



**Hantek**



**HDG3000C** series

Arbitrary waveform signal generator

Data Manual

2022.05

## **Warranties and Declarations**

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### **Product certification**

Hantek certified HDG3000C series arbitrary waveform signal generator to meet China's national industry standards and has passed the CE certification.

### **Contact us**

If you have any questions when using the products of Qingdao Hantek Electronics Co., LTD., you can obtain service and support through the following ways:

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# 1 Product features

## Product features

- Frequency range(CH1/CH2):  
1 $\mu$ Hz ~ 100MHz/80MHz/60MHz/40MHz/25MHz; CH3: 1 $\mu$ Hz ~ 20MHz;
- Sampling rate up to 300MSa/s, 16 bits vertical resolution to ensure the accuracy of waveform amplitude;
- Double channels with equal performance, equivalent to two independent signal sources; CH3 fixed output;
- Storage depth up to 2M to create more waveform cycles as well as the better waveform details;
- Rich modulation functions, supporting for AM, DSB - AM, FM, PM, ASK, FSK and PSK, BPSK, QPSK, 3 FSK, 4 FSK, OSK and PWM, etc.;
- There are more than 160 arbitrary signals such as exponential rise, exponential fall, ECG signal, Gaussian, half orthogonality, Lorentz, dual tone multi-frequency, DC voltage, etc.
- 4.3-inch color TFT LCD screen, clear and intuitive user interface;
- Built-in high resolution 80MHz frequency meter;
- Standard communication interface: front USB Host and rear USB Device;
- Built-in harmonic generator function with 16 harmonic frequency, output harmonic with a specified number of times, amplitude and phase, usually used in harmonic detection equipment or the testing of harmonic filtering equipment.

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HDG3000C has 5 functions, that are arbitrary waveform generator, pulse generator, function generator, harmonic generator, frequency meter all in one; Using DDS (direct digital frequency synthesis) technology, which can generate stable, pure and low distortion output signal; User-friendly interface design and keyboard layout bring users extraordinary experience; Rich configuration interfaces can easily realize computer control, providing more solutions to user measurement.

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## 2 Technical indicators

All technical specifications are applicable to HDG3000C series signal generators. Unless otherwise stated, all technical specifications are guaranteed when the following two conditions hold.

- The signal generator is within the calibration period.
- The signal generator has been operated continuously for more than 30 minutes at the specified operating temperature (18°C to 28°C).

All specifications are guaranteed except those marked with "typical".

### Overview of HDG3000C technical specifications

Model	HDG3103C	HDG3083C	HDG3063C	HDG3043C	HDG3023C
Channel	Three channels				
Wavelength	2M				
Frequency range	100M	80M	60M	40M	25M
Sampling rate	300MSa/s				
Voltage resolution	16Bit				

### Waveform

Standard waveform output	Sine wave, square wave, triangle wave, pulse wave, noise, harmonic wave, DC
Arbitrary waveform output	160 arbitrary waveforms, including exponential rise, exponential fall, ECG signal, Gaussian, half vector, Lorentz, dual tone multiple frequency, etc

### Frequency properties

Sine wave	1uHz~100MHz	1uHz~80MHz	1uHz~60MHz	1uHz~40MHz	1uHz~25MHz
Square	1uHz~15MHz	1uHz~15MHz	1uHz~15MHz	1uHz~15MHz	1uHz~15MHz

wave

Pulse 1uHz~15MHz 1uHz~15MHz 1uHz~15MHz 1uHz~15MHz 1uHz~15MHz

wave

Triangle 1uHz~2MHz 1uHz~2MHz 1uHz~2MHz 1uHz~2MHz 1uHz~2MHz

wave

Harmonic 1uHz~50MHz 1uHz~40MHz 1uHz~30MHz 1uHz~20MHz 1uHz~10MHz

Noise 100 MHz bandwidth

(-3 dB)

Arbitrary 1uHz~20MHz 1uHz~20MHz 1uHz~20MHz 1uHz~15MHz 1uHz~15MHz

wave

Resolution 1uHz

Precision ±1ppm, 18~28°C

**Square properties**

Rise/fall time Typical (1KHz, 1Vpp) ≤9ns

Overshoot Typical (100KHz, 1Vpp) ≤5%

Duty ratio 0.001% ~ 99.999%; The range varies with frequency.

Asymmetry 1% period +4ns

**Triangle wave properties**

Linear ≤1% peak output (typical, 1KHz, 1Vpp, 100% symmetry)

Symmetry 0% ~ 100%

**Pulse wave properties**

Cycle 67ns~1Ms 67ns~1Ms 67ns~1Ms 67ns~1Ms 67ns~1Ms

Pulse width  $\geq 16\text{ns}$  (limited by current frequency settings)

Duty ratio 0.001% to 99.999% (limited by current frequency settings)

Rise/fall time  $\geq 9\text{ns}$  (limited by current frequency settings and pulse width settings)

Overshoot Typical (1KHz, 1Vpp)  $\leq 5\%$

**Arbitrary wave properties**

Wavelength 2M

Vertical 16 Bits

resolution

Sampling rate 1uSa/s ~ 75MSa/s, 1uSa/s resolution

Rise/fall time  $\geq 9\text{ns}$

Overshoot Typical (1Vpp)  $\leq 5\%$

**Harmonic properties**

Harmonic  $\leq 16$

frequency

Harmonic Even harmonic, odd harmonic, all harmonics

type

Harmonic Each harmonic amplitude can be set.

amplitude

Harmonic Each harmonic amplitude can be set.

phase

**Amplitude properties (50Ω terminations)**

Amplitude range	$\leq 10\text{MHz}$ : 1mVpp ~ 10Vpp; $\leq 40\text{MHz}$ : 1mVpp ~ 5.5Vpp; $\leq 60\text{MHz}$ : 1mVpp ~ 4Vpp; $\leq 80\text{MHz}$ : 1mVpp ~ 2Vpp; $\leq 100\text{MHz}$ : 1mVpp ~ 1.5Vpp;
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Precision	Typical (1KHz sine wave, 0V offset, >10mVpp) $\pm 1\%$ set value $\pm 5\text{mVpp}$
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Amplitude flatness	$\leq 5\text{MHz}$ : $\pm 0.1\text{dB}$ ;
(3.5Vpp, 50 $\Omega$ relative to 1kHz sine wave)	$\leq 15\text{MHz}$ : $\pm 0.2\text{dB}$ ; $\leq 25\text{MHz}$ : $\pm 0.3\text{dB}$ ; $\leq 40\text{MHz}$ : $\pm 0.5\text{dB}$ ; $\leq 60\text{MHz}$ : $\pm 1.0\text{dB}$ ;

Unit	Vpp, mVpp, Vrms, dBm(50 $\Omega$ impedance)
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Resolution	1mVpp
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#### Offset properties (50 $\Omega$ terminations)

Range	$\pm 5\text{Vpkac+dc}$
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Precision	$\pm(1\%$ set value + 5mV + 1% amplitude)
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#### Waveform output

Impedance	50 $\Omega$
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#### Modulation properties

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

**AM**

Carrier wave Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation Internal, external, other channels

source

Modulation Sine wave, square wave, triangle wave, Noise, sampled wave, EXP drop, half wave positive vector, Lorentz, dual audio, Gaussian, ECG

Modulation 2mHz~1MHz

frequency

Modulation 0% ~ 120%

**DSB-AM**

Carrier wave Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation Internal, external, other channels

source

Modulation Sine wave, square wave, triangle wave, Noise, sampled wave, EXP drop, half wave positive vector, Lorentz, dual audio, Gaussian, ECG

Modulation 2mHz~1MHz

frequency

Modulation 0% ~ 120%



depth

### FM

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation Internal, external, other channels

source

Modulation Sine wave, square wave, triangle wave, Noise, sampled wave, EXP drop, half wave positive vector, Lorentz, dual audio, Gaussian, ECG

Modulation 2mHz~1MHz

frequency

### PM

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation Internal, external, other channels

source

Modulation Sine wave, square wave, triangle wave, Noise, sampled wave, EXP drop, half wave positive vector, Lorentz, dual audio, Gaussian, ECG

Modulation 2mHz~1MHz

frequency

Phase  $0^\circ \sim 360^\circ$

deviation

### ASK

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation Internal, external

source

Modulation A square wave with 50% duty cycle

wave

Modulation 2mHz~1MHz

frequency

**FSK**

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation Internal, external

source

Modulation A square wave with 50% duty cycle

wave

Modulation 2mHz~1MHz

frequency

**PSK**

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation Internal, external

source

Modulation A square wave with 50% duty cycle

wave

Modulation 2mHz~1MHz

frequency

### BPSK

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation PN15 code, PN21 code, 01 code, 10 code

data source

Modulation 2mHz~1MHz

frequency

### QPSK

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation PN15 code, PN21 code

data source

Modulation 2mHz~1MHz

frequency

### 3FSK

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation internal

source

Modulation A square wave with 50% duty cycle

wave

Modulation 2mHz~1MHz

frequency

### 4FSK

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Modulation internal

source

Modulation A square wave with 50% duty cycle

wave

Modulation 2mHz~1MHz

frequency

### OSK

Carrier Sine wave

Modulation Internal, external

source

Shock time 8 ns - 4.99975 ms

Modulation 2mHz~1MHz

frequency

### PWM

Carrier Square wave

Modulation Internal, external, other channels

source

Modulation Sine wave, square wave, triangle wave, Noise, sampled wave, EXP drop,  
wave half positive vector, Lorentz, dual audio, Gaussian, ECG

Modulation 2mHz~50KHz

frequency

Duty cycle 0.1% ~ 49.9%

deviation

### External modulation input

Input range AM, DSB-AM, FM, PM, OSK, PWM: 75mVRMS ~ ±5Vac+dc  
ASK, FSK, PSK: TTL level

Input 50KHz

bandwidth

Input  $10^{12}\Omega$

impedance

### Sweep frequency properties

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave,  
arbitrary wave (except DC)

Type Linear

Direction Upward

Sweep frequency 1ms ~ 50Ks

time

Hold/return time 1ms ~ 50Ks

Trigger source Internal, external, manual

Tag Sync the model's falling edge

**Burst properties**

Carrier Sine wave, square wave, triangle wave, pulse wave, harmonic wave, arbitrary wave (except DC)

Carrier 1uHz~100M 1uHz~80MH 1uHz~60MH 1uHz~40MH 1uHz~25MH 1uHz~15MH

frequency Hz z z z z z z

Burst 1 ~ 2000 000 000

counting

Start/stop 0° ~ 360°

phase

Internal 2μs ~ 500s

cycle

Gate control External trigger

source

Trigger Internal, external, manual

source

**Counter**

Measurement functions	Frequency, period, positive/negative pulse width, duty cycle
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Frequency	1uHz~80MHz
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Gate time	10ms~16s
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Input signal range 0 ~ 3.3 V

### Trigger properties

#### Trigger input

level	TTL - compatible
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Slope	Rise or fall (optional)
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Pulse width	>100ns
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#### Trigger output

Level	TTL - compatible
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Pulse width	>60ns
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Maximum frequency	1MHz
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### Reference clock

#### External reference input

Lock range	10MHz $\pm$ 50Hz
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Level	Low: 0~400mV, high: 2.5V~ 5V
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Locking time	<2s
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Input impedance	50 $\Omega$ , DC coupling
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Internal reference output

Frequency 10MHz  $\pm$  50Hz

Level 3.3 Vpp

Output impedance 50  $\Omega$ , DC coupling

(typical value)

Synchronous output

Level TTL - compatible

Impedance 50  $\omega$ , nominal value

CH3 output

Standard Sine wave, square wave, triangle wave, noise, harmonic wave, DC waveform output

Arbitrary 160 kinds of arbitrary waveforms, including exponential rise, waveform output exponential fall, ECG signal, Gaussian, half normal vector, Lorentz, double tone multiple frequency, etc.

Frequency Sine wave: 1uHz~20MHz

Square wave: 1uHz~5MHz

Triangle wave: 1uHz~1MHz

Harmonic wave: 1uHz~5MHz

Arbitrary wave: 1uHz~15MHz

Frequency  $\pm$ 1ppm, 18~28 $^{\circ}$ C

accuracy

Sampling rate 150MSa/s



Data length 8K

Vertical resolution 12bit

Amplitude 2mVpp~7Vpp (high resistance)

Output impedance 50 Ω

### General features

Interface USB Host, USB Device

Display 4.3-inch color TFT LCD

Voltage 100-120VACRMS(±10%), 45Hz to 440Hz, CAT II

120-240VACRMS(±10%), 45Hz to 66Hz, CAT II

Power <30W

Fuse T, 0.5A, 250V, 5x20mm

### Environment

Temperature When operating: 0°C ~ 45°C

range When not operating: -20 °C ~ 60 °C

Humidity ≤+104°F(≤+40°C): relative humidity≤90%

range 106°F~122°F (+41°C ~50°C): relative humidity≤60%

Altitude When operating: Below 3,000 meters

When not operating: Below 15,000 meters

### Mechanical specifications

Dimensions (width x height x depth) 265 x 110 x 310mm

Weight 2.5 KG



### 3 Order information and warranty period

#### Order information

Order information	Order no.
<b>Host machine model</b>	
100MHz, 3-channel signal generator	HDG3103C
80MHz, 3-channel signal generator	HDG3083C
60MHz, 3-channel signal generator	HDG3063C
40MHz, 3-channel signal generator	HDG3043C
25MHz, 3-channel signal generator	HDG3023C
<b>Standard accessories</b>	
A power cord that meets the standard of the host country	--
BNC to BNC	HT322
Alligator clip wires (2)	HT324
USB cable	--

#### Warranty period

The host machine is guaranteed for 3 years, excluding the probe and accessories.



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