



DG4000 Series Function/Arbitrary Waveform Generator

- Maximum output frequency: 200MHz, 160MHz, 100MHz, 60MHz
- 500MSa/s sample rate, 14 bit vertical resolution
- Dual channel outputs with identical performance
- 2ppm high-frequency stability
- -115dBc/Hz low phase noise
- Versatile analog and digital modulation functions
- 150 built-in waveforms
- 7digits/s, 200MHz built-in Counter
- Harmonic generator that can generate up to 16th order of harmonic (Std.)
- Powerful waveform editing PC software
- Connectivity: USB Host & Device, LAN
- 7 inch LCD display (800 × 480)

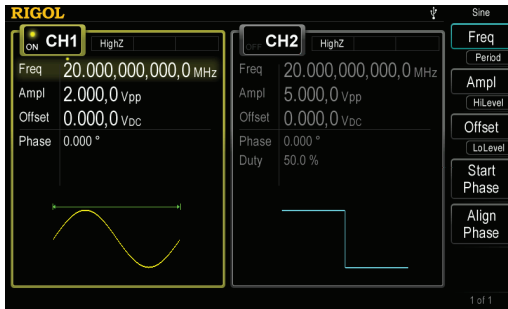
DG4000 series is a multifunctional generator that combines many functions in one, including Function Generator, Arbitrary Waveform Generator, Pulse Generator, Harmonic Generator, Analog/Digital Modulator and Counter. All the models have two channels with complete equivalent functions and precisely adjustable phases.

► Product Overview

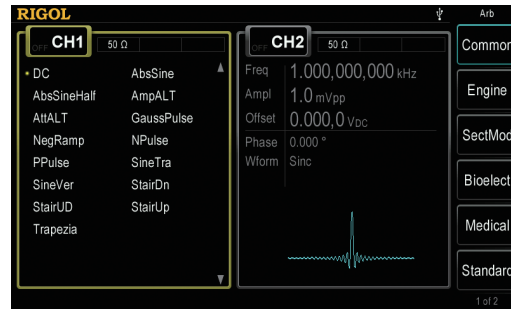


Product Dimensions: Width × Height × Depth = 313mm × 160.7mm × 116.7mm Weight: 3.2kg (Without Package)

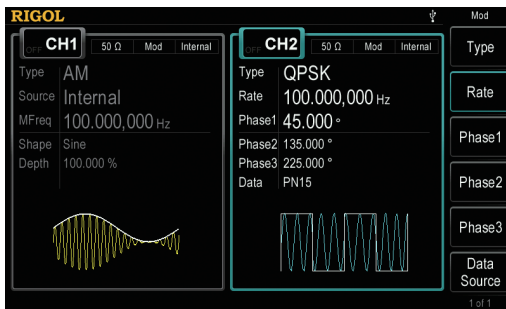
► Function Interfaces



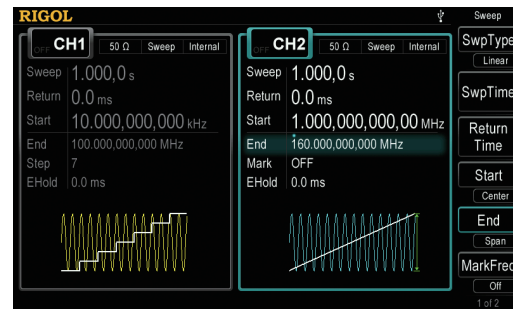
Two channels with complete equivalent functions and precisely adjustable phases (standard)



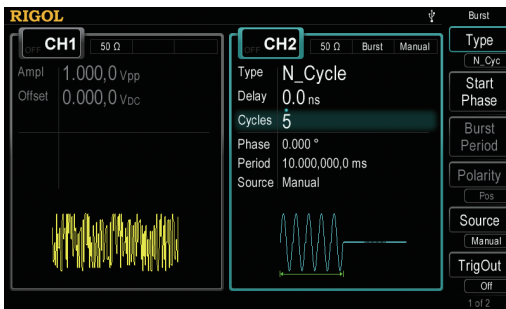
Standard arbitrary waveform function and 150 built-in arbitrary waveforms



Abundant analog and digital modulation functions



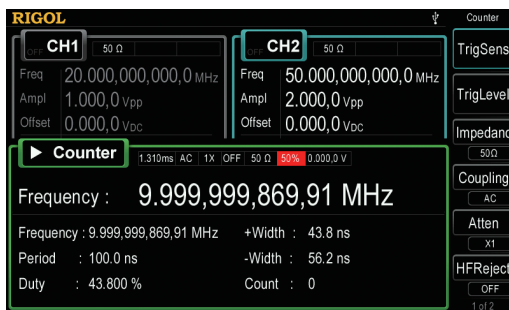
Various sweep modes



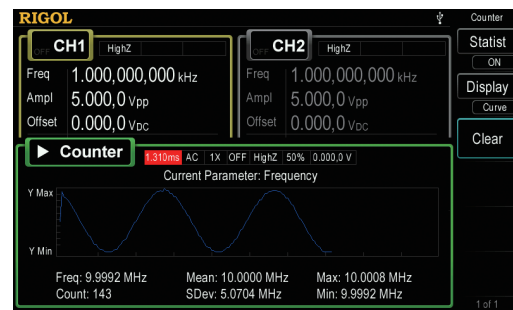
Noise and burst modes



Up to 16 orders customized harmonic generation function



Standard high resolution counter function



Statistic analysis function of counter

► Specifications

All the specifications can be guaranteed if the following two conditions are met unless where noted.

- The generator is within the calibration period and has performed self-calibration.
- The generator has been working continuously for at least 30 minutes under the specified temperature (18°C to 28°C).

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

| Model | DG4202 | DG4162 | DG4102 | DG4062 |
|--------------------|----------|--------|--------|--------|
| Number of Channels | 2 | 2 | 2 | 2 |
| Maximum Frequency | 200MHz | 160MHz | 100MHz | 60MHz |
| Sample Rate | 500MSa/s | | | |

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

| Frequency Characteristics | | | | |
|---------------------------|---------------------|------------------|-----------------|-----------------|
| Sine | 1µHz to 200MHz | 1µHz to 160MHz | 1µHz to 100MHz | 1µHz to 60MHz |
| Square | 1µHz to 60MHz | 1µHz to 50MHz | 1µHz to 40MHz | 1µHz to 25MHz |
| Ramp | 1µHz to 5MHz | 1µHz to 4MHz | 1µHz to 3MHz | 1µHz to 1MHz |
| Pulse | 1µHz to 50MHz | 1µHz to 40MHz | 1µHz to 25MHz | 1µHz to 15MHz |
| Harmonic | 1µHz to 100MHz | 1µHz to 80MHz | 1µHz to 50MHz | 1µHz to 30MHz |
| Noise (-3dB) | 120MHz bandwidth | 120MHz bandwidth | 80MHz bandwidth | 60MHz bandwidth |
| Arbitrary Waveform | 1µHz to 50MHz | 1µHz to 40MHz | 1µHz to 25MHz | 1µHz to 15MHz |
| Resolution | 1µHz | | | |
| Accuracy | ±2ppm, 18°C to 28°C | | | |

| Sine Wave Spectrum Purity | |
|---------------------------|--|
| Harmonic Distortion | Typical (0dBm) DC to 1MHz: <-60dBc 1MHz to 10MHz: <-55dBc 10MHz to 100MHz: <-50dBc 100MHz to 200MHz: <-40dBc |
| Total Harmonic Distortion | <0.1% (10Hz to 20kHz, 0dBm) |
| Spurious (non-harmonic) | Typical (0dBm) ≤10MHz: <-65dBc >10MHz: <-65dBc + 6dB/octave |
| Phase Noise | Typical (0dBm, 10kHz deviation) 10MHz: ≤-115dBc/Hz |

| Signal Characteristics | | | |
|------------------------|---|-------------------------|-------------------------|
| Square | | | |
| Rise/Fall Time | Typical (1Vpp) <8ns | Typical (1Vpp) <10ns | Typical (1Vpp) <12ns |
| Overshoot | Typical (100kHz, 1Vpp) <3% | | |
| Duty Cycle | ≤10MHz: 20.0% to 80.0% 10MHz to 40MHz: 40.0% to 60.0% >40MHz: 50.0% (fixed) | | |
| Non-symmetry | 1% of period + 5ns | | |
| Jitter (rms) | Typical (1MHz, 1Vpp, 50Ω) ≤5MHz: 2ppm + 500ps >5MHz: 500ps | | |
| Ramp | | | |

| | | | |
|-----------|---|--|--|
| Linearity | ≤1% of peak output (Typical, 1kHz, 1VPP, 100% Symmetry) | | |
| Symmetry | 0% to 100% | | |

| | | | |
|----------------------------|---|------------------|--------------------|
| Pulse | | | |
| Period | 25ns to 1000000s | 40ns to 1000000s | 66.7ns to 1000000s |
| Pulse Width | ≥10ns | ≥12ns | ≥18ns |
| Leading/Trailing Edge Time | ≥5ns | ≥7ns | ≥11ns |
| Overshoot | Typical (1Vpp) <3% | | |
| Jitter (rms) | Typical (1Vpp) ≤5MHz: 2ppm + 500ps >5MHz: 500ps | | |

| | |
|------------------------|---|
| Arb | |
| Waveform Length | 16k points |
| Vertical Resolution | 14bits |
| Sample Rate | 500MSa/s |
| Minimum Rise/Fall Time | Typical (1Vpp) <5ns |
| Jitter (rms) | Typical (1Vpp) ≤5MHz: 2ppm + 500ps >5MHz: 500ps |
| Interpolation Method | Off, Linear |
| Edit Method | Edit Points, Edit Block |

| | |
|--------------------|--|
| Harmonic | |
| Harmonic Order | ≤16 |
| Harmonic Type | Even, Odd, All, User |
| Harmonic Amplitude | Can be set for all the orders of harmonics |
| Harmonic Phase | Can be set for all the orders of harmonics |

Output Characteristics

| | | | | |
|------------------------------|---|---|---|---|
| Amplitude (into 50 Ω) | | | | |
| Range | ≤20MHz: 1mVpp to 10Vpp ≤70MHz: 1mVpp to 5Vpp ≤120MHz: 1mVpp to 2.5Vpp ≤200MHz: 1mVpp to 1Vpp | ≤20MHz: 1mVpp to 10Vpp ≤70MHz: 1mVpp to 5Vpp ≤120MHz: 1mVpp to 2.5Vpp ≤160MHz: 1mVpp to 1Vpp | ≤20MHz: 1mVpp to 10Vpp ≤70MHz: 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 | | | |
| Flatness | Typical (relative to 1kHz Sine, 500mVpp, 50Ω) | | | |
| | ≤10MHz: ±0.1dB ≤60MHz: ±0.2dB ≤100MHz: ±0.4dB ≤160MHz: ±0.8dB ≤200MHz: ±1dB | ≤10MHz: ±0.1dB ≤60MHz: ±0.2dB ≤100MHz: ±0.4dB ≤160MHz: ±0.8dB | ≤10MHz: ±0.1dB ≤60MHz: ±0.2dB ≤100MHz: ±0.4dB | ≤10MHz: ±0.1dB ≤60MHz: ±0.2dB |
| Unit | Vpp, Vrms, dBm | | | |
| Resolution | 1mV or 3bits | | | |
| Offset (into 50 Ω) | | | | |
| Range | ±5Vpk ac + dc | | | |
| Accuracy | ±(1% of setting + 5mV + 0.5% of amplitude) | | | |
| Waveform Output | | | | |
| Impedance | 50Ω (Typical) | | | |
| Protection | Short-circuit protection, automatically disable waveform output when overload occurs | | | |

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

| | |
|---------------------|--------------------------------|
| Source | Internal |
| Modulating Waveform | Sine, Square, Ramp, Noise, Arb |
| Key Frequency | 2mHz to 1MHz |

OSK

| | |
|------------------|-----------------------|
| Carrier Waveform | Sine |
| Source | Internal/External |
| Oscillation Time | 8ns to 499.75 μ s |
| Key Frequency | 2mHz to 1MHz |

PWM

| | |
|----------------------|--------------------------------|
| Carrier Waveform | Pulse |
| Source | Internal/External |
| Modulating Waveform | Sine, Square, Ramp, Noise, Arb |
| Width Deviation | 0% to 100% of pulse width |
| Modulating Frequency | 2mHz to 50KHz |

External Modulation Input

| | |
|---------------------|-------------------------------|
| Maximum Input Range | 75mVRMS to $\pm 2.5V_{ac+dc}$ |
| Input Bandwidth | 5MHz |
| Input Impedance | 1k Ω |

Burst Characteristics

| | | | |
|-------------------|---|----------------|---------------|
| Carrier Waveform | Sine, Square, Ramp, Pulse, Noise, Arb (except DC) | | |
| Carrier Frequency | 2mHz to 100MHz | 2mHz to 100MHz | 2mHz to 60MHz |
| Burst Count | 1 to 1000000 or Infinite | | |
| Start/Stop Phase | 0° to 360° | | |
| Internal Period | 2 μ s to 500s | | |
| Gated Source | External Trigger | | |
| Trigger Source | Internal, External or Manual | | |
| Trigger Delay | 0ns to 85s | | |

Sweep Characteristics

| | | | | |
|----------------------|--|----------------------|----------------------|---------------------|
| Carrier Waveform | Sine, Square, Ramp, Arb (except DC) | | | |
| Type | Linear, Log or Step | | | |
| Direction | Up or Down | | | |
| Start/Stop Frequency | 1 μ Hz to 200MHz | 1 μ Hz to 160MHz | 1 μ Hz to 100MHz | 1 μ Hz to 60MHz |
| Sweep Time | 1ms to 300s | | | |
| Hold/Return Time | 0ms to 300s | | | |
| Trigger Source | Internal, External or Manual | | | |
| Mark | Falling edge of Sync signal (programmable) | | | |

Counter

| | | | |
|----------------------|--|--|--|
| Function | Frequency, Period, Positive/Negative Pulse Width, Duty Cycle | | |
| Frequency Resolution | 7 digits/second (Gate Time =1s) | | |
| Frequency Range | 1 μ Hz to 200MHz | | |
| Period Measurement | 5ns to 16 days | | |

Voltage Range and Sensitivity (Non-modulating signal)

| | | | |
|-------------|----------------------|--------------------------------|---------------------------|
| DC Coupling | DC Offset Range | $\pm 1.5V_{DC}$ | Input Attenuation: OFF |
| | 1 μ Hz to 100MHz | 50mVRMS to $\pm 2.5V_{ac+dc}$ | |
| | 100MHz to 200MHz | 100mVRMS to $\pm 2.5V_{ac+dc}$ | |
| AC Coupling | 1 μ Hz to 100MHz | 50mVRMS to $\pm 2.5V_{pp}$ | |
| | 100MHz to 200MHz | 100mVRMS to $\pm 2.5V_{pp}$ | |

Pulse Width and Duty Cycle Measurements

| | | | |
|---------------------------|---------------------|------------------------------|---|
| Frequency/Amplitude Range | 1 μ Hz to 25MHz | 50mVRMS to \pm 2.5Vac + dc | DC Coupling, Input Attenuation: OFF |
| Pulse Width | Minimum | \geq 20ns | |
| | Resolution | 2ns | |
| Duty Cycle | Range (Display) | 0% to 100% | |

Input Characteristics

| | | | |
|------------------|---------------------------|--|-------------------------------|
| Input Range | Breakdown Voltage | \pm 7Vac + dc (Attenuation: OFF) | Input Impedance = 1M Ω |
| | | \pm 70Vac + dc (Attenuation: OFF) | |
| | | 5Vrms | Input Impedance = 50 Ω |
| Input Adjustment | Input Attenuation | ON: \times 10; OFF: \times 1 | |
| | Input Impedance | 50 Ω | 1M Ω |
| | Coupling Mode | 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 | 1ms | |
| | GateTime2 | 10ms | |
| | GateTime3 | 100ms | |
| | GateTime4 | 1s | |
| | GateTime5 | 10s | |
| | GateTime6 | >10s | |

Trigger Characteristics

Trigger Input

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

Trigger Output

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

Clock Reference

Phase Offset

| | |
|------------|----------------------------|
| Range | 0 $^\circ$ to 360 $^\circ$ |
| Resolution | 0.03 $^\circ$ |

External Reference Input

| | |
|---------------------------|---------------------------|
| Lock Range | 10MHz \pm 50Hz |
| Level | 250mVpp to 5Vpp |
| Lock Time | <2s |
| Input Impedance (Typical) | 1k Ω , AC coupling |

Internal Reference Output

| | |
|---------------------------|---------------------------|
| Frequency | 10MHz \pm 50Hz |
| Level | 3.3Vpp |
| Input Impedance (Typical) | 50 Ω , AC coupling |

| Sync Output | |
|-------------|-----------------------|
| Level | TTL-compatible |
| Impedance | 50 Ω , nominal |

| Programming Time (Typical) | | |
|--------------------------------|---------|-------|
| | USB 2.0 | LAN |
| Function Variation | 500ms | 510ms |
| Frequency Variation | 50ms | 50ms |
| Amplitude Variation | 300ms | 310ms |
| Select User Arbitrary Waveform | 500ms | 510ms |

| General Specifications | |
|--|--|
| Power | |
| Power Voltage | 100V to 240V, 45Hz to 440Hz |
| Power Consumption | Less than 50W |
| Fuse | 250V, T2A |
| Display | |
| Type | 7-inch TFT LCD |
| Resolution | 800 Horizontal \times RGB \times 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 : \leq 90% Relative Humidity 35°C to 40°C : \leq 60% Relative Humidity |
| Altitude | Operating: Less than 3000 meters Non-Operating: Less than 15000 meters |
| Mechanical | |
| Dimensions (W \times H \times D) | 313mm \times 160.7mm \times 116.7mm |
| Weight | Without package: 3.2kg With package: 4.5kg |
| Interface | |
| USB Host, USB Device, LAN | |
| IP Protection | |
| IP2X | |
| Calibration Interval | |
| Recommend 1 year for standard interval | |

► Ordering Information

| | Description | Order Number |
|----------------------|---|---------------------|
| Models | DG4202 (200MHz, dual-channel) | DG4202 |
| | DG4162 (160MHz, dual-channel) | DG4162 |
| | DG4102 (100MHz, dual-channel) | DG4102 |
| | DG4062 (60MHz, dual-channel) | DG4062 |
| Standard Accessories | Power Cord | - |
| | USB Cable | CB-USBA-USBB-FF-150 |
| | BNC Cable (1 meter) | CB-BNC-BNC-MM-100 |
| | Quick Guide | - |
| | Resource CD (including User's Guide and Application Software) | - |
| | Warranty | - |
| Optional Accessories | 40dB Attenuator | RA5040K |
| | Rack Mount Kit | RM-DG4000 |
| | 10W Power Amplifier Module | PA1011 |
| | DG4 PC Software (Advanced Function Software) | Ultra Station-adv |
| | Soft Carrying Bag | BAG-G1 |

Warranty

Three-year warranty, excluding accessories.

RIGOL

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