



Hantek



HDG3000B series

Arbitrary waveform signal generator

Data Manual

2022.05

Warranties and Declarations

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Product certification

Hantek certified HDG3000B 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:

Email: service@hantek.com, support@hantek.com

Website: <http://www.hantek.com>

1 **Product features**

Product features

- Frequency range: 1 μ Hz ~ 100MHz/80MHz/60MHz/40MHz/25MHz;
- 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;
- 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.

HDG3000B 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.

2 Technical indicators

All technical specifications are applicable to HDG3000B 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 HDG3000B technical specifications

| | | | | | | |
|-------|----------|----------|----------|----------|----------|----------|
| Model | HDG3102B | HDG3082B | HDG3062B | HDG3042B | HDG3022B | HDG3012B |
|-------|----------|----------|----------|----------|----------|----------|

| | |
|---------|--------------|
| Channel | Two channels |
|---------|--------------|

Wavelength 2M

| | | | | | | |
|-----------|--------|-------|-------|-------|-------|-------|
| Frequency | 100MHz | 80MHz | 60MHz | 40MHz | 25MHz | 15MHz |
|-----------|--------|-------|-------|-------|-------|-------|

range

| | |
|----------|----------|
| Sampling | 300MSa/s |
|----------|----------|

rate

| | |
|---------|-------|
| Voltage | 16Bit |
|---------|-------|

resolution

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

Hz z z z z z z

Square wave 1uHz~15MH 1uHz~15MH 1uHz~15MH 1uHz~15MH 1uHz~15MH 1uHz~15MH

z z z z z z

Pulse wave 1uHz~15MH 1uHz~15MH 1uHz~15MH 1uHz~15MH 1uHz~15MH 1uHz~15MH

z z z z z z

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

z z z z z z

Harmonic 1uHz~50MH 1uHz~40MH 1uHz~30MH 1uHz~20MH 1uHz~10MH 1uHz~5MH

z z z z z

Noise 100MHz bandwidth

(-3dB)

Arbitrary wave 1uHz~20MH 1uHz~20MH 1uHz~20MH 1uHz~15MH 1uHz~15MH 1uHz~15MH

z z z z z z

Resolution 1uHz

Precision ± 1 ppm, 18~28°C

Square properties

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

Overshoot Typical (100KHz, 1Vpp) $\leq 5\%$

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

Asymmetry 1% period +4ns

Triangle wave properties

Linear $\leq 1\%$ peak output (typical, 1KHz, 1Vpp, 100% symmetry)

Symmetry 0% ~ 100%

Pulse wave properties

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

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

Duty ratio 0.001%至 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 resolution 16 Bits

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

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

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

Harmonic properties

Harmonic frequency ≤ 16

Harmonic type Even harmonic, odd harmonic, all harmonics

Harmonic amplitude Each harmonic amplitude can be set.

Harmonic phase Each harmonic amplitude can be set.

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; |
|-----------------|---|

| | |
|-----------|--|
| Precision | Typical (1KHz sine wave, 0V offset, >10mVpp) $\pm 1\%$ set value $\pm 5\text{mVpp}$ |
|-----------|--|

| | |
|--------------------|---|
| Amplitude flatness | $\leq 5\text{MHz}$: $\pm 0.1\text{dB}$; (3.5Vpp, 50 Ω 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 Ω impedance) |
|------|---|

| | |
|------------|-------|
| Resolution | 1mVpp |
|------------|-------|

Offset properties (50 Ω terminations)

| | |
|-------|------------------------|
| Range | $\pm 5\text{Vpkac+dc}$ |
|-------|------------------------|

| | |
|-----------|---|
| Precision | $\pm(1\%$ set value + 5mV + 1% amplitude) |
|-----------|---|

Waveform output

| | |
|-----------|-------------|
| Impedance | 50 Ω |
|-----------|-------------|

Modulation properties

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

| | |
|------|-----|
| type | PWM |
|------|-----|

AM

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

| | |
|-------------------|------------------------------------|
| Modulation source | Internal, external, other channels |
|-------------------|------------------------------------|

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

| | |
|----------------------|-----------|
| Modulation frequency | 2mHz~1MHz |
|----------------------|-----------|

| | |
|------------------|-----------|
| Modulation depth | 0% ~ 120% |
|------------------|-----------|

DSB-AM

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

| | |
|-------------------|------------------------------------|
| Modulation source | Internal, external, other channels |
|-------------------|------------------------------------|

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

| | |
|----------------------|-----------|
| Modulation frequency | 2mHz~1MHz |
|----------------------|-----------|

| | |
|------------------|-----------|
| Modulation depth | 0% ~ 120% |
|------------------|-----------|

FM

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

| | |
|-------------------|------------------------------------|
| Modulation source | Internal, external, other channels |
|-------------------|------------------------------------|

| | |
|-----------------|---|
| Modulation wave | Sine wave, square wave, triangle wave, Noise, sampled wave, EXP |
|-----------------|---|

drop, half positive vector, Lorentz, dual audio, Gaussian, ECG

Modulation frequency 2mHz~1MHz

PM

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

Modulation source Internal, external, other channels

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

Modulation frequency 2mHz~1MHz

Phase deviation $0^{\circ} \sim 360^{\circ}$

ASK

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

Modulation source Internal, external

Modulation wave A square wave with 50% duty cycle

Modulation frequency 2mHz~1MHz

FSK

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

Modulation source Internal, external

Modulation wave A square wave with 50% duty cycle

Modulation frequency 2mHz~1MHz

PSK

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

Modulation source Internal, external

Modulation wave A square wave with 50% duty cycle

Modulation frequency 2mHz~1MHz

BPSK

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

Modulation data source PN15 code, PN21 code, 01 code, 10 code

Modulation frequency 2mHz~1MHz

QPSK

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

Modulation data source PN15 code, PN21 code

Modulation frequency 2mHz~1MHz

3FSK

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

Modulation source internal

Modulation wave A square wave with 50% duty cycle

Modulation frequency 2mHz~1MHz

4FSK

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

Modulation source internal

Modulation wave A square wave with 50% duty cycle

Modulation 2mHz~1MHz

frequency

OSK

Carrier Sine wave

Modulation source Internal, external

Shock time 8 ns - 4.99975 ms

Modulation frequency 2mHz~1MHz

PWM

Carrier Square wave

Modulation source Internal, external, other channels

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

Modulation frequency 2mHz~50KHz

Duty cycle deviation 0.1% ~ 49.9%

External modulation input

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

Input bandwidth 50KHz

Input impedance 10¹²Ω

Sweep frequency properties

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

Type Linear

Direction Upward

Sweep frequency time 1ms ~ 50Ks

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

Burst 1 ~ 2000 000 000

counting

Start/stop 0° ~ 360°

phase

Internal 2 μ s ~ 500s

cycle

Gate control External trigger

source

Trigger Internal, external, manual

source

Counter

Measurement Frequency, period, positive/negative pulse width, duty cycle

functions

Frequency 1uHz~80MHz

Gate time 10ms~16s

Input signal range 0 ~ 3.3 V

Trigger properties

Trigger input

level TTL - compatible

Slope Rise or fall (optional)

Pulse width >100ns

Trigger output

Level TTL - compatible

Pulse width >60ns

Maximum frequency 1MHz

Reference clock

External reference input

Lock range 10MHz ± 50Hz

Level Low: 0~400mV, high: 2.5V~ 5V

Locking time <2s

Input impedance 50 Ω, DC coupling

Internal reference output

Frequency 10MHz ± 50Hz

Level 3.3 Vpp

Output impedance (typical value) 50 Ω, DC coupling

Synchronous output

Level TTL - compatible

Impedance 50 Ω, nominal value

CH3 output

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

Arbitrary waveform output 160 kinds of arbitrary waveforms, including exponential rise, 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 accuracy | ± 1 ppm, 18~28 $^{\circ}$ C |
| 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($\pm 10\%$), 45Hz to 440Hz, CAT II 120-240VACRMS($\pm 10\%$), 45Hz to 66Hz, CAT II |
| Power | <30W |
| Fuse | T, 0.5A, 250V, 5x20mm |

Environment

| | |
|-------------------|---|
| Temperature range | When operating: 0 $^{\circ}$ C ~ 45 $^{\circ}$ C When not operating: -20 $^{\circ}$ C ~ 60 $^{\circ}$ C |
| Humidity range | $\leq +104^{\circ}$ F ($\leq +40^{\circ}$ C): relative humidity $\leq 90\%$ 106 $^{\circ}$ F ~ 122 $^{\circ}$ F (+41 $^{\circ}$ C ~ 50 $^{\circ}$ C): relative humidity $\leq 60\%$ |

| | |
|----------|---|
| 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. |
|--|-----------|
| Host machine model | |
| 100MHz, 2-channel signal generator | HDG3102B |
| 80MHz, 2-channel signal generator | HDG3082B |
| 60MHz, 2-channel signal generator | HDG3062B |
| 40MHz, 2-channel signal generator | HDG3042B |
| 25MHz, 2-channel signal generator | HDG3022B |
| 15MHz, 2-channel signal generator | HDG3012B |
| Standard accessories | |
| 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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