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.

RIGOL TECHNOLOGIES, INC.

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
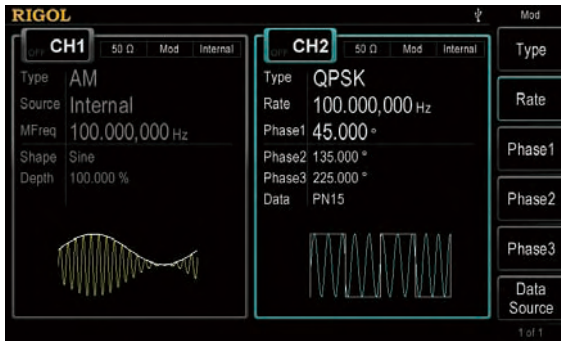- 7 inch color LCD(800X480 pixels)
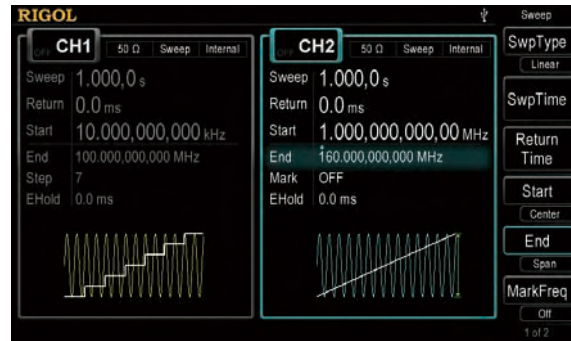
Advanced functions
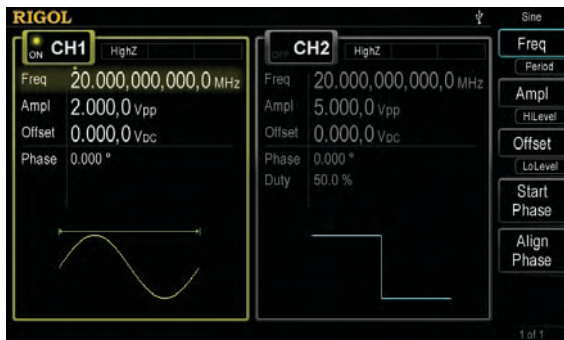
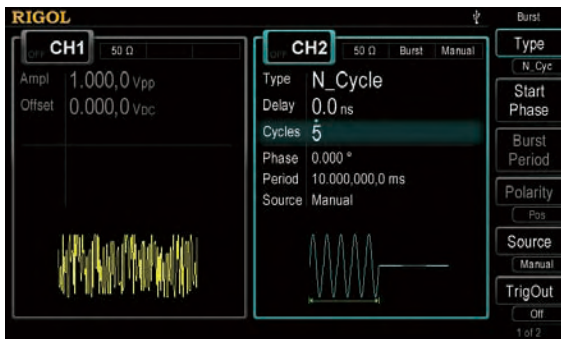Standard identical 2 channels with frequency and phase coupling
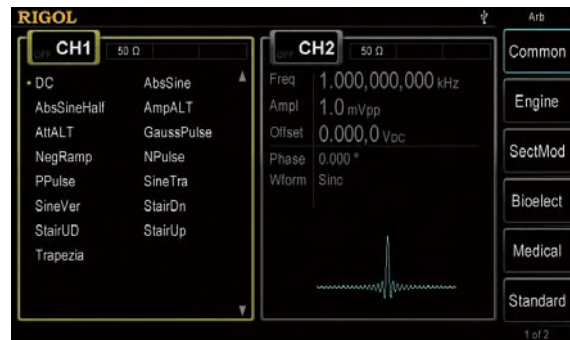
Arbitrary waveform function and built-in 150 waveforms

Abundant analog and digital modulation functions

Various Sweep modes

Noise and Burst modes

Up to 16 orders customized Harmonic generation function
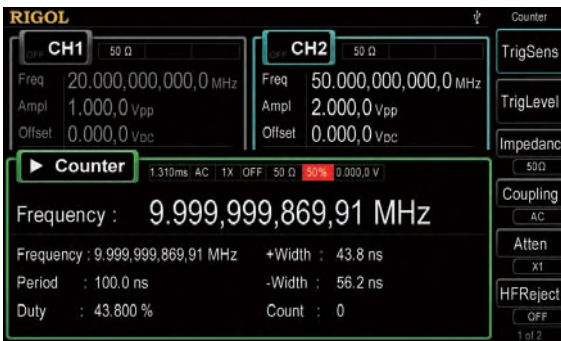
Standard high resolution counter function
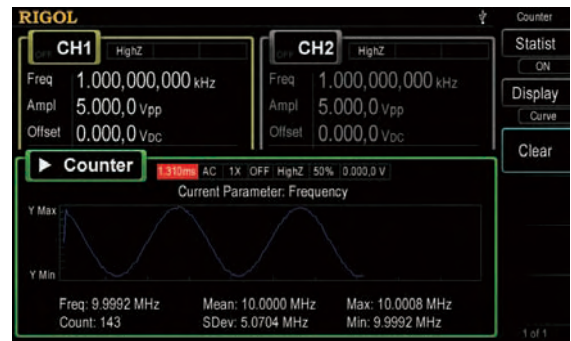
The statistic analysis function of counter

▶ 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			
Rise/Fall Time	Typical（1Vpp）	Typical（1Vpp）	Typical（1Vpp）
	<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			
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		Harmonic	
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)	Harmonic	
	≤5MHZ　2ppm+500 ps	Harmonic Order	≤16
	> 5MHZ　500ps	Harmonic Type	Even, Odd, All, User
Interpolation Method	Close, Linear	Harmonic Amplitude	can be set for all the harmonics
Edit Method	Edit Point, Edit Block	Harmonic Phase	can be set for all the harmonics

Output Characteristics			
Amplitude (into 50 Ω)			
Range	≤20MHz：1mVpp to 10Vpp	≤20MHz：1mVpp to 10Vpp	≤20MHz：1mVpp to 10Vpp
	≤60MHz：1mVpp to 5Vpp	≤60MHz：1mVpp to 5Vpp	≤60MHz：1mVpp to 5Vpp
	≤120MHz：1mVpp to 2.5Vpp	≤100MHz：1mVpp to 2.5Vpp	
	≤160MHz：1mVpp to 1Vpp		
Accuracy	Typical (1kHz Sine, 0V Offset, >10mVpp, Auto)		
	± 1% of setting ± 2mVpp		
Amplitude Flatness (relative to 100 kHz, 1.25Vpp Sine wave, 50Ω)	Typica	Typica	Typica
	≤10MHz：±0.1dB	≤10MHz：±0.1dB	≤10MHz：±0.1dB
	≤60MHz：±0.2dB	≤60MHz：±0.2dB	≤60MHz：±0.2dB
	≤100MHz：±0.4dB	≤100MHz：±0.4dB	
	≤160MHz：±0.8dB		
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/Negtive Pulse Width, Duty Cycle		
Frequcy Resolution	6 digits/second (Gate Time =1s)		
Frequcy 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"

AC Coupling	100MHz～200MHz	100mVRMS～±2.5Vac+dc	
	1uHZ～100MHz	50mVRMS～±2.5Vpp	
	100MHz～200MHz	100mVRMS～±2.5Vpp	

Pulse Width and Duty Cycle Measure			
Frequcy/Amplitude Range	1uHZ～25MHz	50mVRMS～±2.5Vac+dc	DC Coupling
Pulse Width	Minimum	≥20ns	Input Attenuation: "closed"
	Resolution	2ns	
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: "×10"; Closed: "×1"	
	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 × 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 (RH)
	35℃ to 40℃: ≤60％ Relative Humidity (RH)
Altitude	Operating: Less than 3000 meters
	Non-Operating: Less than 15000 meters
Mechanical	
Dimensions (W×H×D)	313 mm ×160.7 mm×116.74mm
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

	Description	Order Number
Model	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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