, arbitrary), external

**Frequency shift key modulation (FSK)**
- Duty cycle: 0% to 100%
- Rate: 0 Hz to 250 kHz
- Hop: any frequency within the carrier signal’s range
- Source: internal (basic waveforms, arbitrary), external

**Pulse width modulation (PWM)**
- Deviation: 0% to 49.99% of pulse width
- Source: internal (basic waveforms, arbitrary), external

### Connectors

**External trigger / gate**
- BNC socket (front panel)
- Impedance: 5 kΩ || 100 pF
- Polarity: positive, negative slope
- Level: TTL, protected up to ±30 V
- Pulse width: min. 100 ns

**Trigger output**
- BNC socket (front panel)
- Impedance: 50 Ω
- Level: TTL, positive slope
- Frequency: max. 10 MHz

**Modulation input**
- BNC socket (rear panel)
- Impedance: 10 kΩ
- Voltage level: max. ±5 V full-scale
- Bandwidth (-3 dB): DC to 50 kHz (250 kSa/s sampling rate)

**Frequency reference input**
- BNC socket (rear panel)
- Impedance: 1 kΩ
- Frequency range: 10 MHz ± 100 kHz
- Level: TTL

**Frequency reference output**
- BNC socket (rear panel)
- Impedance: 50 Ω

### Interfaces

**for mass storage**
- 1x USB-host (type A), FAT16/32

**for remote control**
- R&S®H0720 dual interface: RS-232 / USB-device (type B)

**Optional interfaces**
- R&S®H0732 dual interface: Ethernet (RJ45) / USB-device (type B)
- R&S®H0740 interface: IEEE-488 (GPIB)

**Save and recall**
- on internal file system (up to 4 MB) or external USB memory (max. 4 GB)

### General Characteristics

**Display**
- screen size / type: 8.9 cm (3.5”) QVGA color TFT
- resolution: 320 x 240
- backlight: LED

**Power supply**
- AC supply: 105 V to 253 V, 50 Hz to 60 Hz, CAT II
- power consumption: 30 W (typ.)

**Sweep output**
- Connector: BNC socket (rear panel)
- Impedance: 200 Ω
- Level: 0 V to 5 V ramp synchronous with frequency sweeps

### Frequency
- 10 MHz (norm.)
- Level: 1.65 Vpp (into 50 Ω)

### Sweep output
- Connector: BNC socket (rear panel)
- Impedance: 200 Ω
- Level: 0 V to 5 V ramp synchronous with frequency sweeps

### Interfacing
- connector: BNC socket (front panel)
- Impedance: 50 Ω
- Level: TTL, positive slope
- Frequency max.: 10 MHz

### Mechanical data
- dimensions (W x H x D): 265 x 75 x 365 mm
- weight: 3.6 kg
- All specifications at 23°C after 30 minutes warm-up