

# 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.

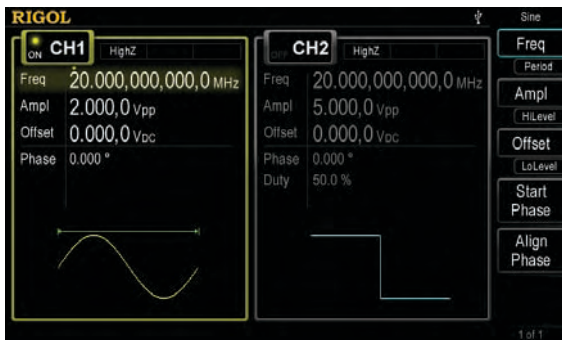
# DG4000 Series Waveform Generators



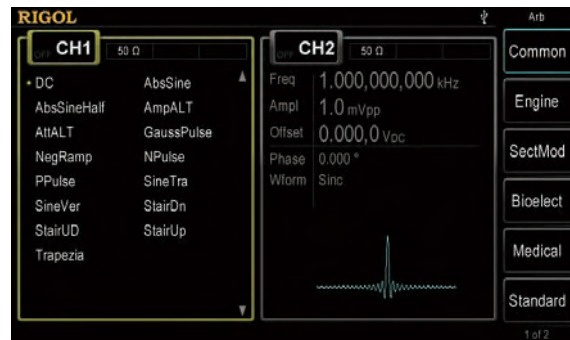
## ► Features and Benefits

- 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)

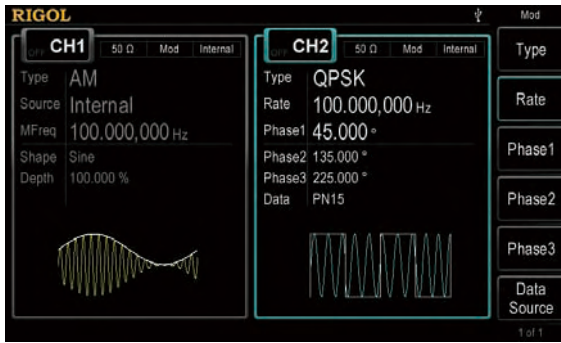
## Advanced functions



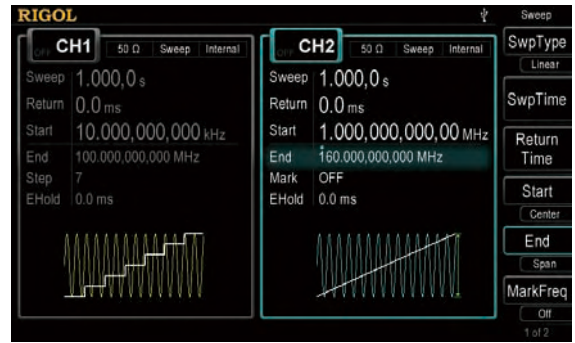
Standard identical 2 channels with frequency and phase coupling



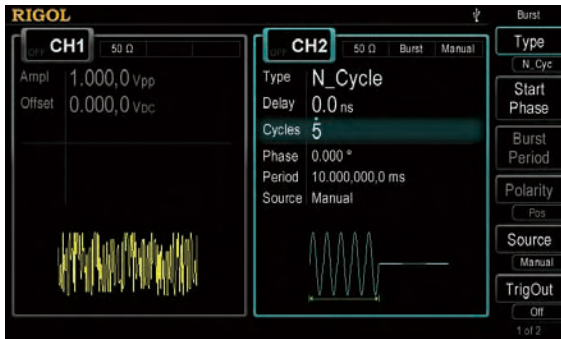
Arbitrary waveform function and built-in 150 waveforms



Abundant analog and digital modulation functions



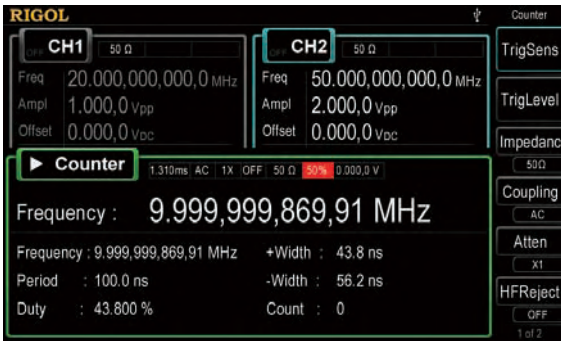
Various Sweep modes



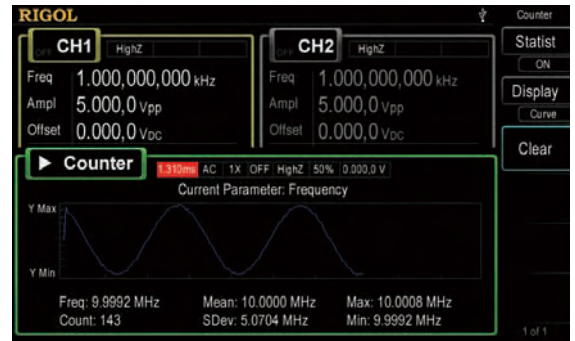
Noise and Burst modes



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	
Interpolation Method	Close, Linear	Harmonic Order	≤16
Edit Method	Edit Point, Edit Block	Harmonic Type	Even, Odd, All, User
		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		
<b>PSK</b>			
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)		
Source	Internal/External		
Modulating Waveforms	Square with 50% duty cycle		
Key Frequency	2 mHz ~ 1 MHz		
<b>BPSK</b>			
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)		
Source	Internal		
Modulating Waveforms	Square with 50% duty cycle		
Key Frequency	2 mHz ~ 1 MHz		
<b>QPSK</b>			
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)		
Source	Internal		
Modulating Waveforms	Square with 50% duty cycle		
Key Frequency	2 mHz ~ 1 MHz		
<b>OSK</b>			
Carrier Waveform	Sine		
Source	Internal/External		
Oscillation Time	8ns ~ 200s		
Key Frequency	2 mHz ~ 1 MHz		
<b>PWM</b>			
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		
<b>ExtTrig Input</b>			
Input Range	75mVRMS ~ ±2.5Vac+dc		
Input Bandwidth	5MHz		
Input Impedance	100Ω		
<b>Burst Characteristics</b>			
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		
<b>Sweep Characteristics</b>			
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)		
<b>Counter Specifications</b>			
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		Internal Reference Output	
Range	0° to 360°	Frequency	10 MHz ± 50 Hz
Resolution	0.03°	Level	3.3Vpp
External Reference Input		Impedance (Typical)	50kΩ, AC coupling
Lock Range	10 MHz ± 50 Hz	Sync Output	
Level	250 mVpp to 5 Vpp	Level	TTL-compatible
Lock Time	< 2 s	Impedance	50 Ω, nominal value
Impedance (Typical)	1kΩ, AC coupling		

#### 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
<b>Mechanical</b>	
Dimensions (WxHxD)	313 mm x160.7 mmx116.74mm
Weight	with no package: 3.2 kg with package: 4.5 kg
<b>Interfaces</b>	
USB Host (2), USB Device, LAN	
<b>IP Protection</b>	
IP2X	
<b>Calibration Interval</b>	
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

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