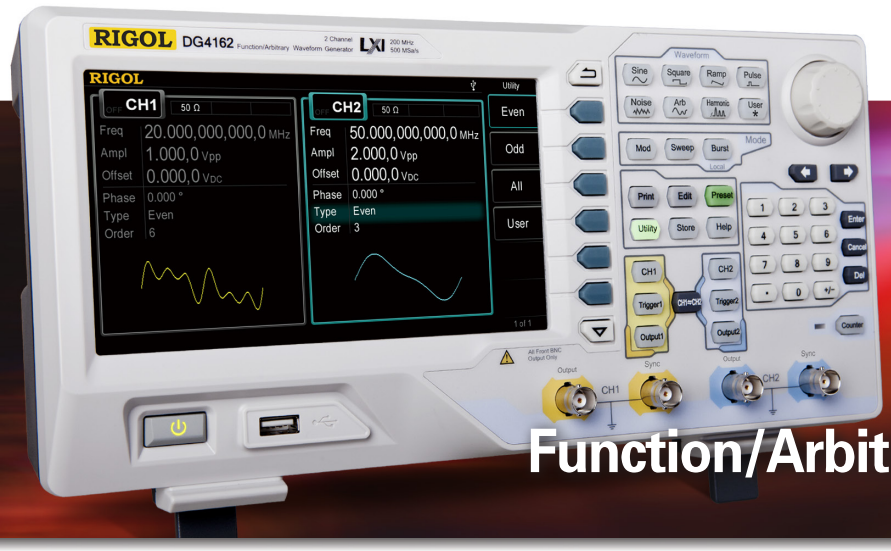
RIGOL



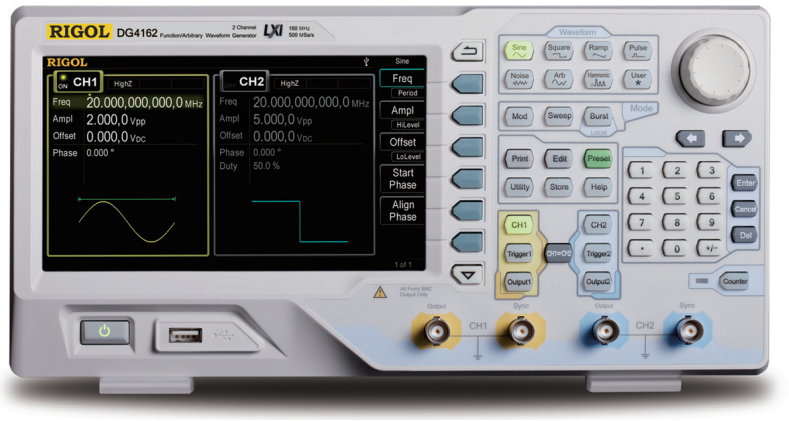
DG4000 Series

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



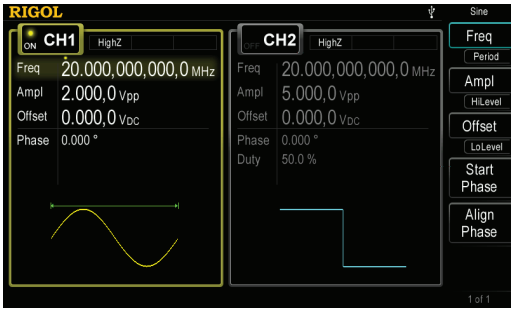
2012 R&D 100
Rigol Technologies
DG4000 Series Waveform Generators
50th ANNIVERSARY



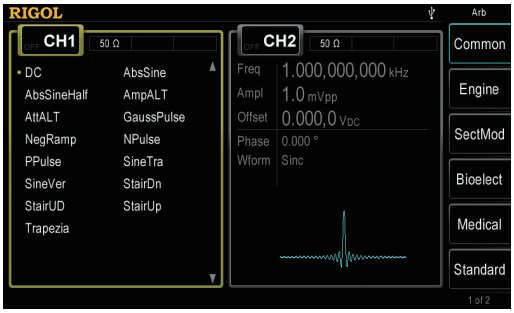


Product Dimensions: Width × Height × Depth = 313mm × 160.7mm × 116.7mm Weight: 3.2kg (Without Package)

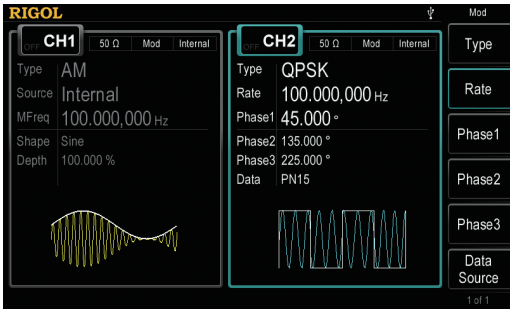
▶ Function Interfaces



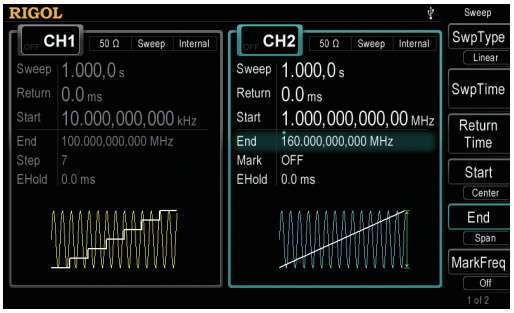
Two channels with complete equivalent functions and precisely adjustable phases (standard)



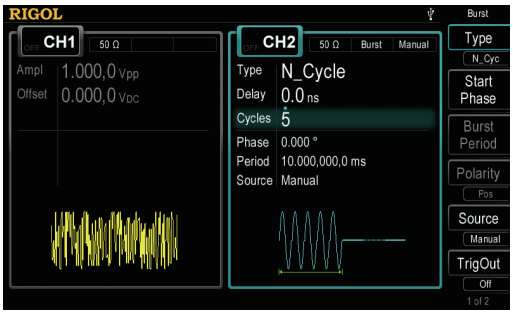
Standard arbitrary waveform function and 150 built-in arbitrary waveforms



Abundant analog and digital modulation functions



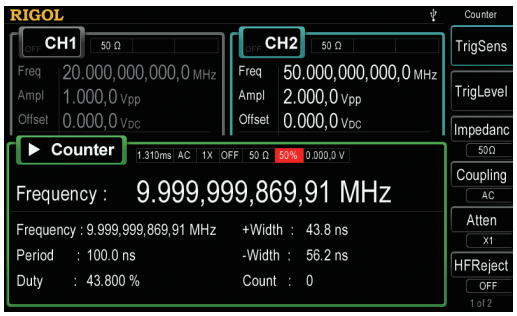
Various sweep modes



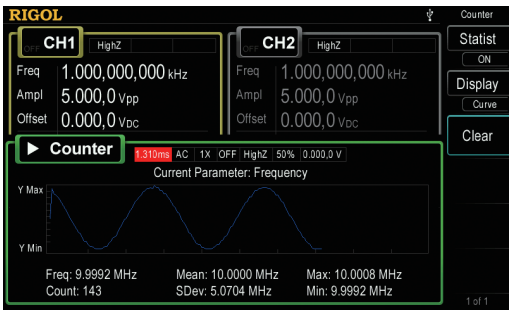
Noise and burst modes



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℃ to 28℃).

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℃ to 28℃			

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 499.75μs
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 ±2.5Vac+dc
Input Bandwidth	5MHz
Input Impedance	1kΩ

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	2μs 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	1μHz to 200MHz	1μHz to 160MHz	1μHz to 100MHz	1μHz 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	1μHz 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
	1μHz to 100MHz	50mVRMS to ±2.5Vac + dc	
	100MHz to 200MHz	100mVRMS to ±2.5Vac + dc	
AC Coupling	1μHz to 100MHz	50mVRMS to ±2.5Vpp	
	100MHz to 200MHz	100mVRMS to ±2.5Vpp	

Pulse Width and Duty Cycle Measurements			
Frequency/Amplitude Range	1μHz to 25MHz	50mVRMS to ±2.5Vac + dc	DC Coupling, Input Attenuation: OFF
Pulse Width	Minimum	≥20ns	
	Resolution	2ns	
Duty Cycle	Range (Display)	0% to 100%	
Input Characteristics			
Input Range	Breakdown Voltage	±7Vac + dc (Attenuation: OFF)	Input Impedance = 1MΩ
		±70Vac + dc (Attenuation: OFF)	
		5Vrms	Input Impedance = 50Ω
Input Adjustment	Input Attenuation	ON: ×10; OFF: ×1	
	Input Impedance	50Ω	1MΩ
	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° to 360°
Resolution	0.03°
External Reference Input	
Lock Range	10MHz ± 50Hz
Level	250mVpp to 5Vpp
Lock Time	<2s
Input Impedance (Typical)	1kΩ, AC coupling
Internal Reference Output	
Frequency	10MHz ± 50Hz
Level	3.3Vpp
Input Impedance (Typical)	50Ω, 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 × RGB × 480 Vertical Resolution
Color	16M 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 35℃ to 40℃ : ≤60% Relative Humidity
Altitude	Operating: Less than 3000 meters Non-Operating: Less than 15000 meters
Mechanical	
Dimensions (W × H × D)	313mm × 160.7mm × 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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September 2015