VOLTCRAFT

VOLTCRAFT – TOP PERFORMANCE IN EVERY WAY

For more than 40 years, our product range has been dynamically adapting to the constant changes in the industry.
We commit to offering first-class quality to our customers while delivering an excellent cost-performance ratio. This philosophy remains the cornerstone of Voltcraft's success.

FG-1302 / FG-1602
DUAL-CHANNEL
ARBITRARY WAVEFORM GENERATOR

CE

Item no. 2616564 (FG-1302)
Item no. 2616563 (FG-1602)

The DDS (Direct Digital Synthesizer) signal generator features inlude 4-bit vertical resolution with two independent channels. It has precise waveform outputs including sine, square, pulse, ramp, noise, as well as 150 built-in arbitrary waveforms.

FEATURES

FG-1602 (60 MHz frequency output) / FG-1302 (30 MHz frequency output) // 1 µHz frequency resolution // 2 channels // 9.14 cm (3.6 inch) TFT LCD display (480 x 272 pixels) // Supports SCPI // FG-1602 (300 MSa/s) / FG-1302 (125 MSa/s) maximum sampling rate // 14-bit vertical resolution

EQUIPMENT

Comprehensive waveform output: sine, square, pulse, ramp, noise, and 150 built-in arbitrary waveforms // Waveform length: 2 pts to 100 k // Modulation waveform: AM, DSB-AM, FM, PM, ASK, FSK, PSK, BPSK, QPSK, 3FSK, 4FSK, OSK, PWM, SUM, SWEEP, BURST // Frequency counter range: 100 mHz - 100 MHz // Frequency counter resolution: 7 digits // Input: Frequency counter input, External modulation input, External trigger input // Output: Sync output // Communication interface: USB host, USB device // Delivery

PACKAGE CONTENTS

Function generator // Power cord // USB cable // Q9 BNC cable // BNC to alligator cable // 1x spare fuse (250 V. F1AL) // Software + English manual on CD // Safety hint sheet // Quick guide

Model FG-1602 shown above.

Technical Data

All technical data are guaranteed when the following conditions are met, unless otherwise stated.

- The signal generator must be operated continuously for more than 30 minutes at the specified operating temperature (20°C to 30°C) to meet these specifications；
- The signal generator is in the calibration internal and has performed a self-calibration.

In addition to the specifications marked with the word "Typical", the specifications used are guaranteed.

Waveforms

Waveforms		
Bandwidth	FG-1032	30 MHz
	FG-1062	60 MHz
Sample Rate	FG-1032	125MSa/s
	FG-1062	300MSa/s
Vertical Resolution	14 bits	
Channel	2	
Standard Waveforms	Sine wave, square wave, ramp wave, pulse wave, noise	
Arbitrary Waveforms	Sinc, exponential rise, exponential decline, electrocardiogram, Gaussian, semi-positive, Lorentz, dual audio, DC voltage totaling more than 150 kinds	

Frequency Characteristics

Frequency Characteristics (Frequency resolution to 1 μHz)		
Sine wave	FG-1032	1 μHz ~ 30MHz
	FG-1062	1 μHz ~ 60MHz
Square wave	FG-1032	1 μHz ~ 15MHz
	FG-1062	1 μHz ~ 20MHz
Pulse wave	FG-1032	1 μHz ~ 15MHz
	FG-1062	1 μHz ~ 20MHz
Ramp wave	FG-1032	1 μHz ~ 1 MHz
	FG-1062	1 μHz ~ 2 MHz
Noise wave (-3 dB)	20 MHz BW（AWGN）	
Arbitrary wave	1 μHz - 10 MHz	
Frequency resolution	1 μHz or 7 significant figures	

Frequency stability	±30 ppm at 0±40℃
Frequency aging rate	±30 ppm per year

Amplitude Characteristics

Amplitude Characteristics (not specifically labeled, the load defaults to 50Ω)		
Output amplitude	FG-1032	2mVpp ~ 20Vpp（≤ 10MHz）High Z 2mVpp ~ 10Vpp（≤ 30MHz）High Z 1mVpp ~ 10Vpp（≤ 10MHz）50 Ω 1mVpp ~ 5Vpp（≤ 30MHz）50 Ω
	FG-1062	2mVpp ~ 20Vpp（≤ 10MHz）High Z 2mVpp ~ 10Vpp（≤ 60MHz）High Z 1mVpp ~ 10Vpp（≤ 10MHz）50 Ω 1mVpp ~ 5Vpp（≤ 60MHz）50 Ω
Amplitude accuracy	± (1% of setting + 1 mVpp) (Typical 1kHz sine, 0V offset)	
Amplitude resolution	1mVpp or 4 digits	
DC offset range (AC +DC)	FG-1032	±(10 Vpk–Amplitude Vpp/2) High Z（≤ 10MHz） ±(5Vpk - Amplitude Vpp/2) High Z（≤ 30MHz） ±(5 Vpk – Amplitude Vpp/2) 50Ω（≤ 10MHz） ±(2.5 Vpk – Amplitude Vpp/2) 50Ω（≤ 30MHz）
	FG-1062	±(10Vpk – Amplitude Vpp/2) High Z（≤ 10MHz） ±(5Vpk–Amplitude Vpp/2) High Z（≤ 60MHz） ±(5 Vpk - Amplitude Vpp/2) 50Ω（≤ 10MHz） ±(2.5 Vpk– Amplitude Vpp/2) 50Ω（≤ 60MHz）
	Note: Offset > 2.5Vpp, amplitude ≥10mV (High Z) Offset > 1.25Vpp, amplitude ≥5mV (50Ω)	
DC offset accuracy	± (1 % of |setting| + 1 mV + amplitude Vpp * 0.5%)	
Offset resolution	1 mVpp or 4 digits	
Output Impedance	50Ω (Typical)	

Signal Characteristics

Signal Characteristics		
Sine		
Bandwidth flatness (relative to 1 kHz Sine wave, 1 Vpp)	FG-1032	≤10MHz: ±0.3dB ≤30MHz: ±0.5dB
	FG-1062	≤10MHz: ±0.3dB ≤35MHz: ±0.5dB ≤60MHz: ±1dB
Harmonic distortion	FG-1032	Typical (0dBm) DC to 1MHz: <-65dBc 1MHz to 30MHz: <-60dBc

	FG-1062	Typical (0dBm) DC to 1MHz: <-65dBc 1MHz to 35MHz: <-60dBc 35MHz to 60MHz: <-50dBc
Total harmonic distortion	< 0.2 %, 10 Hz to 20 kHz, 1 Vpp	
Non-harmonic distortion	Typical (0dBm) ≤10MHz: <-70dBc >10MHz: <-70dBc + 6dB/ sound interval	
Phase noise	Typical (0dBm, 10kHz offset) 10MHz: ≤ -110dBc/Hz	
Square		
Rise/fall time	< 20ns	
Jitter (rms), typical (1Vpp, 50Ω)	200ps + 30ppm	
Overshoot	< 5%	
Ramp		
Linearity	< 1% of peak output (typical 1 kHz, 1 Vpp, symmetry 50%)	
Symmetry	0% to 100%	
Pulse		
Period	FG-1032	67 ns to 1 Ms
	FG-1062	50 ns to 1 Ms
Pulse Width	≥ 24ns	
Rise and fall time	≥ 15ns	
Overshoot	< 5%	
Jitter (rms), typical (1Vpp, 50Ω)	200ps + 30ppm	
Noise		
Types	Gaussian white noise	
Bandwidth (-3dB)	20 M	
Arbiratry wave		
Bandwidth	10M	
Waveform length	2 to 100K points	
Sampling rate	FG-1032	125Ma/s
	FG-1062	300Ma/s
Amplitude accuracy	14 bits	

Modulation Characteristics

Modulation Characteristics	
Modulation Type	AM, DSB-AM, FM, PM, ASK, FSK, PSK, BPSK, QPSK, 3FSK, 4FSK, OSK, PWM, SUM

AM	
Carrier	Sine wave, square wave, ramp wave, arbitrary wave (except DC)
Modulated signal source	Internal or external
Internal modulation waveform	Sine wave, square wave, ramp wave, white noise
Internal amplitude modulation frequency	2 mHz to 100 kHz
Depth	0.0% to 100.0%
DSB-AM	
Carrier	Sine wave, square wave, ramp wave
Modulated signal source	Internal or external
Internal modulation waveform	Sine wave, square wave, ramp wave
Internal amplitude modulation frequency	2 mHz to 100 kHz
Depth	0.0% to 100.0%
FM	
Carrier	Sine wave, square wave, ramp wave, arbitrary wave (except DC)
Modulated signal source	Internal or external
Internal modulation waveform	Sine wave, square wave, ramp wave, white noise
Internal modulation frequency	2 mHz to 100 kHz
Frequency offset	1 μHz ≤ offset < carrier frequency
PM	
Carrier	Sine wave, square wave, ramp wave, arbitrary wave (except DC)
Modulated signal source	Internal or external
Internal modulation waveform	Sine wave, square wave, ramp wave, white noise
Internal phase modulation frequency	2 mHz to 100 kHz
Phase deviation range	0° to 180°
PWM	
Carrier	Pulse wave
Modulated signal source	Internal or external
Internal modulation waveform	Sine wave, square wave, ramp wave, white noise

Internal phase modulation frequency	2 mHz to 1 MHz
Offset	0% to Carrier pulse duty cycle
ASK	
Carrier	Sine wave, square wave, ramp wave, arbitrary wave
Modulated signal source	Internal or external
Internal modulation waveform	50% square wave
Internal modulation amplitude	0m Vpp ≤ amplitude < carrier amplitude
ASK frequency	2 mHz to 1MHz
PSK	
Carrier	Sine wave, square wave, ramp wave, arbitrary wave
Modulated signal source	Internal or external
Internal modulation waveform	50% square wave
PSK frequency	2 mHz to 1MHz
Phase deviation range	0°to 360°
FSK	
Carrier	Sine wave, square wave, ramp wave, arbitrary wave
Modulated signal source	Internal or external
Internal modulation waveform	50% square wave
FSK rate	2 mHz to 1MHz
FSK hopfreq	2 mHz ≤ offset < maximum frequency of corresponding carrier
3FSK	
Carrier	Sine wave, square wave, ramp wave, arbitrary wave
Modulated signal source	Internal
Internal modulation waveform	50% square wave
FSK rate	2 mHz to 1MHz
4FSK	
Carrier	Sine wave, square wave, ramp wave, arbitrary wave
Modulated signal source	Internal
Internal modulation waveform	50% square wave
FSK rate	2 mHz to 1MHz

BPSK	
Carrier	Sine wave, square wave, ramp wave, arbitrary wave
Modulated signal source	Internal
Internal modulation waveform	50% square wave
BPSK rate	2 mHz to 1MHz
Phase deviation range	0°～360°
Data source	01patt, 10 patt, PN15,PN21
QPSK	
Carrier	Sine wave, square wave, ramp wave
Modulated signal source	Internal
QPSK frequency	2 mHz to 1MHz
OSK	
Carrier	Sine wave
Modulated signal source	Internal
Internal modulation waveform	50% square wave
Oscillation time	8ns to 499.75μs
OSK frequency	2 mHz to 1MHz
SUM	
Carrier	Sine wave, square wave, ramp wave
Modulated signal source	Internal or external
Internal amplitude modulation frequency	2 mHz to 100kHz
Depth	0.0% to 100.0%

Sweep Characteristics

Sweep Characteristics	
Carrier	Sine, square wave, ramp wave, arbitrary wave (Except DC)
Minimum/maximum starting frequency	1 μHz（minimum）/ maximum frequency of corresponding carrier
Minimum/maximum termination frequency	1 μHz（minimum）/ maximum frequency of corresponding carrier
Types	Linear, logarithmic
Sweep time	1 ms to 500 s ± 0.1%
Trigger source	Internal, external, manual

Burst Characteristics

Burst Characteristics		
Waveform	Sine wave, square wave, ramp wave, pulse wave and arbitrary wave (Except DC)	
Types	N-cycle,Gated	
N-cycle trigger source	Internal, external, manual	
Carrier frequency	1 μHz ≤ Offset ≤ Maximum frequency of corresponding carrier /2	
N-cycle trigger cycle	FG-1032	67 ns ～ 1 Ms（Min = Cycles * Period）
	FG-1062	34 ns ～ 1 Ms（Min = Cycles * Period）
periodicity	1 ～ 60000（Max =Burst Period / Period）/infinite	
Gated source	External trigger	

Counter Specifications

Counter Specifications	
Measurement function	Frequency, period
Frequency Range	Single channel :100 mHz - 200 MHz
Frequency resolution	7 digits
Input resistance	1 MΩ

Input/Output Characteristics

Input/Output Characteristics	
Communication Interface	USB Host, USB Device
External modulation input	
Input frequency range	DC - 20 kHz
Input level range	± 1V full scale
Input impedance	10 kΩ (typical)
External trigger input	
Level	TTL-compatible
Slope	Rising or falling (selectable)
Pulse Width	>100ns
Sync Output	
Level	TTL-compatible
Maximum frequency	1MHz

General Specifications

Display	
Display type	3.6-inch color LCD display
Display resolution	480 Horizontal ×272 Vertical pixels

Display color	65536 colors, 16 bits, TFT
Power	
Voltage	100- 240 VAC，50/60 Hz，CAT Ⅱ
Power consumption	Less than 20W
Fuse	250V, F1AL
Environment	
Temperature	Working temperature: 0 °C to 40 °C
	Storage temperature: -20 °C to 60 °C
Relative humidity	Less than 35°C: ≤ 90% relative humidity 35°C to 40°C: ≤ 60% relative humidity
Height	Operating 3,000 meters Non-operation 12,000 meters
Mechanical Specification	
Dimension	200mm (Length) × 92.1 mm (Height) × 147.5mm (Width)
Weight	Approx. 0.8 kg
Others	
Adjustment interval	The recommended calibration interval is one year