Chapter 13 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**
Channel	2	2	2	2
Maximum Frequency	200MHz	160MHz	100MHz	60 MHz
Sample Rate	500MSa/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	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-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 (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-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 harmonics			
Harmonic Phase	can be set for all harmonics			
Output Characteristics				
Amplitude (into 50 Ω)				
Range	≤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 (relative to 1kHz	Typical ≤10MHz:	Typical ≤10MHz:	Typical ≤10MHz:	Typical ≤10MHz:

Sine wave, 500mVpp, 50Ω)	±0.1dB ≤60MHz: ±0.2dB ≤100MHz: ±0.4dB ≤160MHz: ±0.8dB ≤200MHz: ±1dB	±0.1dB ≤60MHz: ±0.2dB ≤100MHz: ±0.4dB ≤160MHz: ±0.8dB	±0.1dB ≤60MHz: ±0.2dB ≤100MHz: ±0.4dB	±0.1dB ≤60MHz: ±0.2dB
Units	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	Square with 50% duty cycle

Waveform			
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 Waveforms	Sine, Square, Ramp, Noise, Arb		
Width Deviation	0% to 100% of Pulse Width		
Modulating Frequency	2mHz to 50KHz		
[Mod/FSK/Trig] 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 1 000 000 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 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 Specifications			
Function	Frequency, Period, Positive/Negative Pulse Width, Duty Cycle		
Frequency Resolution	7 digits/second (Gate Time =1s)		
Frequency Range	1μHz to 200MHz		
Period Measurement	Measurement Range		5ns to 16 days
Voltage Range and Sensitivity (Not modulation signal)			
DC Coupling	DC Offset Range	±1.5V_{DC}	Input Attenuation: "closed"
	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 Measurement			
Frequency/Amplitude Range	1μHz to 25MHz	50mVRMS to ±2.5Vac+dc	DC Coupling Input Attenuation: "closed"
Pulse Width	Minimum	≥20ns	
	Resolution	2ns	
Duty Cycle	Range (Display)	0% to 100%	
Input Characteristics			
Input Range	Breakdown 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	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	
Impedance (Typical)	1kΩ, AC coupling	
Internal Reference Output		
Frequency	10MHz ± 50Hz	
Level	3.3Vpp	
Impedance (Typical)	50Ω, AC coupling	
Sync Output		
Level	TTL-compatible	
Impedance	50 Ω, nominal value	
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 (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×116.7mm
Weight	without package: 3.2 kg with package: 4.5 kg
Interfaces	
USB Host, USB Device, LAN	
IP Protection	
IP2X	
Calibration Interval	
Recommend 1 year for standard interval	