

RIGOL

Data Sheet

DG10X2 Series Function/Arbitrary Waveform Generator

DG1012, DG1022

Product Overview

DG10X2 Series Function/Arbitrary Waveform Generators adopt DDS technology, which enables to generate stable, high-precision, pure and low distortion signals.



Applications

- Analog Sensor
- Practical Environment Signals
- Circuit Function Test
- IC chip Test

Easy to Use Design

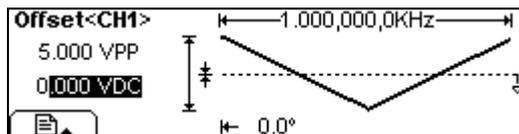
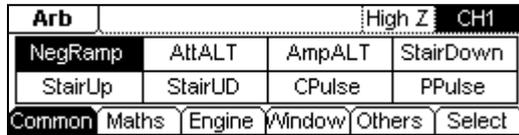
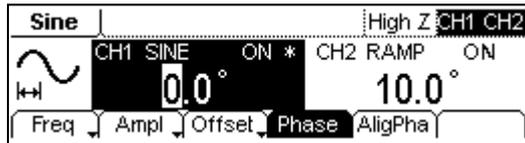
- A variety of display modes
- Clear graphical interface
- Support for Chinese and English menu and input
- Push-help makes information getting more convenient.
- File management (support for U disc and local storage)

Main Features

- Adopt advanced DDS technology; dual channel output; 100 MSa/s maximum sampling rate; 14 bits vertical accuracy
- Output 5 standard waveforms; built-in 48 arbitrary waveforms
- Abundant modulation functions: AM, FM, PM, FSK, linear/logarithm sweep and burst
- Abundant output and input: waveform output; synchronous signal output; external modulation source, external clock reference (10 MHz) input, external trigger input
- Unique channel coupling and channel copy
- Built-in high precision and wide band counter, the measurement range: 100 mHz ~ 200 MHz (single channel)
- Standard configuration interfaces: USB Device & USB Host, and support U-disc storage
- Seamlessly interconnect with DS1000 series digital oscilloscope
- Powerful arbitrary waveform editing software "UltraWave"
- Support remote control by commands

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➤ Dual Channel Output, Built-in and Editable Arb Waveform



Dual Channel Output: Separately setup the waveform and parameter as well as the output state of two channels. The phases from two channels could be synchronous while outputting based on the “AligPha” function from operation menu.

Built-in Waveform Output: The instrument has 48 built-in arbitrary waves (contains DC) which including common, math, engineering, window function and other common waves.

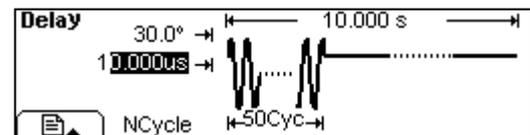
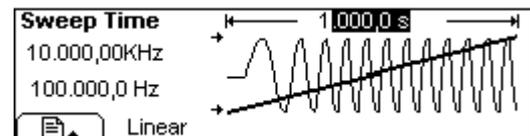
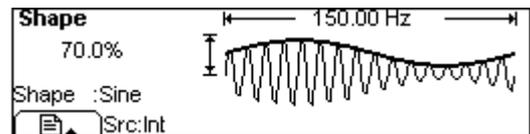
Editable Arb Waveform: Enable to edit and output a arbitrary wave with 14bits, 4kpts. In addition, the instrument provides 10 nonvolatile memories for storing custom arbitrary waves. According to Ultrawave, more waves could be edited and saved.

➤ Abundant Modulation Functions, Sweep, Burst

Abundant Modulation Functions: Support AM, FM, PM and FSK, the modulated waveforms are intuitively shown on the screen. It can be used in Education & Training area proverbially.

Sweep: It can generate “sweep” from the start frequency to the stop frequency during appointed sweep time (1 ms ~ 500 s) you specify. Sweeping can be generated by Sine, Square, Ramp or Arbitrary waveforms.

Burst: It can generate pulse sequence for a variety of waveform function, and the waveform could continuously cycle within specific time or apply external gating signal.



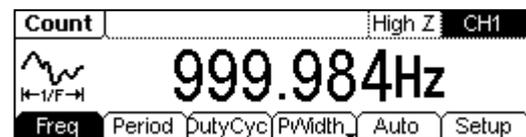
➤ Channel Coupling and Copy



Channel Coupling: Once you setup the base channel and the Frequency/Phase deviation of the two channels, the Frequency/Phase of the other one will vary with the base channel and will still keep the deviation you have selected.

Channel Copy: According to this function, the parameters from one channel could be copied to another channel with no change of the waveform shape.

➤ Built-in Frequency Counter

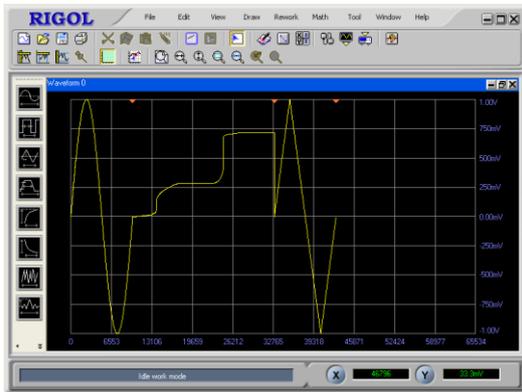


The counter could be used to measure these parameters: frequency, period, duty cycle, positive pulse width and negative pulse width within the range of 100 mHz to 200 MHz. Two modes of counter are available:

Auto mode: The trigger level, sensitive, the switch of high frequency reject, the frequency of measured signal and others could be set automatically.

Manual mode: DC/AC, sensitive (low, mid, high), trigger level, the switch of high frequency reject and other parameters could be set manually.

➤ Powerful Waveform Editing Software "UltraWave"



In order to meet the most basic needs of users, UltraWave provides 9 standard waveforms: Sine, Square, Ramp, Pulse, ExpRise, ExpFall, Sinc, Noise and DC. 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.

Either, UltraWave has following utilitarian functions:

- Windows operation: enable to perform math operations such as "+", "-", "×" for the waves in two windows.
- Absolute operation: enable to perform absolute operation for the selected waves.
- Filter: enable to perform low pass filtering or smoothing for the whole wave.
- Save the arbitrary wave that has been created as the format of .txt (text file), .csv (CSV file) and .rdf (arbitrary waveform file).
- Read the wave files stored as the format of .Wfm from DS series Digital Oscilloscope.
- Print waveforms.
- Download the waves have been created to the internal storage of DG10X2.

Specifications

All the specifications below apply to DG10X2 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 (DG1022)	
Waveforms	Sine, Square, Ramp, Triangle, Pulse, Noise, Arb
Sine	1 μ Hz ~ 20 MHz
Square	1 μ Hz ~ 5 MHz
Pulse	500 μ Hz ~ 3 MHz
Ramp/Triangle	1 μ Hz ~ 150 kHz
White Noise	5 MHz bandwidth (-3 dB)
Arb.	1 μ Hz ~ 5 MHz
Resolution	1 μ Hz
Accuracy	\pm 50 ppm in 90 days \pm 100 ppm in 1 year 18°C ~ 28°C
Temperature Coefficient	< 5 ppm/°C

Frequency (DG1012)				
Waveforms	Sine, Square, Ramp, Triangle, Pulse, Noise, Arb			
Sine	1 μ Hz ~ 15 MHz			
Square	1 μ Hz ~ 4 MHz			
Pulse	500 μ Hz ~ 2 MHz			
Ramp/Triangle	1 μ Hz ~ 100 kHz			
White Noise	5 MHz bandwidth (-3 dB)			
Arb	1 μ Hz ~ 4 MHz			
Resolution	1 μ Hz			
Accuracy	\pm 50 ppm in 90 days \pm 100 ppm in 1 year 18°C ~ 28°C			
Temperature Coefficient	< 5 ppm/°C			
Sine Wave Spectrum Purity				
Harmonic Distortion	CH1		CH2	
	\leq 1 Vpp	>1 Vpp	\leq 1 Vpp	>1 Vpp
DC-1 MHz	-55 dBc	-45 dBc	-55 dBc	-45 dBc
1 MHz - 5 MHz	-55 dBc	-40 dBc	-55 dBc	-40 dBc
5 MHz - 20 MHz	-50 dBc	-35 dBc	-45 dBc	-35 dBc
Total Harmonic Distortion	DC ~ 20 kHz, 1 Vpp <0.2%			
Spurious Signal (non-harmonic)	DC ~ 1 MHz < -70 dBc 1 MHz ~ 10 MHz < -70 dBc + 6 dB/octave			
Phase Noise	10kHz Offset -108 dBc / Hz (typical)			
Square Wave				
Rise/Fall Time	< 20 ns (10% ~ 90%), (typical, 1 kHz, 1 Vpp)			
Overshoot	< 5% (Typical, 1 kHz, 1 Vpp)			
Duty Cycle	1 μ Hz ~ 3 MHz		20% ~ 80%	
	3 MHz (not contain) ~ 4 MHz		40% ~ 60%	
	4 MHz (not contain) ~ 5 MHz		50%	
Asymmetry (below 50% Duty Cycle)	1% of period + 20 ns (typical, 1 kHz, 1 Vpp)			
Jitter	6 ns + 0.1% of period (typical, 1 kHz, 1 Vpp)			
Ramp Wave				
Linearity	< 0.1% of peak output (typical, 1 kHz, 1 Vpp, 100% Symmetry)			
Symmetry	0% to 100%			
Pulse Wave				
Pulse Width	2000 s max period; 20 ns min period; 1 ns resolution			
Overshoot	< 5%			
Jitter	6 ns + 100 ppm of period			
Arb Wave		CH1	CH2	
Waveform Length	4k points		1k points	
Vertical Resolution	14 bits (including sign)		10 bits (including sign)	
Sampling Rate	100 MSa/s		100 MSa/s	
Minimum Rising /Falling Time	35 ns (Typical)		35 ns (typical)	
Jitter (RMS)	6 ns + 30 ppm (typical)		6 ns + 30 ppm (typical)	

Nonvolatile Storage (Total:10 Waveforms)	10 waveforms	10 waveforms
Output Characteristics	CH1	CH2
Amplitude	2 mVpp ~ 10 Vpp (50 Ω) 4 mVpp ~ 20 Vpp (High Z)	2 mVpp ~ 3 Vpp (50 Ω) 4 mVpp ~ 6 Vpp (High Z)
Vertical Accuracy (100 kHz Sine)	±(1% of setting +1 mVpp)	±(1% of setting +1 mVpp)
Amplitude Flatness (relative to 100 kHz, 5 Vpp Sine wave)	<100 kHz 0.1 dB	<100 kHz 0.1 dB
	100 kHz ~ 5 MHz 0.15 dB	100 kHz ~ 5 MHz 0.15 dB
	5 MHz ~ 20 MHz 0.3 dB	5 MHz ~ 20 MHz 0.3 dB
DC Offset	CH1	CH2
Range (DC)	5 V (50 Ω) 10 V (High Z)	1.5 V (50 Ω) 3 V (High Z)
Offset Accuracy	±(1% of the Offset Setting + 1 mV)	± (1% of the Offset Setting + 1 mV)
Waveform Output	CH1	CH2
Impedance	50 Ω (typical)	50 Ω (typical)
Protection	Short-circuit protection ^[1]	Short-circuit protected ^[1]
AM (CH1)		
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)	
Source	Internal/ External	
Modulation Waveforms	Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb (2 mHz to 20 kHz)	
Depth	0% ~ 120%	
FM (CH1)		
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)	
Source	Internal/ External	
Modulation Waveforms	Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb (2 mHz to 20 kHz)	
Frequency Deviation	DC ~ 5 MHz	
PM (CH1)		
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)	
Source	Internal/ External	
Modulation waveforms	Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb (2 mHz to 20 kHz)	
Phase Deviation	0 ~ 360°	
FSK (CH1)		
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)	
Source	Internal/ External	
Modulating Waveforms	50% duty cycle square (2 mHz to 50 kHz)	
Sweep (CH1)		
Carrier Waveforms	Sine, Square, Ramp, Arb (except DC)	
Type	Linear or Logarithmic	
Direction	Up or Down	
Sweep Time	1 ms to 500 s ± 0.1%	
Trigger Source	Internal/External/Manual	
Burst (CH1)		
Waveforms	Sine, Square, Ramp, Pulse, Noise, Arb (except DC)	
Types	Count (1 to 50,000 periods), infinite, gated	
Start Phase	-180° to +180°	

Internal Period	1 μ s – 500 s \pm 1%		
Gate Source	External Trigger		
Trigger Source	Internal/External/Manual		
Rear Panel Connector			
External AM Modulation	\pm 5 VPK = 100% modulation 5 k Ω input impedance		
External Trigger	TTL compatible		
Trigger Input			
Input Level	TTL compatible		
Slope	Rising or falling (selectable)		
Pulse Width	> 100 ns		
Input Impedance	> 10 k Ω , DC coupled		
Linear Sweep	< 500 μ s (typical)		
Latency Sweep	< 500 ns (typical)		
Trigger Output			
Electrical Level	TTL compatible		
Pulse Width	> 400 ns (typical)		
Output Impedance	50 Ω (typical)		
Maximum Rate	1 MHz		
Sync Output (CH1)			
Electrical Level	TTL compatible		
Pulse Width	> 50 ns (typical)		
Output Impedance	50 Ω (typical)		
Maximum Frequency	2 MHz		
Counter Specification			
Function	Frequency, period, positive/negative Pulse width, Duty cycle		
Frequency Range	Single channel: 100 mHz ~ 200 MHz		
Frequency Resolution	6 digits/second		
Voltage Range and Sensitivity (non-modulation signal)			
Auto mode	1 Hz ~ 200 MHz	200 mVpp ~ 5 Vpp	
Manual mode	DC coupled	DC offset range	\pm 1.5 VDC
		100 mHz ~ 100 MHz	20 mVRMS ~ \pm 5 Vac+dc
	AC coupled	100 MHz ~ 200 MHz	40 mVRMS ~ \pm 5 Vac+dc
		1 Hz ~ 100 MHz	50 mVpp ~ \pm 5 Vpp
	100 MHz ~ 200 MHz	100 mVpp ~ \pm 5 Vpp	
Pulse width and Duty cycle Measure	1 Hz ~ 10 MHz (100 mVpp ~ 10 Vpp)		
Input adjust	Input impedance	1 M Ω	
	Coupling mode	AC, DC	
	High frequency restrain	High frequency noise restrain (HFR) On or Off	
	sensitivity	Low, Medium, High	
Trigger mode	The trigger level can adjust manually/ automatically		
	Trigger level range: \pm 3 V (0.1% to 100%)		
	Resolution: 6 mV		

Remark:

[1] In normal temperature, short circuit in less than half hour will be tolerable.

General Specifications

Display		
Display Type	Black and White LCD Screen	
Display Resolution	256 Horizontal x 64 Vertical	
Grey Degree	4 Level Grey	
Display Contrast (typical)	150 : 1	
Backlight Brightness (typical)	300 nit	
Power Supply		
Supply Voltage	100 ~ 240 VAC _{RMS} , 45 ~ 440 Hz, CAT II	
Power Consumption	Less than 40 W	
Fuse	2 A, T Level, 250 V	
Environment		
Ambient Temperature	Operation: 10°C ~ +40°C	
	Non-operation: -20°C ~ +60°C	
Cooling Method	Natural cooling	
Humidity Range	Below +35°C: ≤90% relative humidity	
	+35°C~+40°C: ≤60%relative humidity	
Height above sea level	Operation: below 3,000m	
	Non-operation: below 15,000m	
Mechanism		
Dimension	Width	232 mm
	Height	108 mm
	Depth	288 mm
Weight	Net Weight	2.65 kg
	Gross Weight	4 kg
IP Protection		
IP2X		
Calibration Interval		
One year suggested		

Ordering Information

Name of Product

RIGOL DG10X2 Series Function/Arbitrary Waveform Generator

Model Frequency

DG1012	15 MHz
DG1022	20 MHz

Standard Accessories

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

Optional Accessories

- BNC Cable

Contact Us

If you have any problem or requirement during using our products, please contact **RIGOL** Technologies, Inc. or the local distributors.

Domestic: Please call

Tel: (86-10) 8070 6688
Fax: (86-10) 8070 5070

Service & Support Hotline: 800 810 0002

9:00 am –5: 00 pm from Monday to Friday

Or by e-mail:

Service@rigol.com

Or mail to:

RIGOL Technologies, Inc.
156# CaiHe Village, ShaHe Town, ChangPing District, Beijing, China
Post Code: 102206

Overseas: Contact the local **RIGOL** distributors or sales office.

For the latest product information and service, visit our website: <http://www.rigolna.com>

Warranty

Very 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.