



# AFG-2000 Series

## Arbitrary Function Generator

### FEATURES

- 0.1Hz ~ 5/12/25 MHz with 0.1Hz Resolution
- Sine, Square, Pulse, Ramp, Triangle, Noise, DC and Arbitrary Waveform
- 20MSa/s Sampling Rate, 10 bit Vertical Resolution and 4k point Memory for Arbitrary Waveform
- 1% ~ 99% Adjustable Duty Cycle for Square Waveform
- Waveform Parameter Setting Through Numeric Keypad Entry & Knob Selection
- Amplitude, DC Offset and Other Key Setting Information Shown on the 3.5" LCD Screen Simultaneously
- AM/FM/FSK Modulation, Sweep, and Frequency Counter Functions (AFG-2100 only)
- USB Device Interface for Remote Control and Waveform Editing
- PC Arbitrary Waveform Editing Software

**GW INSTEK**  
Simply Reliable

원문: GW Instek AFG-2100/2000 시리즈 브로셔 · 제조사 원문 자료입니다. 사양은 제조사 사정에 따라 변경될 수 있습니다.

## PANEL INTRODUCTION



- 1. 3 Color LCD Panel
- 2. General Function Keys
- 3. Arbitrary Function Keys
- 4. Number Pad
- 5. Scroll Knob & Selection Key
- 6. Output Terminals
- 7. Main Output Switch
- 8. Power Switch
- 9. Operation Keys
- 10. Trigger, Modulation & Counter Input
- 11. Modulation Output
- 12. USB Device

## Innovation and Value in Waveform Design

The AFG-2100/2000 Series Arbitrary Function Generator is a DDS (Direct Digital Synthesized) based signal generator designed to accommodate the educational and basic industrial requirements for an accurate and affordable signal source covering the output of Sine, Square (Pulse), Ramp (Triangle), Noise and Arbitrary waveforms. The 20MSa/s sampling rate, 10 bit vertical resolution and 4k point memory of the AFG-2100/2000 Series provide users with a flexible environment for creating the specific waveform output as needed. The 0.1Hz resolution of Sine, Square and Triangle waveforms and the 1% ~ 99% adjustable duty cycle of Square (Pulse) waveform are the remarkable features to greatly extend its application range in various fields. The AFG-2100/2000 Series includes 6 models in three frequency bands of 5MHz, 12MHz and 25MHz. Besides the basic features of the whole AFG-2100/2000 Series, AFG-2100 carries additional features of AM/FM/FSK Modulation, Sweep, and Frequency Counter.

The friendly human interface of AFG-2100/2000 Series allows users to set waveform parameters, including waveform type, frequency, amplitude, DC offset, modulation type, and duty cycle, through keypad entry and/or the knob selection, and display the set parameters on the 3.5" LCD screen. The AFG-2100/2000 Series is equipped with a USB Device interface for remote control and waveform editing through a PC. A waveform editing software is provided to facilitate the waveform creation on the PC. After the waveform editing is done, the user is able to download the waveform data from PC to the AFG-2100/2000 Series for signal output.

### A. BUILT-IN ARBITRARY WAVEFORM FUNCTION

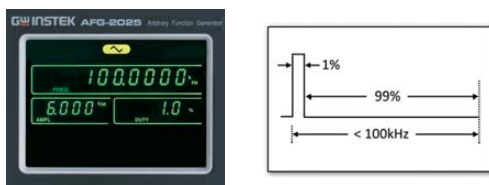


In addition to the high accuracy and high stability DDS Function Waveforms-Sine, Square and Ramp, the AFG-2100/2000 Series also provides the feature to generate Arbitrary Waveforms as what user wants. The 20MSa/s sampling rate, 10 bit vertical resolution and 4k point

waveform memory allow user to create the needed waveform point by point through keypad entry on the front panel, or to do waveform editing on the PC and download the waveform data to the AFG-2100/2000 Series, for arbitrary waveform output.

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## B. 1% ADJUSTABLE DUTY CYCLE OF SQUARE WAVE



1% Duty Cycle of Square Wave Setting

For most conventional Function Generators, the adjustable duty cycle falls in a limited 20% ~ 80% range, which may not fit the demands of specific applications. The AFG-2100/2000 is able to provide a 1%~99% variable duty cycle for its Square waveform and 0%~100% variable symmetry for the Ramp. This allows the AFG-2100/2000 to be used as a Pulse Generator to create pulse waveform simulating a spike signal or a transient signal.

## D. AMPLITUDE & DC OFFSET DISPLAY



Parameter Display

With the 3.5" LCD, the AFG-2100/2000 is able to show output waveform amplitude, DC offset and other key setting information simultaneously. This provides the convenience for user to know what signal is being sent out at the output terminal without the need to check the waveform through an oscilloscope.

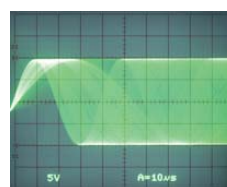
## C. FULLY DIGITAL ENTRY DESIGN



Fully Digital Keypad Operation

The conventional analog knob is not accurate enough for precision setting of waveform parameters, and may generate noise to interfere the system operation. The keypad entry design of AFG-2100/2000 improves the setting uncertainty and therefore significantly increases the accuracy of its waveform output. Besides, there is a Main Output switch which controls the main signal ON/OFF status. When a parameter, like output amplitude, is intended to be changed, user can turn off the output signal to avoid damaging the DUT.

## E. AM/FM/FSK MODULATION, SWEEP & FREQUENCY COUNTER



Sweep Waveform

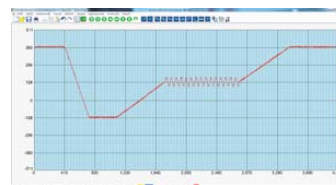
All AFG-2100 models are equipped with additional AM/FM/FSK Modulation, Sweep & Frequency Counter functions. The AM/FM modulated signal provides a means for basic modulation circuit tests and experiments, and the FSK modulated signal offers the signal source of the most common digital modulation signal. The Sweep function adequately fits a lot of basic applications such as sweep-tone test for the speaker in audio frequency range. The built-in frequency counter is able to measure the frequency of an external signal up to 150MHz, which saves the cost of purchasing a frequency counter.

## F. USB INTERFACE & ARBITRARY WAVEFORM EDITING PC SOFTWARE



USB Device Interface

The AFG-2100/2000 Series provides a USB Device Interface, which allows the programming of remote control or ATE of the product. An arbitrary waveform editing PC software can generate the waveform by hand drawing, recalling and tailoring waveforms including Rayleigh, Gaussian, Normal Noise, Pseudo Ternary, Bipolar AMI, Manchester, Differential Manchester, RS-232C, and NRZ etc. from the library.



Arbitrary Waveform Editing PC Software

Besides, this software can import CSV format file as waveform data which is created by the other tools. After the waveform editing is completed on the PC, the waveform data can be downloaded through USB Interface to the AFG-2100/2000 for arbitrary waveform output. The software fits for both AFG-2100/2000 and 3000 series and can be downloaded from GW Instek's website. ([www.gwinstek.com](http://www.gwinstek.com))

| SPECIFICATIONS             |                                                                                  | AFG-2100 Series                                                                                                                                |          |          | AFG-2000 Series |          |          |
|----------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|-----------------|----------|----------|
| MODELS                     |                                                                                  | AFG-2105                                                                                                                                       | AFG-2112 | AFG-2125 | AFG-2005        | AFG-2012 | AFG-2025 |
| WAVEFORMS                  |                                                                                  | Sine, Square, Ramp, Noise, Arbitrary Waveform                                                                                                  |          |          |                 |          |          |
| ARITRARY FUNCTION          |                                                                                  | 20MSa/s<br>10MHz<br>4k point<br>10 bit                                                                                                         |          |          |                 |          |          |
| FREQUENCY CHARACTERISTICS  | Sample Rate                                                                      | 0.1Hz~5MHz                                                                                                                                     |          |          |                 |          |          |
|                            | Repetition Rate                                                                  | 0.1Hz ~ 1MHz                                                                                                                                   |          |          |                 |          |          |
|                            | Waveform Length                                                                  | 0.1Hz                                                                                                                                          |          |          |                 |          |          |
|                            | Amplitude Resolution                                                             | ±20ppm                                                                                                                                         |          |          |                 |          |          |
|                            | Range                                                                            | ±1ppm, per 1 year                                                                                                                              |          |          |                 |          |          |
|                            | Sine/Square                                                                      | ≤ 10mHz                                                                                                                                        |          |          |                 |          |          |
|                            | Resolution                                                                       | ≤ 20MHz : 1mVpp~10Vpp(50Ω); 2mVpp~20Vpp(open-circuit)                                                                                          |          |          |                 |          |          |
|                            | Accuracy                                                                         | ≤ 25MHz : 1mVpp~5Vpp(50Ω); 2mVpp~10Vpp(open-circuit)                                                                                           |          |          |                 |          |          |
|                            | Stability                                                                        | ±2% of setting ±1mVpp; (at 1kHz/into 50Ω without DC offset)                                                                                    |          |          |                 |          |          |
|                            | Aging                                                                            | ±1% (0.1dB) ≤ 100kHz; ±3% (0.3dB) ≤ 5MHz; ±4% (0.4dB) ≤ 12MHz; ±20% (2dB) ≤ 20MHz; ±5% (0.4dB) ≤ 25MHz; (sine wave relative to 1 kHz/into 50Ω) |          |          |                 |          |          |
|                            | Tolerance                                                                        | Vpp, Vrms, dBm                                                                                                                                 |          |          |                 |          |          |
|                            | Offset                                                                           | ±5Vpk ac+dc(into 50Ω); ±10Vpk ac+dc(open circuit); ±2.5Vpk ac+dc(into 50Ω) for 20MHz~25MHz; ±5Vpk ac+dc(open circuit) for 20MHz~25MHz          |          |          |                 |          |          |
|                            | Range                                                                            | 2% of setting+10mV+0.5% of amplitude                                                                                                           |          |          |                 |          |          |
|                            | Waveform Output                                                                  | 50Ω typical (fixed); >300kΩ (output disabled)                                                                                                  |          |          |                 |          |          |
|                            | Impedance                                                                        | Short-circuit protected; Overload relay auto matically disables main output                                                                    |          |          |                 |          |          |
|                            | Protection(main output)                                                          | TTL-compatible into >1kΩ                                                                                                                       |          |          |                 |          |          |
|                            | SYNC Output                                                                      | 500 nominal                                                                                                                                    |          |          |                 |          |          |
|                            | Level                                                                            | ≤ 25ns                                                                                                                                         |          |          |                 |          |          |
|                            | Impedance                                                                        | -55 dBc DC ~ 200kHz, Ampl > 0.1Vpp; -50 dBc 200kHz ~ 1MHz, Ampl > 0.1Vpp                                                                       |          |          |                 |          |          |
|                            | Rise or Fall Time                                                                | -35 dBc 1MHz ~ 5MHz, Ampl > 0.1Vpp; -30 dBc 5MHz ~ 25MHz, Ampl > 0.1Vpp                                                                        |          |          |                 |          |          |
| SINE WAVE CHARACTERISTICS  | Harmonic Distortion                                                              | ≤ 25ns at maximum output (into 50Ωload)                                                                                                        |          |          |                 |          |          |
| SQUAREWAVE CHARACTERISTICS | Rise/Fall Time                                                                   | < 5%                                                                                                                                           |          |          |                 |          |          |
|                            | Overshoot                                                                        | 1% of period+1 ns                                                                                                                              |          |          |                 |          |          |
|                            | Asymmetry                                                                        | 1%~99%≤100kHz; 20.0%~80.0%≤5MHz; 40.0%~60.0%≤10MHz; 50%≤25MHz                                                                                  |          |          |                 |          |          |
|                            | Variable Duty Cycle                                                              | (1% Resolution for full Frequency Range)                                                                                                       |          |          |                 |          |          |
| RAMP CHARACTERISTICS       | Linearity                                                                        | < 0.1% of peak output                                                                                                                          |          |          |                 |          |          |
| AM MODULATION              | Variable Symmetry                                                                | 0%~100% (0.1% Resolution)                                                                                                                      |          |          |                 |          |          |
|                            | Carrier Waveforms                                                                | Sine, Square, Triangle                                                                                                                         |          |          |                 |          |          |
|                            | Modulating Waveforms                                                             | Sine, Square, Triangle                                                                                                                         |          |          |                 |          |          |
|                            | Modulating Frequency                                                             | 2 mHz~20 kHz (Int); DC~20KHz (Ext)                                                                                                             |          |          |                 |          |          |
|                            | Depth                                                                            | 0%~120.0%                                                                                                                                      |          |          |                 |          |          |
|                            | Source                                                                           | Internal/External                                                                                                                              |          |          |                 |          |          |
| FM MODULATION              | Carrier Waveforms                                                                | Sine, Square, Triangle                                                                                                                         |          |          |                 |          |          |
|                            | Modulating Waveforms                                                             | Sine, Square, Triangle                                                                                                                         |          |          |                 |          |          |
|                            | Modulating Frequency                                                             | 2 mHz~20 kHz (Int); DC~20KHz (Ext)                                                                                                             |          |          |                 |          |          |
|                            | Deviation                                                                        | DC to Max Frequency                                                                                                                            |          |          |                 |          |          |
|                            | Source                                                                           | Internal/External                                                                                                                              |          |          |                 |          |          |
| SWEEP                      | Waveforms                                                                        | Sine, Square, Triangle                                                                                                                         |          |          |                 |          |          |
|                            | Type                                                                             | Linear or Logarithmic                                                                                                                          |          |          |                 |          |          |
|                            | Start/Stop Frequency                                                             | 0.1Hz~Max Frequency                                                                                                                            |          |          |                 |          |          |
|                            | Sweep Time                                                                       | 1ms~500s                                                                                                                                       |          |          |                 |          |          |
|                            | Source                                                                           | Internal/External                                                                                                                              |          |          |                 |          |          |
| FSK                        | Carrier Waveforms                                                                | Sine, Square, Triangle                                                                                                                         |          |          |                 |          |          |
|                            | Modulating Waveforms                                                             | 50% duty cycle square                                                                                                                          |          |          |                 |          |          |
|                            | Modulation Rate                                                                  | 2mHz~100kHz(Int); DC~100kHz(Ext)                                                                                                               |          |          |                 |          |          |
|                            | Frequency Range                                                                  | 0.1Hz~Max Frequency                                                                                                                            |          |          |                 |          |          |
|                            | Source                                                                           | Internal/External                                                                                                                              |          |          |                 |          |          |
| FREQUENCY COUNTER          | Range                                                                            | 5Hz~150MHz                                                                                                                                     |          |          |                 |          |          |
|                            | Accuracy                                                                         | Time Base accuracy ± 1count                                                                                                                    |          |          |                 |          |          |
|                            | Time base                                                                        | ±20ppm (23°C±5°C) after 30minutes warm up                                                                                                      |          |          |                 |          |          |
|                            | Resolution                                                                       | 100nHz for 1Hz, 0.1Hz for 100MHz                                                                                                               |          |          |                 |          |          |
|                            | Input Impedance                                                                  | 1KΩ                                                                                                                                            |          |          |                 |          |          |
|                            | Sensitivity                                                                      | 35mVrms~30Vrms (5Hz~150MHz)                                                                                                                    |          |          |                 |          |          |
|                            |                                                                                  |                                                                                                                                                |          |          |                 |          |          |
| STORE/RECALL               | 10 Groups of Setting Memories                                                    |                                                                                                                                                |          |          |                 |          |          |
| INTERFACE                  | USB(Device)                                                                      |                                                                                                                                                |          |          |                 |          |          |
| DISPLAY                    | LCD                                                                              |                                                                                                                                                |          |          |                 |          |          |
| POWER SOURCE               | AC100~240V, 50~60Hz                                                              |                                                                                                                                                |          |          |                 |          |          |
| POWER CONSUMPTION          | 25 VA                                                                            |                                                                                                                                                |          |          |                 |          |          |
| OPERATING ENVIRONMENT      | Temperature to satisfy the specification: 18~28°C; Operating temperature: 0~40°C |                                                                                                                                                |          |          |                 |          |          |
|                            | Relative Humidity: ≤80%, 0~40°C; ≤70%, 35~40°C; Installation category: CAT II    |                                                                                                                                                |          |          |                 |          |          |
|                            |                                                                                  |                                                                                                                                                |          |          |                 |          |          |
| OPERATING ALTITUDE         | 2000 meters                                                                      |                                                                                                                                                |          |          |                 |          |          |
| STORAGE TEMPERATURE        | -10~70°C, Humidity: ≤70%                                                         |                                                                                                                                                |          |          |                 |          |          |
| DIMENSIONS & WEIGHT        | 266(W)×107(H)×293(D) mm ; Approx. 2.5 kg                                         |                                                                                                                                                |          |          |                 |          |          |

Specifications subject to change without notice. FG-2000GD3BH

## ORDERING INFORMATION

|          |                                             |
|----------|---------------------------------------------|
| AFG-2005 | 5MHz Arbitrary Waveform Function Generator  |
| AFG-2105 | 5MHz Arbitrary Waveform Function Generator  |
| AFG-2012 | 12MHz Arbitrary Waveform Function Generator |
| AFG-2112 | 12MHz Arbitrary Waveform Function Generator |
| AFG-2025 | 25MHz Arbitrary Waveform Function Generator |
| AFG-2125 | 25MHz Arbitrary Waveform Function Generator |

## ACCESSORIES

CD (user manual + software) × 1, Quick Start Guide × 1, Power cord × 1  
 AFG-2100 Series - GTL-101 Test Lead × 2, Instruction Manual × 1, Power cord × 1  
 AFG-2000 Series - GTL-101 Test Lead × 1, Instruction Manual × 1, Power cord × 1

## OPTIONAL ASSESSORIES

GTL-246 USB Cable, USB 2.0 Type A - Type B, 4P

## FREE DOWNLOAD

PC Software Arbitrary Waveform Editing Software Driver USB driver

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