RIGOL

Data Sheet

DG3000 Series Function/Arbitrary Waveform Generator

DG3121A, DG3101A, DG3061A

Product Overview

DG3000 Series Function/Arbitrary Waveform Generators adopt DDS technology, which enables to generate stable, high-precision, pure and low distortion signals. Also, DG3000 is the first industry's MSG designed with logic signal output function.

Applications

- Analog Sensor
- Practical Environment Signals
- Circuit Function Test
- Serial Bus Adjust
- IC chip Test

Easy to Use Design

- Clear graphical interface
- Support for Chinese and English menu and input
- Push-help makes information getting more convenient.
- File management (support for U disc and local storage)

Main Features

- Adopt advanced DDS technology; 14 bits vertical accuracy; 512 kpts waveform length; 300 MSa/s maximum sampling rate; 120 MHz maximum output frequency
- 3.8 inches STN colorful LCD
- Optional 16+2 channels logic signal output module DG-POD-A; enable to reappear more mixture signals by working with the analog channels
- DG-POD-A supports RS-232, SPI, IIC and PO protocol as well as user-designed protocol based on PO
- Output 10 standard waveforms, DC and user-designed arbitrary waveforms; the waveforms up to 1024 kpts could be stored
- Abundant modulation functions: AM, FM, PM, PWM, FSK; linear/logarithm sweep and burst
- Abundant output and input: waveform output; synchronous signal output; attached modulation source, attached clock reference 10 MHz input, external trigger input and internal 10MHz clock output
- Standard interface: USB Device, USB Host, LAN, RS-232 and GPIB; support U-disc storage and Web remote control
- Seamlessly interconnect with DS1000 series digital oscilloscope
- Powerful arbitrary waveform editing software "UltraWave"
- Support remote control via a command line

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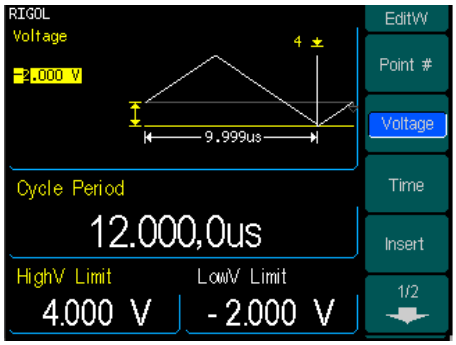
➢ 10 Standard Waves, DC and Editable Arb Waves



Editable Arb Waveform

10 Standard Waves and DC Output: Enable to output Sine, Square, Ramp, Pulse, ExpRise, ExpFall, Sinc, Noise and DC waves.

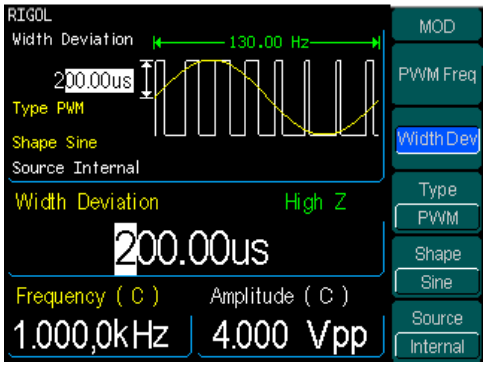
Editable Arb Waves: Enable to edit and output arbitrary wave up to 14bits and 512kpts. In addition, the instrument provides 4 nonvolatile memories for storing custom arbitrary waves. According to Ultrawave, more waves (up tp 1024kpts) could be edited and saved, or perform analysis for the waves that has already been uploaded to it.

➢ Abundant Modulation Functions, Sweep, Burst

Abundant Modulation Functions: Support AM, FM, PM, PWM and FSK, the modulated waveforms are intuitively shown on the screen.

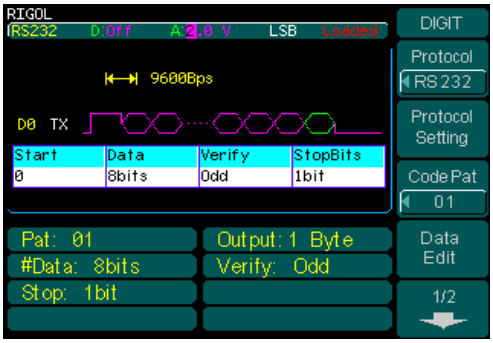
Sweep: It can output in the form of linearity or logarithm from the start frequency to the stop frequency during the sweep time (1 ms ~ 500 s) you specified. Sweeping can be generated by Sine, Square, Ramp or Arbitrary waveforms.

Burst: It can generate versatile waveforms in burst, which can last specific times of waveform cycle (N-Cycle Burst) or output gating pluse if applied external gating signal.



PWM Modulated Wave

➢ Optional Logic Signal Output Module



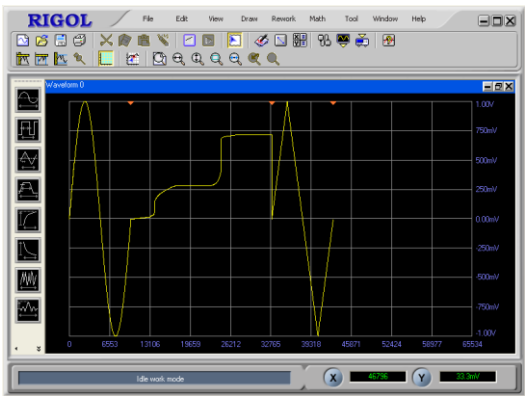
Configue RS232 protocol

With external 16 data and 2 timing channels, the logical signal output module DG-POD-A makes DG3000 series products to be the real MSG. Either, by this module, DG3000 series could easiliy generate common digital protocol waves and reappear more mixture signals by working with analog channels.

Support four protocol outputs: RS-232, SPI, IIC and PO as well as user-designed protocol output based on PO.

➢ Powerful Waveform Editing Software "UltraWave"

In order to meet the most basic needs of users, UltraWave provides 9 standard waveforms. In addition, hand drawing, line (point by point) drawing and arbitrary points drawing are also offered to make it easier to create complex waveforms and to edit multiple waves simultaneously through the multi-file management interface.



UltraWave

Specifications

All the specifications below apply to DG3000 Series Function/ Arbitrary Waveform Generator unless where noted. To come up to these specifications, two conditions must be met firstly:

- The instrument must have been operated continuously for 30 minutes under the specified operating temperature.
- Do perform Self-Calibration through the Utility menu if the range of operating temperature variations up to or more than 5°C.

Note: All specifications are guaranteed unless where marked "typical".

Specifications

Frequency（DG3121A）	
Waveforms	Sine, Square, Ramp, Triangle, Pulse, Noise, DC, Arb
Sine	1 μHz ~ 120 MHz
Square	1 μHz ~ 60 MHz
Pulse	500 μHz ~ 30 MHz
Ramp	1 μHz ~ 1 MHz
White Noise	50 MHz bandwidth (-3 dB) (typical)
Accuracy	10 ppm in 90 days 20 ppm in one year 18°C ~ 28°C
Temperature Coefficient	< 2 ppm/°C
Frequency（DG3101A）	
Waveforms	Sine, Square, Ramp, Triangle, Pulse, Noise, DC, Arb
Sine	1 μHz ~ 100 MHz
Square	1 μHz ~ 50 MHz
Pulse	500 μHz ~ 25 MHz
Ramp	1 μHz ~ 1 MHz
White Noise	40 MHz bandwidth (-3 dB) (typical)
Accuracy	10 ppm in 90 days 20 ppm in one year 18°C ~ 28°C
Temperature Coefficient	< 2 ppm/°C
Frequency（DG3061A）	
Waveforms	Sine, Square, Ramp, Triangle, Pulse, Noise, DC, Arb
Sine	1 μHz ~ 60 MHz
Square	1 μHz ~ 30 MHz
Pulse	500 μHz ~ 20 MHz
Ramp	1 μHz ~ 1 MHz
White Noise	30 MHz bandwidth (-3 dB) (typical)
Resolution	1 μHz
Accuracy	10 ppm in 90 days 20 ppm in one year 18°C ~ 28°C
Temperature Coefficient	< 2 ppm/°C
Sine Wave Spectrum Purity	
Harmonic Distortion	**< 1 V_{PP} > 1 V_{PP}**

	DC ~ 20 kHz -70 dBc -70 dBc 20 kHz ~ 100 kHz -65 dBc -60 dBc 100 kHz ~ 1 MHz -50 dBc -45 dBc 1 MHz ~ 10 MHz -40 dBc -35 dBc
Total Harmonic Distortion	DC ~ 20 kHz, 1 V_{PP} <0.2%
Spurious Signal (non-harmonic)	DC ~ 1 MHz < -70 dBc 1 MHz ~ 10 MHz < -70 dBc + 6 dB/octave
Phase Noise	10 kHz Offset –115 dBc / Hz (typical)
Square Wave	
Rise/Fall Time	< 5 ns （10% to 90%）(typical, 1 kHz, 1 V_{PP}）
Overshoot	< 2%
Duty Cycle	20% ~ 80% (to 25 MHz） 40% ~ 60% (to 50 MHz) 50% (> 50 MHz）
Asymmetry (below 50% Duty Cycle)	1% of period + 5 ns
Jitter	300 ps + 100 ppm of period
Ramp Wave	
Linearity	< 0.1% of peak output (typical, 1 kHz, 1 V_{PP}, 100% Symmetry)
Symmetry	0% to 100%
Pulse Wave	
Pulse Width	2000 s max period; 8 ns min period; 1 ns resolution
Variable Edge	5 ns ~ 1 ms
Overshoot	< 2%
Jitter	300 ps + 100 ppm of period
Arb Wave	
Frequency Range	1 μHz ~ 25 MHz
Waveform Length [1]	2 ~ 1024 k points
Vertical Resolution	14 bits (including sign)
Sampling Rate	300 MSa/s
Minimum Rising /Falling Time	35 ns (typical)
Jitter (RMS)	6 ns + 30 ppm
Nonvolatile Storage	4 waveforms
Output Characteristics	
Amplitude [2]	10 m V_{PP} ~ 10 V_{PP} (50 Ω) 20 m V_{PP} ~ 20 V_{PP} (High Z)
Vertical Accuracy (100 kHz Sine)	±(1% of setting +1 m V_{PP})
Amplitude Flatness (sine wave relative to 100 kHz Sine, 5 V_{PP})	< 40 MHz 0.20 dB 40 MHz ~ 80 MHz 0.60 dB 80 MHz ~120 MHz 1.00 dB
DC Offset	
Range (peak value AC＋DC)	±5 V (50 Ω) ±10 V (High Z)
Offset Accuracy	± (2%of the |Offset Setting| + 0.5% of the amplitude+ 2 mV)
Waveform Output	
Impedance	50 Ω (typical)
Isolation	42 Vpk max. to Earth
Protection	Short-circuit protected; Overload relay automatically disables main output.
AM	

Carrier Waveforms	Sine, Square, Ramp, Arb
Source	Internal/ External
Modulation Waveforms	Sine, Square, Ramp, Noise, Arb (2 mHz to 20 kHz)
Modulation Depth	0% ~ 120%
FM	
Carrier Waveforms	Sine, Square, Ramp, Arb
Source	Internal/ External
Modulation waveforms	Sine, Square, Ramp, Noise, Arb (2 mHz to 20 kHz)
Frequency Deviation	DC ~ 60 MHz [3]
PM	
Carrier Waveforms	Sine, Square, Ramp, Arb
Source	Internal/ External
Modulation waveforms	Sine, Square, Ramp, Noise, Arb (2 mHz to 20 kHz)
Phase Deviation	0° ~ 360°
FSK	
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)
Source	Internal/External
Modulation Waveforms	50% duty cycle square (2 mHz to 100 kHz)
PWM	
Carrier Waveforms	Pulse
Source	Internal/ External
Modulation Waveforms	Sine, Square, Ramp, Noise, Arb (2 mHz to 20 kHz)
Width Deviation	0% ~100% of the pulse width
Sweep	
Carrier Waveforms	Sine, Square, Ramp, Arb
Type	Linear or Logarithmic
Direction	up/down
Sweep Time	1 ms ~ 500 s ± 0.1%
Trigger Source	Manual/Internal/External
Burst	
Waveforms	Sine, Square, Ramp, Pulse, Noise, Arb
Types	Count (1 to 1,000,000 periods), infinite, gated
Start Phase	-360° to +360°
Internal Period	1 µs – 300 s ± 1%
Gate Source	External Trigger
Trigger Source	Manual/Internal/External
Rear Panel Connector	
External AM Modulation	± 5 Vpk = 100% modulation 5kΩ input impedance
Input/Output Frequency Range	10 MHz ± 500 Hz
Input/Output Level Range	80 m V_{PP} ~ 10 V_{PP} /0 dBm (typical)
Input/Output Impedance	2 kΩ/50 Ω (typical, AC coupled)
Locking Time	< 1 s
External Trigger	TTL compatible
Trigger Input	
Input Level	TTL compatible
Slope	Rising or falling (selectable)
Pulse Width	> 100 ns

Input Impedance	> 10 kΩ, DC coupled
Linear Sweep	< 500 μs (typical)
Delay Time of Pulse	< 500 ns (typical)
Trigger Output	
Electrical Level	TTL compatible, input >1 kΩ
Pulse Width	> 400 ns (typical)
Output Impedance	50 Ω (typical)
Maximum Frequency	1 MHz

Remark [1]:
The instrument can edit the points of arbitrary wave up to 524,288, but up to 1 M (1024k) could be edited VIA PC and downloaded to the volatile memory of equipment for output.

Remark [2]:

- Amplitude range (50 Ω):
  If output frequency ≤10 MHz, the range is 10 m V_{PP} ~ 10 V_{PP};
  If output frequency ≤80 MHz 时, the range is 10 m V_{PP} ~ 5 V_{PP};
  If output frequency >80 MHz 时, the range is 10 m V_{PP} ~ 2.5 V_{PP}.
- Amplitude range (High Z):
  If output frequency ≤10 MHz, the range is 20 m V_{PP} ~ 20 V_{PP};
  If output frequency ≤80 MHz, the range is 20 m V_{PP} ~ 10 V_{PP};
  If output frequency >80 MHz, the range is 20 m V_{PP} ~ 5 V_{PP}.
- If the output frequency is set >80MHz and the amplitude range is 2 V_{PP} ~5 V_{PP} (High Z), the amplitude flatness is 3dB.
- Square
  If frequency < 8 MHz, the upper limit of amplitude is 20 V_{PP};
  If frequency ≥ 8 MHz, the upper limit of amplitude is 10 V_{PP}.
- Pulse
  If frequency < 5 MHz, the upper limit of amplitude is 20 V_{PP};
  If frequency ≥ 5 MHz, the upper limit of amplitude is 10 V_{PP}.

Remark [3]:
The values are different with each model:
When the frequency of device is 60 MHz, the corresponding value is 30MHz; when the frequency of device is 100MHz, the corresponding value is 50MHz.

General Specifications

Display		
Display Type		3.8 inches STN colorful LCD
Display Resolution		320 Horizontal×RGB×240 Vertical
Display Colors		64 colors
Display Contrast (typical)		150 : 1
Backlight Brightness (typical)		300 nit
Supply Power		
Supply Voltage		100-240 VACrms, 45-440 Hz, CAT II
Power Consumption		Less than 50 W
Fuse		2 A, T Level, 250 V
Environment		
Ambient Temperature		Operation: 10℃ ~ +40℃
		Non-operation: -20℃ ~ +60℃
Cooling Method		Natural cooling
Humidity Range		Below +35℃: ≤90％ relative humidity
		+35℃~+40℃: ≤60％relative humidity
Height above sea level		Operation : below 3,000m
		Non-operation: below 15,000m
Mechanism		
Dimension	Width	232 mm
	Height	107.5 mm
	Depth	365+9.5 mm (the depth of BNC is 9.5 mm)
Weight	Net Weight	3.56 kg
	Gross Weight	5.10 kg
IP Protection		
IP2X		
Calibration Interval		
One year suggested		

Ordering Information

Name of Product

RIGOL DG3000 Series Function/Arbitrary Waveform Generator

Model	Frequency
DG3121A	120 MHz
DG3101A	100 MHz
DG3061A	60 MHz

Standard Accessories

- A Power Cord that fits the standard of destination country
- A USB Data Cable
- A User's Guide
- Ultrawave software

Optional Accessories

- BNC Cable
- RS-232 Data Cable
- Logic Signal Output Module (DG-POD-A)
- Logic Cable

Warranty

Thank you for choosing **RIGOL** products!

RIGOL Technologies, Inc. warrants that this product will be free from defects in materials and workmanship from the date of shipment. If a product proved defective within the respective period, **RIGOL** will provide repair or replacement as described in the complete warranty statement.

For the copy of complete warranty statement or maintenance, please contact with your nearest **RIGOL** sales and service office.

RIGOL do not provide any other warranty items except the one being provided by this summary and the warranty statement. The warranty items include but not being subjected to the hint guarantee items related to tradable characteristic and any particular purpose. **RIGOL** will not take any responsibility in cases regarding to indirect, particular and ensuing damage.

Contact Us

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