

DG4000 series Waveform Generators

DG4000 series is a multifunctional generator that combines many functions in one, including Function Generator, Arbitrary Waveform Generator, Pulse Generator, Harmonic Generator, Analog/Digital Modulator and Counter. All of the 3 models have two channels with complete equivalent functions and precisely phase adjustable, they are the real dual-channel signal generator.

DG4000, 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.

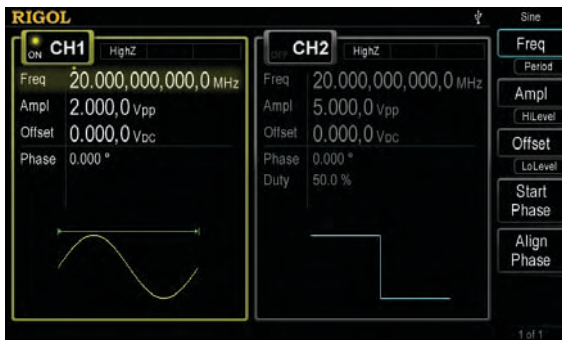
DG4000 Series Waveform Generators



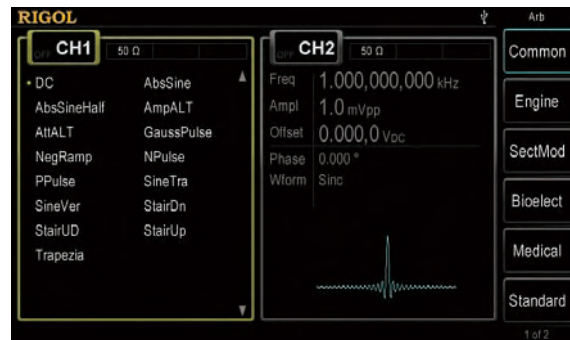
► Features and Benefits

- Standard 2 full functional channels
- 500 MSa/s sample rate, 14 bits vertical resolution
- 2ppm high frequency stability, -115dBc/Hz low phase noise
- Arbitrary waveform function with up to 150 built-in waveforms
- Versatile analog and digital modulation functions(AM,FM,PM,ASK,FSK,PSK,BPSK,QPSK,3FSK,4FSK,OSK,PWM)
- Build-in high precision 200MHz frequency counter
- Up to 16 orders customized Harmonic Generation function
- 7 inch color LCD(800X480 pixels)

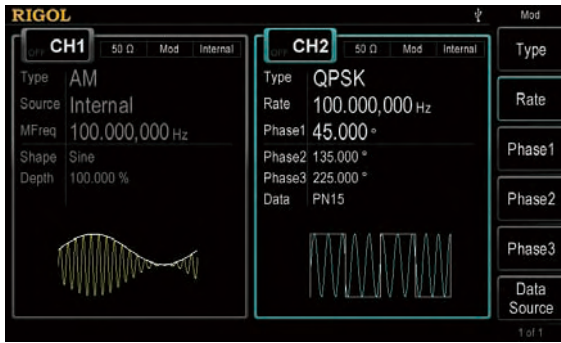
Advanced functions



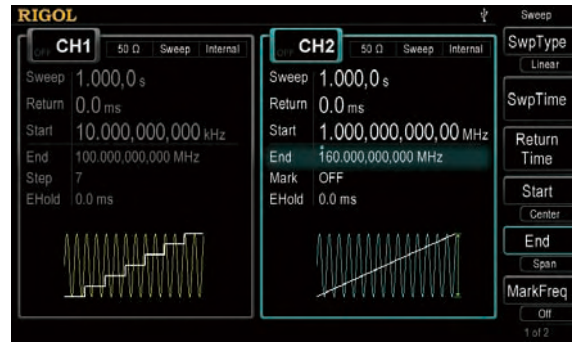
Standard identical 2 channels with frequency and phase coupling



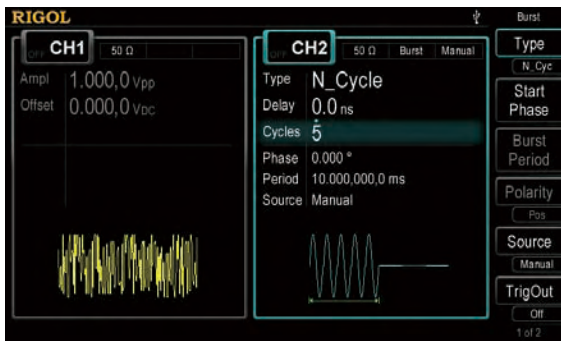
Arbitrary waveform function and built-in 150 waveforms



Abundant analog and digital modulation functions



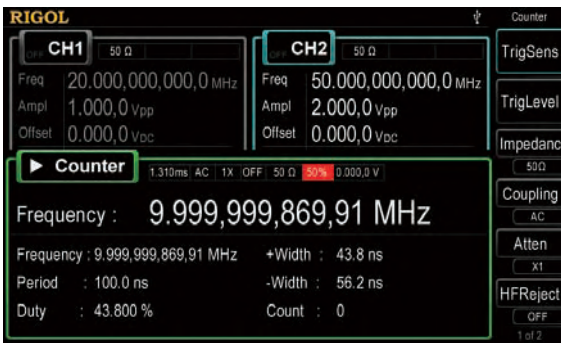
Various Sweep modes



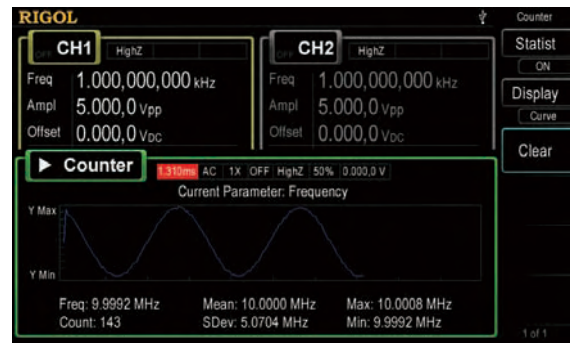
Noise and Burst modes



Up to 16 orders customized Harmonic generation function



Standard high resolution counter function



The statistic analysis function of counter

► 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 | DG4162 | DG4102 | DG4062 |
|-------------------|-----------|---------|--------|
| Channel | 2 | 2 | 2 |
| Maximum Frequency | 160MHz | 100 MHz | 60 MHz |
| Sample Rate | 500 MSa/s | | |

| Waveforms | |
|---------------------|--|
| Standard waveforms | Sine, Square, Ramp, Pulse, Noise, Harmonics |
| Arbitrary Waveforms | 150 kinds, including Sinc, Exponential Rise, Exponential Fall, ECG, Gauss, HaverSine, Lorentz, Dual-Tone, DC, etc. |

| Frequency Characteristics | | | |
|---------------------------|--------------------|------------------|------------------|
| Sine | 1 μHz to 160 MHz | 1 μHz to 100 MHz | 1 μHz to 60 MHz |
| Square | 1 μHz to 50 MHz | 1 μHz to 40 MHz | 1 μHz to 25 MHz |
| Ramp | 1 μHz to 4MHz | 1 μHz to 3 MHz | 1 μHz to 1 MHz |
| Pulse | 1 μHz to 40 MHz | 1 μHz to 25 MHz | 1 μHz to 15 MHz |
| Harmonic | 1 uHz to 80 MHz | 1 uHz to 50 MHz | 1 uHz to 30 MHz |
| Noise (-3dB) | 120 MHz Bandwidth | 80 MHz Bandwidth | 60 MHz Bandwidth |
| Arb | 1 μHz to 40 MHz | 1 μHz to 25 MHz | 1 μHz to 15 MHz |
| Resolution | 1 μHz | | |
| Accuracy | ±2ppm, 18 °C至28 °C | | |

| Sine Wave Spectrum Purity | |
|---------------------------|--|
| Harmonic Distortion | Typical (0dBm) DC-1MHz: <-60dBc 1MHz-10MHz: <-55dBc 10MHz-100MHz: <-50dBc 100MHz-160MHz: <-40dBc |
| Total Harmonic Distortion | <0.1%(10Hz-20kHz,0dBm) |
| Spurious (non-harmonic) | Typical(0dBm) ≤10MHz <-65dBc >10MHz <-65dBc+6dB/octave |
| Phase Noise | Typical (0 dBm, 10 kHz deviation) 10 MHz: ≤-115 dBc/Hz |

| Signal Characteristics | | | |
|----------------------------|--|--------------------|----------------------|
| Square | Typical (1Vpp) | | |
| Rise/Fall Time | <8 ns | <10 ns | <12 ns |
| Overshoot | Typical (1Vpp) <3% | | |
| Duty Cycle | ≤10 MHz: 20.0% to 80.0% 10 MHz-40 MHz: 40.0% to 60.0% >40 MHz: 50.0% (fixed) | | |
| Non-symmetry | TBD | | |
| Jitter (rms) | Typical (1Vpp) ≤5MHz 2ppm+500 ps > 5MHz 500ps | | |
| Ramp | Linearity: ≤1% of peak output (Typical, 1kHz, 1 VPP, 100% Symmetry) | | |
| Symmetry | 0% to 100% | | |
| Pulse | Typical (1Vpp) | | |
| Period | 25 ns to 1000000 s | 40 ns to 1000000 s | 66.7 ns to 1000000 s |
| Pulse Width | ≥10ns | ≥12ns | ≥18ns |
| Leading/Trailing Edge Time | ≥5ns | ≥7ns | ≥11ns |
| Overshoot | Typical (1Vpp) <3% | | |
| Jitter (rms) | Typical (1Vpp) ≤5MHz 2ppm+500 ps > 5MHz 500ps | | |

| Arb | | | |
|------------------------|---|--------------------|----------------------------------|
| Waveform Length | 16k points | | |
| Vertical Resolution | 14 bits | | |
| Sample Rate | 500M Sa/s | | |
| Minimum Rise/Fall Time | Typical (1Vpp) <5 ns | | |
| Jitter (rms) | Typical (1Vpp) ≤5MHz 2ppm+500 ps > 5MHz 500ps | Harmonic | Harmonic Order ≤16 |
| Interpolation Method | Close, Linear | Harmonic Type | Even, Odd, All, User |
| Edit Method | Edit Point, Edit Block | Harmonic Amplitude | can be set for all the harmonics |
| | | Harmonic Phase | can be set for all the harmonics |

| Output Characteristics | | | |
|--|---|---|---|
| Amplitude (into 50 Ω) | | | |
| Range | ≤20MHz: 1mVpp to 10Vpp ≤60MHz: 1mVpp to 5Vpp ≤120MHz: 1mVpp to 2.5Vpp ≤160MHz: 1mVpp to 1Vpp | ≤20MHz: 1mVpp to 10Vpp ≤60MHz: 1mVpp to 5Vpp ≤100MHz: 1mVpp to 2.5Vpp | ≤20MHz: 1mVpp to 10Vpp ≤60MHz: 1mVpp to 5Vpp |
| Accuracy | Typical (1kHz Sine, 0V Offset, >10mVpp, Auto) ± 1% of setting ± 2mVpp | | |
| Amplitude Flatness (relative to 100 kHz, 1.25Vpp Sine wave, 50Ω) | Typica ≤10MHz: ±0.1dB ≤60MHz: ±0.2dB ≤100MHz: ±0.4dB ≤160MHz: ±0.8dB | Typica ≤10MHz: ±0.1dB ≤60MHz: ±0.2dB ≤100MHz: ±0.4dB | Typica ≤10MHz: ±0.1dB ≤60MHz: ±0.2dB |
| Units | Vpp, Vrms, dBm | | |
| Resolution | 1 mV or 3 bit | | |
| Offset (into 50 Ω) | | | |
| Range | ±5 Vpk ac + dc | | |
| Accuracy | 1% of setting + 5mV + 0.5% of amplitude | | |
| Waveform Output | | | |
| Impedance | 50 Ω (Typical) | | |
| Protection | Short-circuit protection, automatically disables main output when overload relay | | |

| Modulation Characteristics | |
|----------------------------|---|
| Modulation Types | AM, FM, PM, ASK, FSK, PSK, BPSK, QPSK, 3FSK, 4FSK, OSK, PWM |
| AM | |
| Carrier Waveforms | Sine, Square, Ramp, Noise, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Sine, Square, Ramp, Noise, Arb |
| Depth | 0% to 120% |
| Modulating Frequency | 2mHz ~ 50kHz |
| FM | |
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Sine, Square, Ramp, Noise, Arb |
| Modulating Frequency | 2mHz ~ 50kHz |
| PM | |
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Sine, Square, Ramp, Noise, Arb |
| Phase Deviation | 0° to 360° |
| Modulating Frequency | 2mHz ~ 50kHz |
| ASK | |
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Square with 50% duty cycle |
| Key Frequency | 2 mHz ~ 1 MHz |
| FSK | |
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal/External |
| Modulating Waveforms | Square with 50% duty cycle |
| Key Frequency | 2 mHz ~ 1 MHz |
| 3FSK | |
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal |
| Modulating Waveforms | Square with 50% duty cycle |
| Key Frequency | 2 mHz ~ 1 MHz |
| 4FSK | |
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) |
| Source | Internal |

| | | | |
|---|--|----------------------|--------------------|
| Modulating Waveforms | Square with 50% duty cycle | | |
| Key Frequency | 2 MHz ~ 1 MHz | | |
| PSK | | | |
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) | | |
| Source | Internal/External | | |
| Modulating Waveforms | Square with 50% duty cycle | | |
| Key Frequency | 2 MHz ~ 1 MHz | | |
| BPSK | | | |
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) | | |
| Source | Internal | | |
| Modulating Waveforms | Square with 50% duty cycle | | |
| Key Frequency | 2 MHz ~ 1 MHz | | |
| QPSK | | | |
| Carrier Waveforms | Sine, Square, Ramp, Arb (except DC) | | |
| Source | Internal | | |
| Modulating Waveforms | Square with 50% duty cycle | | |
| Key Frequency | 2 MHz ~ 1 MHz | | |
| OSK | | | |
| Carrier Waveform | Sine | | |
| Source | Internal/External | | |
| Oscillation Time | 8ns ~ 200s | | |
| Key Frequency | 2 MHz ~ 1 MHz | | |
| PWM | | | |
| Carrier Waveform | Pulse | | |
| Source | Internal/External | | |
| Modulating Waveforms | Sine, Square, Ramp, Noise, Arb | | |
| Width Deviation | 0% to 100% of Pulse Width | | |
| Modulating Frequency | 2mHz ~ 50kHz | | |
| ExtTrig Input | | | |
| Input Range | 75mVRMS ~ ±2.5Vac+dc | | |
| Input Bandwidth | 5MHz | | |
| Input Impedance | 100Ω | | |
| Burst Characteristics | | | |
| Carrier Waveforms | Sine, Square, Ramp, Pulse, Noise, Arb (except DC) | | |
| Carrier Frequency | 2mHz to 100 MHz | 2mHz to 100 MHz | 2mHz to 60 MHz |
| Burst Count | 1 to 1 000 000 or Infinite | | |
| Start/Stop Phase | 0° to 360° | | |
| Internal Period | 2μs 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 160 MHz | 1 μHz to 100 MHz | 1 μHz to 60 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) | | |
| Counter Specifications | | | |
| Function | Frequency, Period, Positive/Negative Pulse Width, Duty Cycle | | |
| Freqcy Resolution | 6 digits/second (Gate Time =1s) | | |
| Freqcy Range | 1uHz to 200MHz | | |
| Period Range | 5ns to 16 days | | |
| Voltage Range and Sensitivity (Not modulation signal) | | | |
| DC Coupling | DC Offset Range | ±1.5VDC | Input Attenuation: |
| | 1uHZ ~ 100MHz | 50mVRMS ~ ±2.5Vac+dc | "closed" |

| | | | |
|------------------------------------|---------------------------|--|--------------------|
| | 100MHz~200MHz | 100mVRMS~±2.5Vac+dc | |
| AC Coupling | 1uHZ~100MHz | 50mVRMS~±2.5Vpp | |
| | 100MHz~200MHz | 100mVRMS~±2.5Vpp | |
| Pulse Width and Duty Cycle Measure | | | |
| Freqcy/Amplitude Range | 1uHZ~25MHz | 50mVRMS~±2.5Vac+dc | DC Coupling |
| Pulse Width | Minimum | ≥20ns | Input Attenuation: |
| | Resolution | 2ns | "closed" |
| Duty Cycle | Range (Display) | 0%~100% | |
| Input Characteristics | | | |
| Input Range | Brakdown Voltage | ±7Vac+dc (Attenuation: closed) | Impedance=1MΩ |
| | | ±70Vac+dc(Attenuation: open) | |
| | | 5Vrms | Impedance=50Ω |
| Input Adjustment | Attenuation | Open: "x10"; Closed: "x1" | |
| | Impedance | 50Ω | 1MΩ |
| | Coupling | AC | DC |
| | HF Reject | ON: input bandwidth=250KHz; OFF: input bandwidth=225MHz | |
| Input Trigger | Trigger Level Range | -2.5V to +2.5V | |
| | Trigger Sensitivity Range | 0% (140mV hysteresis voltage) to 100% (2mV hysteresis voltage) | |
| Gate Time | GateTime1 | 1.310ms | |
| | GateTime2 | 10.48ms | |
| | GateTime3 | 166.7ms | |
| | GateTime4 | 1.342s | |
| | GateTime5 | 10.73s | |
| | GataTime6 | >10s | |

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 | 0.03° |
| External Reference Input | |
| Lock Range | 10 MHz ± 50 Hz |
| Level | 250 mVpp to 5 Vpp |
| Lock Time | < 2 s |
| Impedance (Typical) | 1kΩ, AC coupling |

Internal Reference Output

| | |
|---------------------|-------------------|
| Frequency | 10 MHz ± 50 Hz |
| Level | 3.3Vpp |
| Impedance (Typical) | 50kΩ, AC coupling |

Sync Output

| | |
|-----------|---------------------|
| Level | TTL-compatible |
| Impedance | 50 Ω, nominal value |

General Specifications

| | |
|-------------------|---|
| Power | |
| Power Voltage | 100V~240V (45Hz~440Hz) |
| Power Consumption | Less than 50 W |
| Fuse | 250V, T2A |
| Display | |
| Type | 7-inch TFT LCD |
| Resolution | 800 Horizontal x RGB x 480 Vertical Resolution |
| Color | 16M color |
| Environment | |
| Temperature Range | Operating: 10 C to 40 C Non-Operating: -20 C to 60 C |
| Cooling Method | Cooling by fans compulsively |

| | |
|--|--|
| Humidity Range | Less than 35 C : ≤90% Relative Humidity (RH) 35 C to 40 C : ≤60% Relative Humidity (RH) |
| Altitude | Operating: Less than 3000 meters Non-Operating: Less than 15000 meters |
| Mechanical | |
| Dimensions (WxHxD) | 313 mm x160.7 mmx116.74mm |
| Weight | with no package: 3.2 kg with package: 4.5 kg |
| Interfaces | |
| USB Host (2), USB Device, LAN | |
| IP Protection | |
| IP2X | |
| Calibration Interval | |
| Recommend 1 year for standard interval | |

► Ordering Information

| Model | Description | Order Number |
|----------------------|---|--------------|
| | DG4162 (160 MHz, dual-channel) | DG4162 |
| | DG4102 (100 MHz, dual-channel) | DG4102 |
| | DG4062 (60 MHz, dual-channel) | DG4062 |
| Standard | Power Cord | - |
| Accessories | USB Cable | CB-USB |
| | BNC Cable (1 meter) | CB-BNC-BNC-1 |
| | Quick Guide (Hard Copy) | - |
| | Resource CD (including User's Guide and Application Software) | - |
| Optional Accessories | 40 dB Attenuator | ATT-40dB |
| | Rack Mount Kit | RMK-DG-4 |

RIGOL



DS1052E
50MHz Oscilloscope



DG1022 20MHz
Function/Arbitrary
Waveform Generator

Signal Analysis Package
Scope & Generator together below \$700

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