RIGOL


# DG5000 series

## Function/Arbitrary Waveform Generator

DG5000 is a multifunctional generator that combines many functions in one, including Function Generator, Arbitrary Waveform Generator, Pulse Generator, IQ Baseband Source/IQ IF Source, Frequency Hopping Source (optional) and Pattern Generator (optional). It provides single and dual-channel models. The model is a kind of truly dual-channel signal generator, as the functions of its two channels are equivalent and its phase deviation between the two channels is precisely adjustable.

DG5000, adopting the Direct Digital Synthesizer (DDS) technology, can provide stable, precise, pure and low distortion signal. The user-friendly interface design and panel layout bring users exceptional experience. Besides, the remote control of the generator can be easily done through different standard configuration interfaces, which provides more solutions for users.

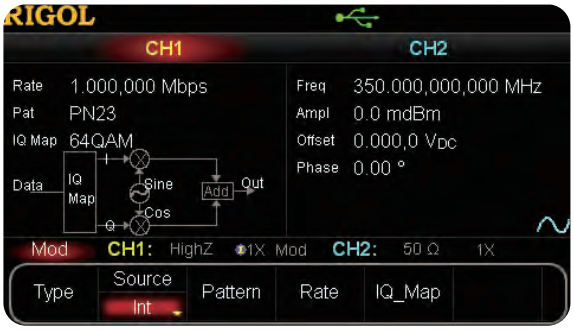
**RIGOL** TECHNOLOGIES CO., LTD.

# DG5000 Series Function/Arbitrary Waveform Generator

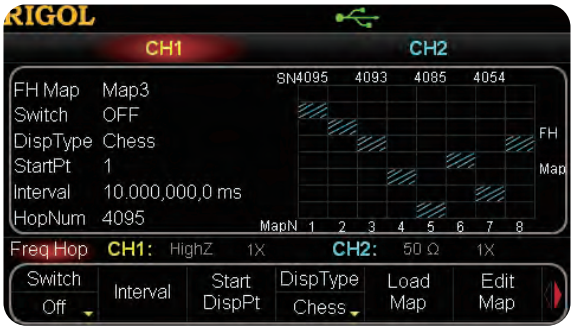

## Features and Benefits

- 4.3 inches, 16M true color TFT LCD.
- 350 MHz, 250 MHz, or 100 MHz or 70 MHz maximum sine output frequency, 1 GSa/s sample rate, 14 bits resolution.
- Single/dual-channel models. The dual-channel model supports frequency and phase coupling.
- The channels of the dual-channel model are isolated from each other.
- The 16+2 channels digital output module (optional) together with the analog channel can rebuild the more mixed signals in daily practice.
- Support an external power amplifier (optional) that can be configured online.
- Support frequency hopping(optional) with hopping interval up to 80 ns and arbitrary editing frequency hopping patterns.
- 14 standard waveform functions: Sine,Square,Ramp,Pules,Noise,Sinc,Exponential Rise,Exponential Fall,ECG,Gauss,Haversune, Lorentz,Dual Tones and DC.
- Rise/Fall Time of the Pulse could be adjusted separately.
- Enable to edit arbitrary waveform up to 512 kpts and output arbitrary waveforms up to 128 Mpts.
- Support AM,FM,PM,ASK,FSK,PSK and PWM modulations.
- Support user-defined IQ vector signal modulation and IQ baseband/IF source output.
- Support Frequency Sweep and Burst output.
- Abundant I/O: waveform output, synchronous signal output, modulation input, 10 MHz clock input/output, trigger input/output.
- Enable to store and recall waveform data and instrument state, and support versatile file types. Standard configuration with 1 GBytes flash memory.
- Plenty of standard interfaces: double USB Hosts, USB Device, LAN, and GPIB (IEEE-488.2).
- Seamlessly interconnected with **RIGOL** USB-TMC digital oscilloscopes for loading and reappearing waveforms.
- Support USB flash device storage for FAT files.
- Support PictBridge printer.
- Provide security lock hole.
- Support remote control through 10/100M Ethernet web.
- Conform to LXI-C instrument standards (Version 1.2).
- Provide Chinese and English built-in help and input methods.
- Provide powerful waveform editing PC software.

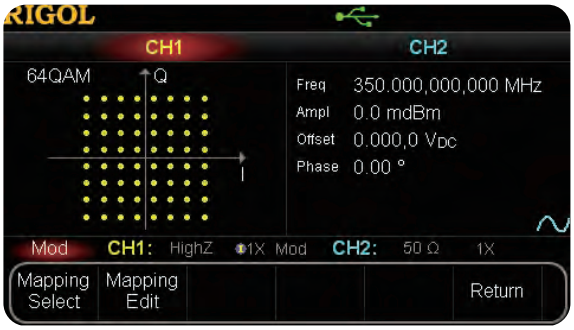
# Advanced functions




IQ Modulation

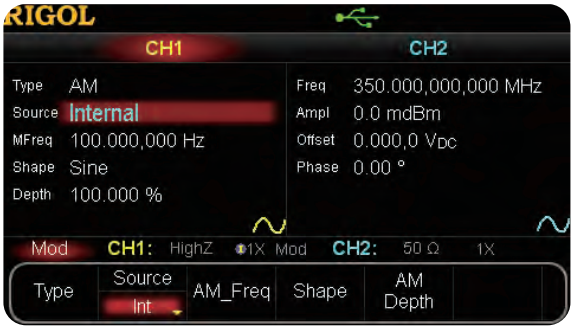



Frequency Hopping



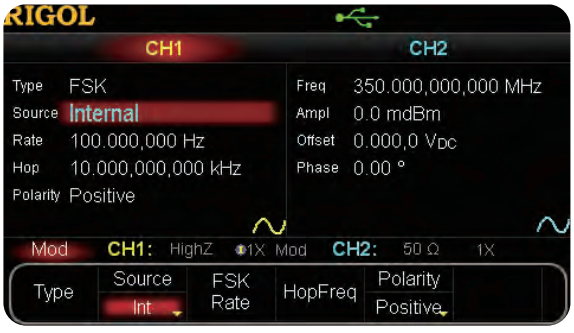

IQ Mapping Selection


IQ Mapping Edit

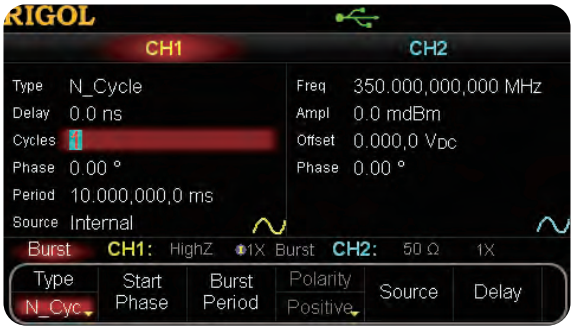



AM

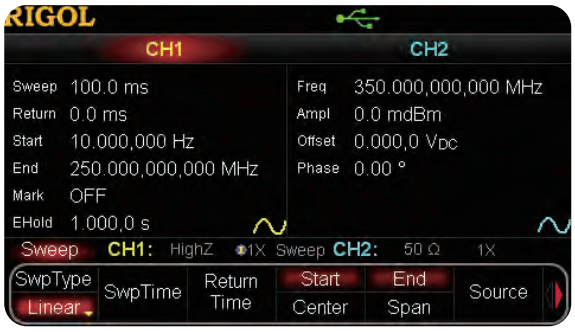

PWM



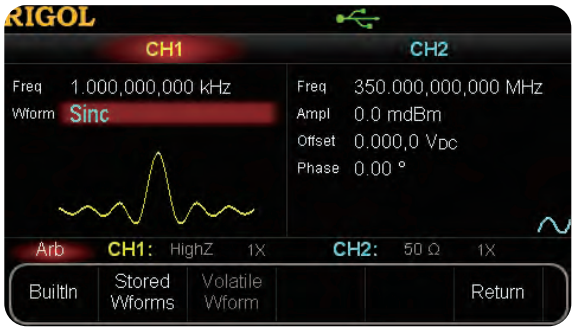

FSK




Burst




Sweep




ARB

## Specification

All the specifications can be guaranteed if the following two conditions are met unless where noted.
- The generator is within the calibration and has performed self-calibration.
- The generator has been working continuously for 30 minutes at specified temperature (18°C ~ 28°C).

All the specifications are guaranteed unless those marked with "typical".

| Model | DG5352<br>DG5351 | DG5252<br>DG5251 | DG5102<br>DG5101 | DG5072<br>DG5071 |
|---|---|---|---|---|
| Channel | 2/1 | 2/1 | 2/1 | 2/1 |
| Maximum Frequency | 350 MHz | 250 MHz | 100 MHz | 70 MHz |
| Sample Rate | 1 GSa/s | | | |
| **Waveforms** | | | | |
| Standard Waveforms | Sine, Square, Ramp, Pulse, Noise | | | |
| Arbitrary Waveforms | Sinc, Exponential Rise, Exponential Fall, ECG, Gauss, HaverSine, Lorentz, Dual-Tone, DC | | | |

| **Frequency Characteristics** | | | | |
|---|---|---|---|---|
| Sine | 1 μHz to 350 MHz | 1 μHz to 250 MHz | 1 μHz to 100 MHz | 1 μHz to 70 MHz |
| Square | 1 μHz to 120 MHz | 1 μHz to 120 MHz | 1 μHz to 100 MHz | 1 μHz to 70 MHz |
| Ramp | 1 μHz to 5 MHz | 1 μHz to 5 MHz | 1 μHz to 3 MHz | 1 μHz to 3 MHz |
| Pulse | 1 μHz to 50 MHz | 1 μHz to 50 MHz | 1 μHz to 50 MHz | 1 μHz to 50 MHz |
| Noise | 250 MHz Bandwidth | | | |
| Arb | 1 μHz to 50 MHz | 1 μHz to 50 MHz | 1 μHz to 50 MHz | 1 μHz to 50 MHz |
| Resolution | 1 μHz | | | |
| Accuracy | ±1 ppm, 18 °C to 28 °C | | | |

| **Sine Wave Spectrum Purity** | | | | |
|---|---|---|---|---|
| Harmonic Distortion | Typical (0 dBm)<br>≤100MHz: <-40dBc<br>>100MHz: <-35dBc | Typical (0 dBm)<br>≤100MHz: <-40dBc<br>>100MHz: <-35dBc | Typical (0 dBm)<br>≤100MHz: <-40dBc | Typical (0 dBm) ≤<br>70MHz: <-40dBc |
| Total Harmonic Distortion | <0.5% (10 Hz to 20 kHz, 0 dBm) | | | |
| Spurious (non-harmonic) | Typical (0 dBm)<br>≤100MHz: <-50dBc<br>>100MHz:<br>-50dBc+6dBc/octave | Typical (0 dBm)<br>≤100MHz: <-50dBc<br>>100MHz:<br>-50dBc+6dBc/octave | Typical (0 dBm) ≤<br>100MHz: <-50dBc | ypical (0 dBm) ≤<br>70MHz: <-50dBc |
| Phase Noise | Typical (0 dBm, 10 kHz deviation) 10 MHz: <-110 dBc | | | |

| **Signal Characteristics** | | | | |
|---|---|---|---|---|
| Square | | | | |
| Rise/Fall Time | Typical Value (1Vpp)<br>< 2.5 ns | Typical Value (1Vpp)<br>< 2.5 ns | Typical Value (1Vpp)<br>< 3 ns | Typical Value (1Vpp)<br><4 ns |
| Overshoot | Typical Value (1Vpp)<br>< 5% | | | |
| Duty Cycle | ≤ 10 MHz: 20.0% to 80.0%<br>10 MHz to 40 MHz: 40.0% to 60.0%<br>> 40 MHz: 50.0% (fixed) | | | |
| Non-symmetry | 1% of period + 5 ns | | | |
| Jitter (rms) | Typical Value (1Vpp)<br>≤ 30 MHz: 10ppm+500 ps<br>> 30 MHz: 500 ps | | | |

| Ramp | | | | |
|---|---|---|---|---|
| Linearity | ≤ 0.5% of peak output | | | |
| Symmetry | 0% to 100% | | | |
| Pulse | | | | |
| Period | 20 ns to 1000000 s | | | |
| Pulse Width | 4 ns to 1000000 s | | | |
| Leading/Trailing Edge Time | 2.5 ns to 1 ms | 2.5 ns to 1 ms | 3 ns to 1 ms | 4 ns to 1 ms |
| Overshoot | <5% | | | |
| Jitter (rms) | Typical Value (1Vpp) | | | |
| | 10 ppm+500 ps | | | |

| Arb | |
|---|---|
| Waveform Length | Normal Mode: 2 to 16Mpts |
| | Play Mode : 2 to 128Mpts |
| Vertical Resolution | 14 bits |
| Mode | Normal Mode, Play Mode |
| Sample Rate | Normal Mode (Waveform Length is from 2 to 16Mpts): 1G Sa/s (fixed) |
| | Play Mode (Waveform Length is from 2 to 128Mpts): ≤1G Sa/s (variable) |
| Minimum Rise/Fall Time | Typical Value (1Vpp) |
| | ≤3 ns |
| Jitter (rms) | 3 ns |
| Interpolation Method | Close, Linear, Sinc |
| Edit Method | Edit Point, Edit Block |
| Non-Volatile Memory | 1G Bytes |

| Output Characteristics | | | | |
|---|---|---|---|---|
| Amplitude (into 50 Ω) | | | | |
| Range | ≤ 100MHz: 5mVpp to 10Vpp | ≤100MHz: 5mVpp to 10Vpp | 5mVpp to 10Vpp | 5mVpp to 10Vpp |
| | ≤ 250MHz: 5mVpp to 5Vpp | ≤250MHz: 5mVpp to 5Vpp | | |
| | ≤ 350MHz: 5mVpp to 2Vpp | | | |
| Accuracy | Typical (1kHz Sine, 0V Deviation, >10mVpp, Auto) | | | |
| | ± 1% of setting ± 1mVpp | | | |
| Amplitude | <10MHz: ±0.1dB | <10MHz: ±0.1dB | <10MHz: ±0.1dB | <10MHz: ±0.1dB |
| Flatness | 10MHz to 60MHz: ±0.2dB | 10MHz to 60MHz: ±0.2dB | 10MHz to 60MHz: ±0.2dB | 10MHz to 60MHz: ±0.2dB |
| (relative to 100 | 60MHz to 100MHz: ±0.4dB | 60MHz to 100MHz: ±0.4dB | 60MHz to 100MHz: ±0.4dB | 60MHz to 70MHz: ±0.4dB |
| kHz, 1.25Vpp Sine | 100MHz to 250MHz: ±1.0dB | 100MHz to 250MHz: ±1.0dB | | |
| wave, | >250MHz: ±1.5dB | | | |
| 50Ω) | | | | |
| Units | Vpp, Vrms, dBm, High Level, Low Level | | | |
| Resolution | 0.1 mV or 4 digits | | | |

| Offset (into 50 Ω) | |
|---|---|
| Range | ±5 Vpk ac + dc |
| Accuracy | 1% of setting + 5mV + 0.5% of amplitude |
| Waveform Output | |
| Impedance | 50 Ω (typical) |
| Isolation | 42 Vpk max. to Earth |
| Protection | Over-temperature protected, Short-circuit protected, Overload relay automatically disables main output |

| FH Characteristics | | | | |
|---|---|---|---|---|
| FH Bandwidth | 1.5 MHz to 250 MHz | 1.5 MHz to 250 MHz | 1.5 MHz to 100 MHz | 1.5 MHz to 70 MHz |
| FH Rate | 1 Hop/s to 12.5M Hop/s | | | |
| Frequency Point Count | 4096 | | | |
| Sequence Length | 4096 | | | |

| Modulation Characteristics | |
|---|---|
| Modulation Types | AM, FM, PM, ASK, FSK, PSK, PWM, IQ |

| AM | |
|---|---|
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Sine, Square, Ramp, Noise, Arb (2 mHz to 50 kHz) |
| Depth | 0% to 120% |

| FM | |
|---|---|
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Sine, Square, Ramp, Noise, Arb (2 mHz to 50 kHz) |

| PM | |
|---|---|
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Sine, Square, Ramp, Noise, Arb (2 mHz to 50 kHz) |
| Phase Deviation | 0° to 360° |

| ASK | |
|---|---|
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Square with 50% duty cycle (2 mHz to 1 MHz) |

| FSK | |
|---|---|
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Square with 50% duty cycle (2 mHz to 1 MHz) |

| PSK | |
|---|---|
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Square with 50% duty cycle (2 mHz to 1 MHz) |

| PWM | |
|---|---|
| Carrier Waveform | Pulse |
| Source | Internal/External |
| Modulating Waveforms | Sine, Square, Ramp, Noise, Arb (2 mHz to 50 kHz) |
| Width Deviation | 0% to 100% of Pulse Width |

| IQ | | | | |
|---|---|---|---|---|
| Carrier Waveform | Sine (max. 200 MHz) | Sine (max. 200 MHz) | Sine (max. 100 MHz) | Sine (max. 70 MHz) |
| Source | Internal/External | | | |
| Code Pattern | PN Sequence, 4 bits code pattern, User | | | |
| IQ Mapping | 4QAM, 8QAM, 16QAM, 32QAM, 64QAM, BPSK, QPSK, OQPSK, 8PSK, 16PSK, User | | | |
| Code Rate | 1 bps to 1 M bps | | | |

| External Modulatio n Input | |
|---|---|
| Input Range | ±5 Vac |
| Input Bandwidth | 50 kHz |
| Input Impedance | 10 kΩ |

| Burst Characteristics | | | | |
|---|---|---|---|---|
| Carrier Waveforms | Sine, Square, Ramp, Pulse, Noise, Arb (except DC) | | | |
| Carrier Frequency | 1 μHz to 120 MHz | 1 μHz to 120 | 1 μHz to 100 MHz | 1 μHz to 70 MHz |
| Burst Count | 1 to 1 000 000 or Infinite | | | |
| Start/Stop Phase | 0° to 360° | | | |
| Internal Period | 1 μs to 500 s | | | |
| Gated Source | External Trigger | | | |
| Trigger Source | Internal, External or Manual | | | |
| Trigger Delay | 0 ns to 85 s | | | |

| Sweep Characteristics | | | | |
|---|---|---|---|---|
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) | | | |
| Type | Linear, Log or Step | | | |
| Direction | Up or Down | | | |
| Start/Stop Frequency | 1 μHz to 250 MHz | 1 μHz to 250 MHz | 1 μHz to 100 MHz | 1 μHz to 70 MHz |
| Sweep Time | 1 ms to 300 s | | | |
| Hold/Return Time | 0 ms to 300 s | | | |
| Trigger Source | Internal, External or Manual | | | |
| Marker | Falling edge of Sync signal (programmable) | | | |

| Programming Time | | | |
|---|---|---|---|
| Configuration Time (typical) | | | |
| | USB2.0 | LAN | GPIB |
| Function Change | 500ms | 510ms | 510ms |
| Frequency Change | 50ms | 50ms | 50ms |
| Amplitude Change | 300ms | 310ms | 310ms |
| Select User Arb | 500ms | 510ms | 510ms |
| Arb Download Time (binary transfer) | | | |
| 1 Mpts/s | | | |
| Note: Download time do not include setup or output time. | | | |

| Trigger Characteristics | |
|---|---|
| Trigger Input | |
| Level | TTL-compatible |
| Slope | Rising or falling (selectable) |
| Pulse Width | > 50 ns |
| Latency | Sweep: <100 ns (typical) |
| | Burst: <300 ns (typical) |

| Trigger Output | |
|---|---|
| Level | TTL-compatible |
| Pulse Width | > 60 ns (typical) |
| Maximum Rate | 1MHz |

| Clock Reference | |
|---|---|
| Phase Offset | |
| Range | 0° to 360° |
| Resolution | 0.001°(arb waveform), |
| | 0.03° (other waveforms) |

| External Reference Input | |
|---|---|
| Lock Range | 10 MHz ± 50 Hz |
| Level | 80 mVpp to 10 Vpp |
| Lock Time | < 2 s |
| Internal Reference Output | |
| Frequency | 10 MHz ± 50 Hz |
| Level | 632 mVpp (0 dBm), nominal value |
| Sync Output | |
| Level | TTL-compatible |
| Impedance | 50 Ω, nominal value |

**General Specifications**

| | |
|---|---|
| Power | |
| Power Voltage | 100-127 V, 45-440Hz |
| | 100-240 V, 45-65Hz |
| Power Consumption | Less than 125 W |
| Fuse | 250V, T3A |
| Display | |
| Type | 4.3-inch TFT LCD |
| Resolution | 480 Horizontal × RGB × 272 Vertical Resolution |
| Color | 16 M color |
| Environment | |
| Temperature Range | Operating: 10℃ to 40℃ |
| | Non-Operating: -20℃ to 60℃ |
| Cooling Method | Cooling by fans compulsively |
| Humidity Range | Less than 35℃: ≤90% Relative Humidity (RH) |
| | 35℃ to 40℃: ≤60% Relative Humidity (RH) |
| Altitude | Operating: Less than 3,000 m eters |
| | Non-Operating: Less than 15,0 00 meters |
| Mechanical | |
| Dimensions (W×H×D) | 230 mm ×106 mm×501 mm |
| Weight | with no package: 4.3 kg |
| | with package: 5.84 kg |
| Interfaces | USB Host (2), USB Device, GPIB, LAN |
| IP Protection | IP2X |
| Calibration Interval | Recommend 1 year for standard interval |

## Order Information

| | Description | Order Number |
|---|---|---|
| Model | DG5352 (350 MHz, dual-channel) | DG5352 |
| | DG5351 (350 MHz, single-channel) | DG5351 |
| | DG5252 (250 MHz, dual-channel) | DG5252 |
| | DG5251 (250 MHz, single-channel) | DG5251 |
| | DG5102 (100 MHz, dual-channel) | DG5102 |
| | DG5101 (100 MHz, single-channel) | DG5101 |
| | DG5072 (70MHz, dual-channel) | DG5072 |
| | DG5071 (70MHz, single-channel) | DG5071 |
| Standard Accessories | Power Cord | - |
| | USB Cable | CB-USB |
| | BNC Cable (1 meter) | CB-BNC-BNC-1 |
| | Warranty Card | - |
| | SMB(F) to BNC(M) Cable (1 meter) | CB-SMB(F)-BNC(M)-1 |
| Options | Frequency Hopping Module | DG5-FH |
| | Power Amplifier | PA1011 |
| Optional Accessories | SMB(F) to SMB(F) Cable (1 meter) | CB-SMB(F)-SMB(F)-1 |
| | SMB(F) to BNC(F) Cable (1 meter) | CB-SMB(F)-BNC(F)-1 |
| | 40 dB Attenuator | ATT-40dB |
| | Rack Mount Kit | RMK-DG-5 |

**HEADQUARTER**

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