

HMF2525

HMF2550

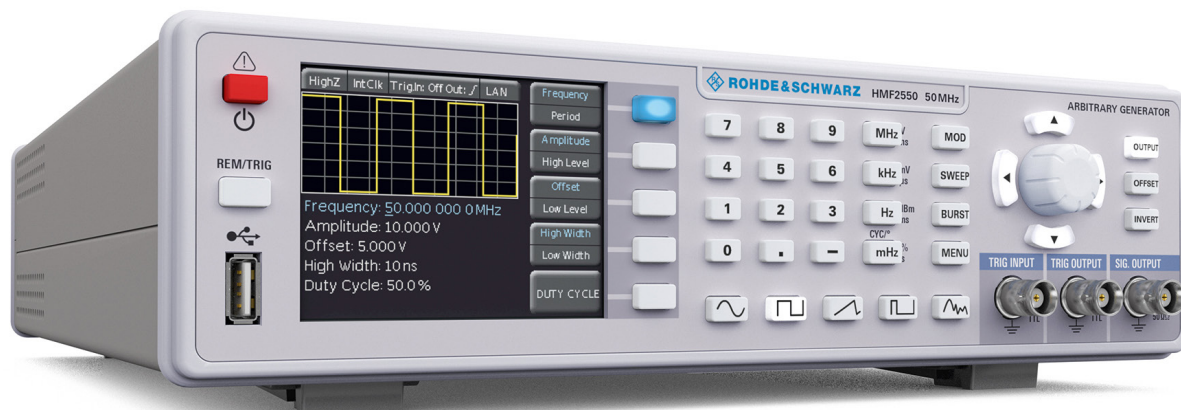
Arbitrary Function Generator

Technical Data



海洋儀器

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Key facts

- Frequency range: 10 μ Hz to 25 MHz [50 MHz]
- Triangle and ramp signal up to 10 MHz
- Pulse: frequency range from 100 μ Hz to 12.5 MHz [25 MHz]
- Output voltage: 5 mV_{PP} to 10 V_{PP} (into 50 Ω load)
- DC offset: $\pm$ 5 mV to 5 V
- Output impedance steplessly adaptable (1 Ω to 10 k Ω)
- 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, $\pm$ 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 50Ω load

Models

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

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 1×10^{-6} (+18°C to +28°C)

Aging (after one year) $\pm 1 \times 10^{-6}$ (+25°C)

Waveform Characteristics

Sine

Frequency range

R&S®HMF2525	10μHz to 25MHz
R&S®HMF2550	10μHz to 50MHz

Amplitude flatness

up to 10MHz	±0.15dB
10MHz to 25MHz	±0.2dB
above 25MHz	±0.4dB

Harmonic distortion

up to 100kHz	< -70dBc
100kHz to 10MHz	< -55dBc
10MHz to 25MHz	< -40dBc
above 25MHz	< -37dBc

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

Non-harmonic spurious

up to 1MHz	< -70dBc
above 1MHz	< -70dBc, increasing +6dB / decade

Phase noise (SSB)

10kHz Offset	-115dBc / Hz (typ.)
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Square

Frequency range

R&S®HMF2525	10μHz to 25MHz
R&S®HMF2550	10μHz to 50MHz

Rise and fall times 8ns, fixed

Overshoot < 3% (typ.)

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

Jitter < 1ns_{rms} (typ.)

Pulse

Frequency range

R&S®HMF2525	100μHz to 12.5MHz
R&S®HMF2550	100μHz to 25MHz

Rise and fall times 8ns to 500ns, variable

Overshoot < 3% (typ.)

Duty cycle 0.01% to 99.99%

Pulse width min. 15ns, resolution 5ns

Jitter < 500ps_{rms} (typ.)

Ramp and Triangle

Frequency range

R&S®HMF2525	10μHz to 5MHz
R&S®HMF2550	10μHz to 10MHz

Ramp symmetry 0% to 100%, resolution 0.1%
(0% $\triangleq$ negative ramp,
100% $\triangleq$ positive ramp, 50% $\triangleq$ triangle)

Linearity

up to 250kHz	< 0.1% (typ.)
above 250kHz	< 2% (typ.)

Arbitrary

Frequency range

R&S®HMF2525	100μHz to 12.5MHz
R&S®HMF2550	100μHz to 25MHz

Waveform length up to 256kSa

Sample rate 250MSa/s

Amplitude resolution 14bits

Internal non-volatile memory up to 4MB

Output Characteristics

Waveform output BNC socket (front panel)

Output impedance 50Ω

Signal output on, off, inverted

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

Amplitude

Range 5mV_{PP} to 10V_{PP} (into 50Ω)
10mV_{PP} to 20V_{PP} (open circuit)

Resolution 1mV

Units V_{PP} or dBm, selectable

Accuracy ±1% of setting ±1mV_{PP} at 1kHz

DC Offset

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

Resolution 1mV (into 50Ω)

Units V

Accuracy ±2% of offset setting ±0.5% of
amplitude setting ±2mV ±1mV / 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 1μs to 500s

Sweep

Waveform signals all (except pulse)

Type linear, logarithmic

Direction up ($f_{\text{start}} < f_{\text{stop}}$)
down ($f_{\text{start}} > f_{\text{stop}}$)

Sweep time 1ms to 500s, resolution 1ms

Trigger sources	immediate (continous), internal, external (positive or negative slope)
Marker	adjustable to any frequency between f_{start} and f_{stop}
Modulation	
Modulation types	AM, FM, PM, FSK, PWM
Waveform carrier	all (except pulse)
Internal modulation (waveform)	sine, square (50%), ramp (pos., neg.), triangle (50%), noise (white, pink), cardinal sine, exponential (rise, fall), arbitrary up to 4,096 points
Internal modulation frequency	10 μ Hz to 50 kHz
External modulation bandwidth (-3dB)	DC to 50 kHz (250 kSa/s sampling rate)
Amplitude modulation (AM)	
Depth	0% to 100%
Source	internal (basic waveforms, arbitrary), external
Frequency modulation (FM)	
Deviation	10 μ Hz 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	
Connector	BNC socket (front panel)
Impedance	5 k Ω 100 pF
Polarity	positive, negative slope
Level	TTL, protected up to $\pm$ 30 V
Pulse width	min. 100 ns
Trigger output	
Connector	BNC socket (front panel)
Impedance	50 Ω
Level	TTL, positive slope
Frequency	max. 10 MHz
Modulation input	
Connector	BNC socket (rear panel)
Impedance	10 k Ω
Voltage level	max. $\pm$ 5 V full-scale
Bandwidth (-3dB)	DC to 50 kHz (250 kSa/s sampling rate)
Frequency reference input	
Connector	BNC socket (rear panel)
Impedance	1 k Ω
Frequency range	10 MHz $\pm$ 100 kHz
Level	TTL
Frequency reference output	
Connector	BNC socket (rear panel)
Impedance	50 Ω

Frequency	10 MHz (norm.)
Level	1.65 V _{pp} (into 50 Ω)
Sweep output	
Connector	BNC socket (rear panel)
Impedance	200 Ω
Level	0 V to 5 V ramp synchronous with frequency sweeps
Interfaces	
for mass storage	1x USB-host (type A), FAT16/32
for remote control	R&S®HO720 dual interface: RS-232 / USB-device (type B)
Optional interfaces	R&S®HO732 dual interface: Ethernet (RJ45) / USB-device (type B) R&S®HO740 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	8.9cm (3.5") QVGA color TFT
resolution	320 x 240
backlight	LED
Real-time clock (RTC)	date and time
Power supply	
AC supply	105 V to 253 V, 50 Hz to 60 Hz, CAT II
power consumption	30 W (typ.)
Safety	safety class I (EN61010-1)
Temperature	
operating temperature range	+5°C to +40°C
storage temperature range	-20°C to +70°C
Rel. humidity	5% to 80% (without condensation)
Mechanical data	
dimensions (W x H x D)	285 x 75 x 365 mm
weight	3.6 kg
All specifiactions at 23°C after 30 minutes warm-up	

Accessories supplied:

Line cord, Operating manual, Software

Recommended accessories:

R&S®HO732	Dual-Interface Ethernet/USB
R&S®HO740	Interface IEEE-488 (GPIB), galvanically isolated
R&S®HZ20	Adapter, BNC to 4mm banana
R&S®HZ24	Attenuators 50 Ω (3/6/10/20 dB)
R&S®HZ42	19" Rackmount kit 2RU
R&S®HZ72	IEEE-488 (GPIB) Cable 2m