RIGOL
Data Sheet

DG1022 Dual-Channel Function/Arbitrary Waveform Generator

Product Overview

DG1022 Dual-Channel 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 USB flash device 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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RIGOL Technologies, Inc.

➢ Dual Channel Output, Built-in and Editable Arb Waveform
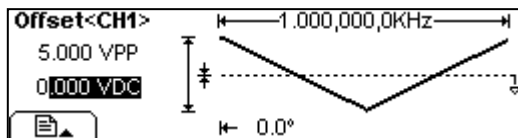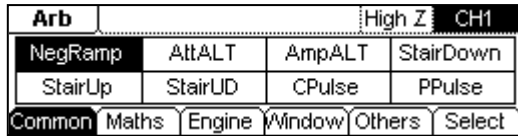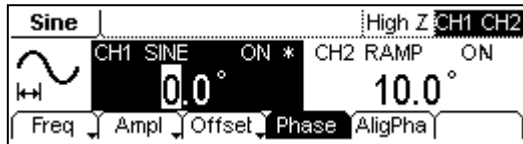
Dual Channel Output: Separately setup the wavefrom and parameter as well as the output state of two channels. The phases from two channels could be synchronous while outputting based on the "**AligPha**" function from operation menu.

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 continuousely cycle within specific time or apply external gating signal.
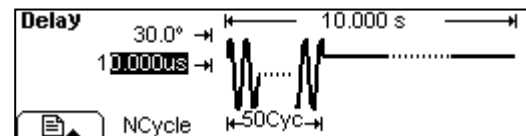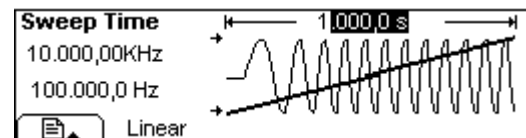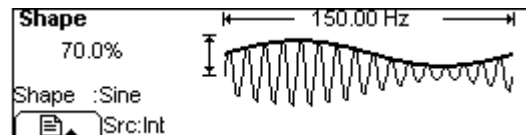
➢ Channel Coupling and Copy

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
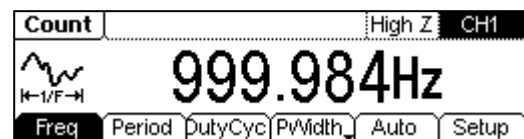
The counter coulde be used to measure these parameters: frequency, period, duty cycle, positive pulse width and negative pulse width within the range of 100 mHz to 200 MHz.
Two modes of counter are available:
Auto mode: The coupling mode, sensitivity, trigger level and the switch of high frequency reject could be set automatically.
Manual mode: DC/AC, sensitivity (low, mid, high), trigger level, the switch of high frequency reject could be set manually.

➢ **Powerful Waveform Editing Software "UltraWave"**
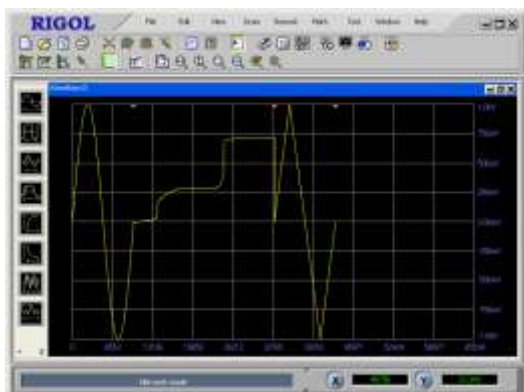
In order to meet the most basic needs of users, UltraWave provides 9 standard waveforms: Sine, Square, Ramp, Pulse, ExpRise, ExpFall, Sinc, Noise and DC. In addition, hand drawing, line (point by point) drawing and arbitrary points drawing are also offered to make it easier to create complex waveforms 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 wavefroms.
- Download the waves have heen created to the internal storage of DG1022.

Specifications

All the specifications below apply to DG1022 Dual-Channel 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 (18°C ~ 28°C).
- Variation of the operating temperature should be within $5\,^{\circ}C$.

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

Specifications

Frequency	
Waveforms	Sine, Square, Ramp, Triangle, Pulse, Noise, Arb
Sine	1 µHz ~ 20 MHz
Square	1 µHz ~ 5 MHz
Pulse	500 µHz ~ 3 MHz
Ramp/Triangle	1 µHz ~ 150 kHz
White Noise	5 MHz bandwidth (-3 dB)
Arb.	1 µHz ~ 5 MHz
Resolution	1 µHz
Accuracy	±50 ppm in 90 days ±100 ppm in 1 year 18°C ~ 28°C
Temperature Coefficient	< 5 ppm/°C

Sine Wave Spectrum Purity

Harmonic Distortion	CH1		CH2	
	≤1 Vpp	>1 Vpp	≤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 µHz ~ 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]	±(1% of setting +1 mVpp)	±(1% of setting +1 mVpp)
Amplitude Flatness (relative to 100 kHz, 5 Vpp Sine wave) [1]	<100 kHz 0.1 dB 100 kHz ~ 5 MHz 0.15 dB 5 MHz ~ 20 MHz 0.3 dB	<100 kHz 0.1 dB 100 kHz ~ 5 MHz 0.15 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 [2]	Short-circuit protected, overload relay automatically disables main output	Short-circuit protected
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 ~ 10 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 μs – 500 s ± 1%	
Gate Source	External Trigger	
Trigger Source	Internal/External/Manual	
Rear Panel Connector[3]		
External Modulation	± 5 Vpk = 100% modulation 5 kΩ input impedance	
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
Latency	Sweep: < 500 μs (typical)
	Burst: < 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	±1.5 VDC
		100 mHz ~ 100 MHz	20 mVRMS ~ ±5 Vac+dc
		100 MHz ~ 200 MHz	40 mVRMS ~ ±5 Vac+dc
	AC coupled	1 Hz ~ 100 MHz	50 mVpp ~ ±5 Vpp
		100 MHz ~ 200 MHz	100 mVpp ~ ±5 Vpp
Pulse width and Duty cycle Measure	1 Hz ~ 10 MHz (100 mVpp ~ 10 Vpp)		
Input adjust	Input impedance	1 MΩ	
	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: ±3 V (0.1% to 100%)		
	Resolution: 6 mV		

Remark:

[1] In atypical condition, the specification may have minor differences.

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

- CH1 is provided with **Overvoltage** function. When the output terminal is connected to an external circuit, the relationships between the output voltage "Vout" of generator and the voltage "Vin" possibly generated by external circuit are:

  If Vout≤1V$_{DC}$, the protective range of Vin is ±6.5V

  If Vout>1V$_{DC}$, the protective range of Vin is ±12.5V

  Thereinto, Vout=Amplitude/2+|Offset|, the Amplitude and Offset are the parameters of the signal outputted from generator.

  The generator will cut off the output automatically when Vin exceeds the specified range.

- The voltage inputted to the output connector of CH2 should be within ±3V.

[3] External input voltage should be within ±5V, or else the generator may be damaged.

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℃ ~ +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	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 DG1022 Dual-Channel
Function/Arbitrary Waveform Generator

Standard Accessories

- A Power Cord that fits the standard of destination country
- A CD (including User's Guide and application software)
- A Quick Guide

Optional Accessories

- BNC Cable
- BNC to Alligator Clip Cable
- USB Data Cable
- 40dB Attenuator
- Power Amplifier

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.

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