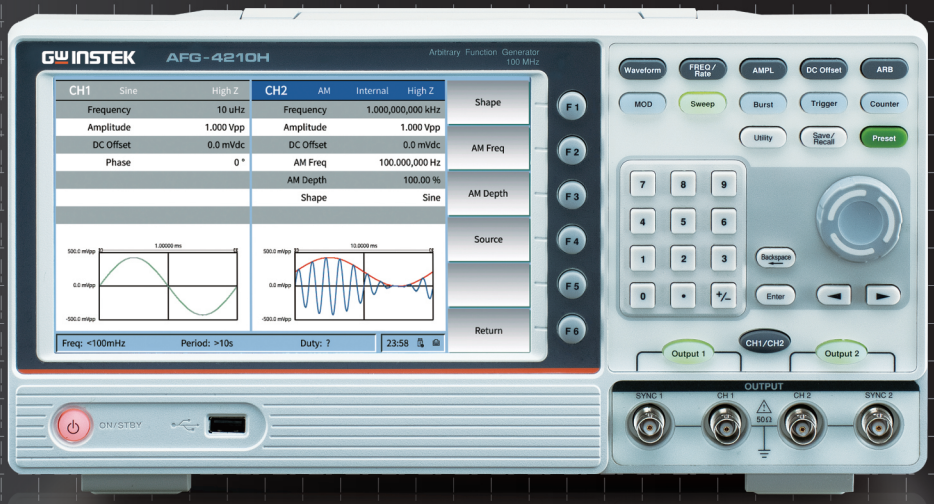


AFG-4000 Series

Arbitrary Function Generator

FEATURES

- Provide Single-channel or Dual-channel Output
  Single Channel : AFG-4125E/4125AE(25 MHz)
  Dual Channel : AFG-4225E/4235/4260/4280/4210H/4225H(25/35/60/80/100/250 MHz)
- Built-in Sine, Square, Triangle, Ramp, Pulse, Noise, Harmonic Wave, Arbitrary Wave
- Min. Resolution : 1 μHz
- Sampling Rate : AFG-4225H : 1.25 GSa/s; AFG-4235/4260/4280/4210H : 500 MSa/s;
  AFG-4125E/4125AE/4225E : 125 MSa/s
- Amplitude Resolution : AFG-4125E/4125AE/4225E : 14 bits;
  AFG-4235/4260/4280/4210H/4225H : 16 bits
- Memory Length : AFG-4225E/4235/4260/4280/4210H/4225H : 10 M/per channel;
  AFG-4125E/4125AE : 16 k/per Channel
- Modulation : AM,DSB-AM,FM,PM,PWM,ASK,PSK,BPSK,QPSK,FSK,FSK,4FSK,OSK,SUM
- Built-in Sweep, Burst, Counter Function
- AFG-4125AE Built-in Power Amplifier Function
- Communication Interface : AFG-4235/4260/4280/4210H/4225H Provide USB, LAN Interface
  AFG-4125E/4125AE/4225E Provide USB Interface
- 8” TFT LCD Display, 800 x 480 Resolution
- Multi-Touch Display : AFG-4235/4260/4280/4210H/4225H

GW INSTEK
Simply Reliable

25 to 250 MHz Frequency Bandwidth Selections to Meet Diverse Signal Generation Needs!

AFG-4000 series arbitrary function generator series is GW Instek's first arbitrary function generator series to be equipped with an 8” large touch screen. The frequency bandwidth of the single-channel models is 25 MHz, and dual- channel models feature 250/100/80/60/35/25 MHz frequency bandwidth selections. The entire series provides high resolution of 1 μHz and has built-in standard waveforms such as sine wave, square wave, triangle wave, pulse wave, noise wave, harmonic wave, etc. The highest bandwidth 250 MHz model provides 1.25 GSa/s sample rate; the mid-range models ranging from 35 MHz to 100 MHz provide 500 MSa/s sample rate; and the 25 MHz entry-level models have a sampling rate of 125 MSa/s. For vertical resolution, the 35 MHz to 250 MHz models feature 16-bit resolution, and 25 MHz entry-level models provide 14-bit resolution. In addition, in terms of memory depth, dual channel 25 MHz to 250 MHz models provide 10 M memory depth, and entry-level single channel 25 MHz models provide arbitrary waveform editing function with 16k memory depth. The entire series has built-in 146 arbitrary waveforms for editing and output.

The dual-channel models provide dual-channel related settings such as frequency coupling, amplitude coupling and tracking, allowing users to quickly set the output related to the two channels. In terms of modulation function, the AFG-4000 series provides AM, DSB-AM, FM, PM, PWM, ASK, PSK, BPSK, QPSK, FSK, 3FSK, 4FSK, OSK, SUM and other modulation signal outputs. Standard functions include Sweep and Burst outputs and the Counter function. AFG-4125AE has a built-in power amplifier. The power output of the amplifier reaches 10 W, and the amplification factor reaches 10 times to produce a maximum output of 22 V. The independent input/output power amplifier provides a bandwidth range from 5 Hz to 100 kHz, which can be used for audio signal and other application requirements.

The AFG-4000 series is equipped with an 8-inch high-resolution TFT LCD, and models above 35 MHz are equipped with the touch screen function. The configuration of touch screen makes inputting parameters more convenient. Users only need to touch parameters such as Frequency, Amplitude or DC offset, and a numeric input window will appear on the screen. Users can intuitively input parameters through this window or the numeric keys on the AFG-4000 panel. Through the 8" large screen, touch screen and diverse built-in waveforms, users can control it at will to meet their signal generation needs.

As for the interfaces, the 25 MHz models: AFG-4125E/4125AE/4225E have a built-in USB Host/Device interfaces, and the models with higher bandwidths ranging from 35 MHz to 250 MHz come standard with USB Host/Device and LAN interfaces.

SELECTION GUIDE

Model	AFG-4125E	AFG-4125AE*	AFG-4225E	AFG-4235	AFG-4260	AFG-4280	AFG-4210H	AFG-4225H
No. of Channel	Single		Dual					
Frequency Range (Sine)	25 MHz		25 MHz	35 MHz	60 MHz	80 MHz	100 MHz	250 MHz
Sample Rate (Sa/s)	125 M		500 M					1.25 G
Amplitude Resolution	14 bits		16 bits					
Memory Length	16 k/CH		10 M/CH					
Touch Panel	N/A		Yes					
Communication Interface	USB(Host, Device)		USB(Host, Device), LAN					

*AFG-4125AE built-in power amplifier function

A. 8” TOUCH SCREEN DISPLAY

The AFG-4000 series is equipped with an 8-inch high-resolution TFT LCD, and models above 35 MHz are equipped with the touch screen function.

The configuration of touch screen makes inputting parameters more convenient. Users only need to touch parameters such as Frequency, Amplitude or DC offset, and a numeric input window will appear on the screen. They can intuitively enter setting parameters through this window or the numeric keys on the AFG-4000 series.

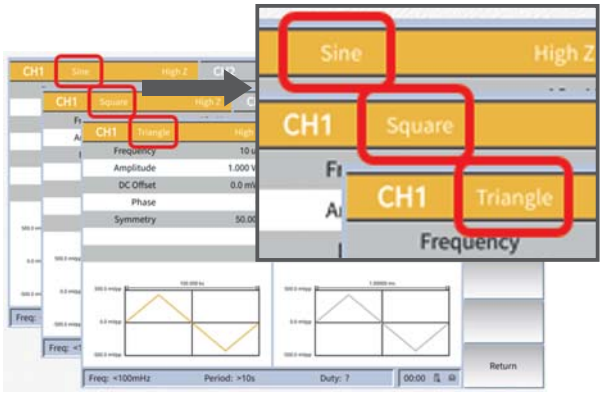
B. WIDE FREQUENCY SELECTION

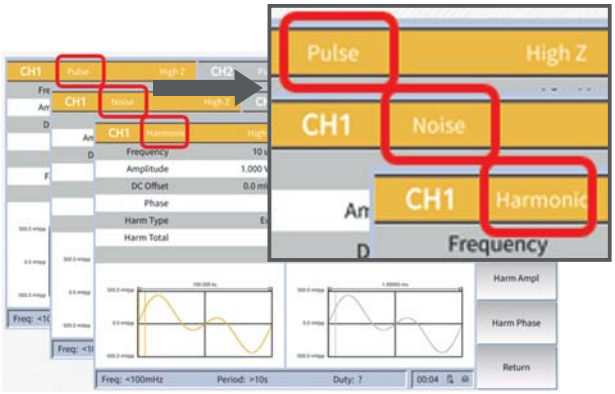
Channel	Model	Display	Main Output
Dual-CH	AFG-2225	3.5" TFT LCD	25 MHz
	AFG-4225E	8" TFT LCD	25 MHz
	MFG-2230M	4.3" TFT LCD	30 MHz
	AFG-4235	8" TFT LCD Touch Screen	35 MHz
	AFG-4260	8" TFT LCD Touch Screen	60 MHz
	MFG-2260M	4.3" TFT LCD	60 MHz
	MFG-2260MFA	4.3" TFT LCD	60 MHz
	MFG-2260MRA	4.3" TFT LCD	60 MHz
	AFG-4280	8" TFT LCD Touch Screen	80 MHz
	AFG-4210H	8" TFT LCD Touch Screen	100 MHz
	MFG-2220HM	4.3" TFT LCD	200 MHz
	AFG-4225H	8" TFT LCD Touch Screen	250 MHz

Channel	Model	Display	Main Output
Single-CH	AFG-2005	3.5" 3-color LCD	5 MHz
	AFG-2012	3.5" 3-color LCD	12 MHz
	AFG-2025	3.5" 3-color LCD	25 MHz
	AFG-2105	3.5" 3-color LCD	5 MHz
	AFG-2112	3.5" 3-color LCD	12 MHz
	AFG-2125	3.5" 3-color LCD	25 MHz
	MFG-2110	4.3" TFT LCD	10 MHz
	MFG-2120	4.3" TFT LCD	20 MHz
	MFG-2120MA	4.3" TFT LCD	20 MHz
	AFG-4125E	8" TFT LCD	25 MHz
	AFG-4125AE	8" TFT LCD	25 MHz
	MFG-2130M	4.3" TFT LCD	30 MHz
	MFG-2160MF	4.3" TFT LCD	60 MHz
	MFG-2160MR	4.3" TFT LCD	60 MHz

The bandwidth range covers from 25 MHz to 250 MHz. Combined with the original AFG/MFG series, GW Instek signal source selections are rich and diverse, which can meet users' usage habits and diverse testing needs.

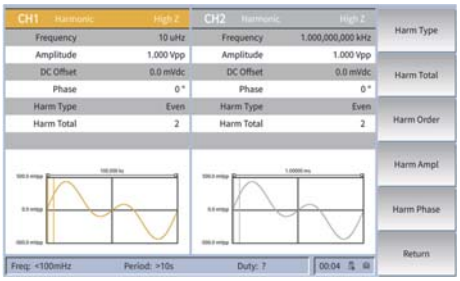
C. BUILT-IN VARIOUS STANDARD WAVEFORMS





Various standard waveforms are built-in, such as sine wave, square wave, triangle wave, pulse wave, noise wave, harmonics, etc., allowing users to easily select and set to generate the waveforms required for their applications.

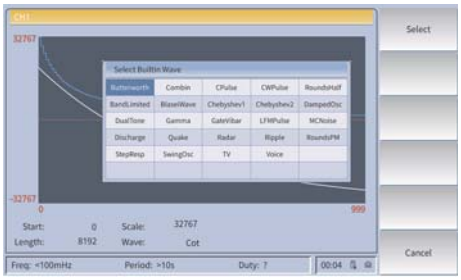
D. HARMONIC SIGNAL GENERATOR



The harmonic signal generator can simulate the harmonic signal of the switching power supply and test the characteristics of the EMI power filter.

Users can set the amplitude and phase of each order signal to achieve the desired signal. AFG-4000 can set and generate up to 16 th order harmonics.

E. RICH BUILT-IN ARBITRARY WAVEFORM SELECTIONS

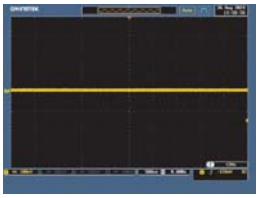


Users can use the built-in 146 application arbitrary waveforms for signal editing and output.

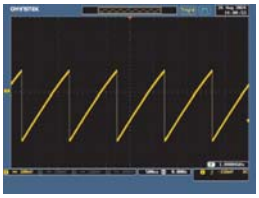
ARB's built-in waveforms include Common, Medical, Standard, or Math and Trigonometric, Window, Engineer, and Segmented Modulation related waveforms.

From the panel, users can select built-in waveforms and edit, save, recall and output arbitrary waveforms..

COMMON WAVEFORMS INCLUDE DC AND ABSSINEHALF WAVEFORMS

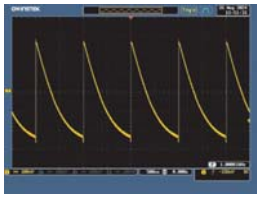


DC

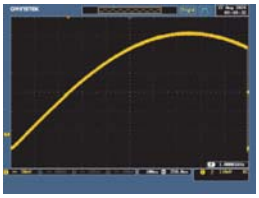


ABSSinehalf

MATH WAVEFORMS INCLUDE AIRY AND BESSELJ WAVEFORMS



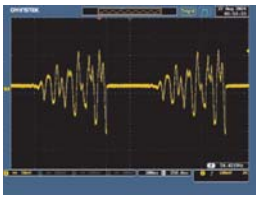
Airy



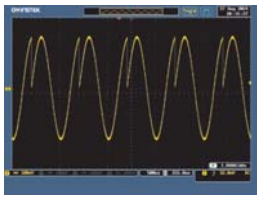
Besselj

ENGINEERING WAVEFORMS INCLUDE TV, VOICE, CWPULSE, SWINGOSC, ROUNDSHALF AND OTHER WAVEFORMS

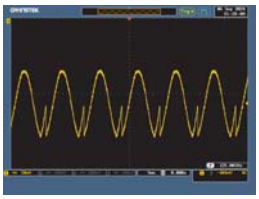
TV



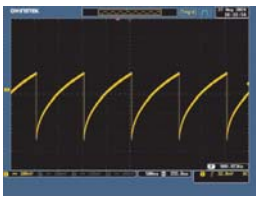
Voice



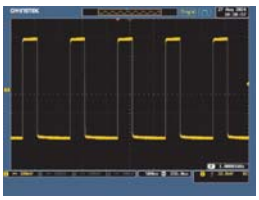
Cwpulse



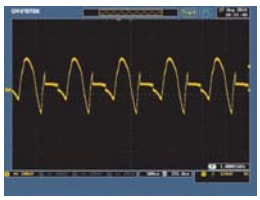
SwingOsc



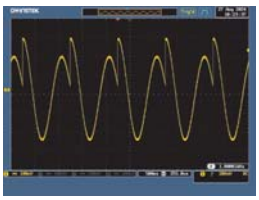
Roundshalf



Bandlimit

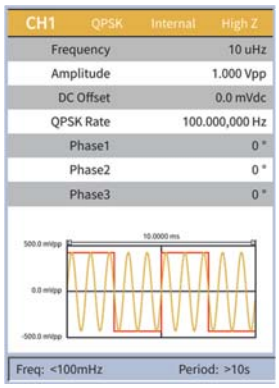


Blaseiwave

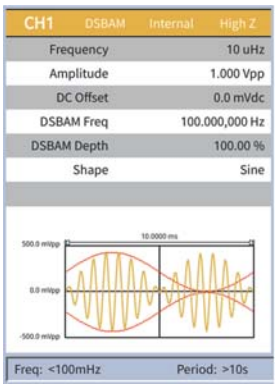


DepandOSC

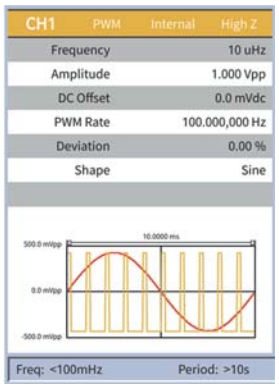
F. BUILT-IN RICH MODULATION WAVEFORMS



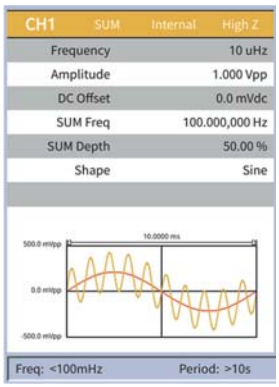
QPSK



DSBAM



PWM

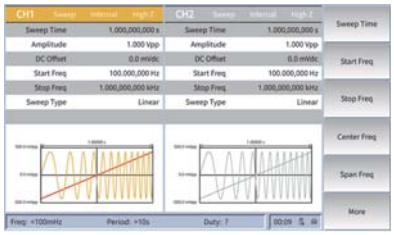


SUM

Provides a wide range of modulation signals, including analog and digital modulation, such as AM, DSB-AM, FM, PM, PWM, ASK, PSK, BPSK, QPSK, FSK, 3FSK, 4FSK, OSK, SUM and other modulation signals.

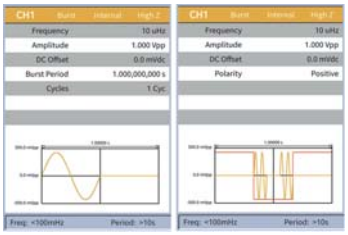
Suitable for various tests such as fundamental frequency function of communications system, motor control and lighting adjuster, etc.

G. PROVIDES SWEEP, BURST, COUNTER FUNCTIONS



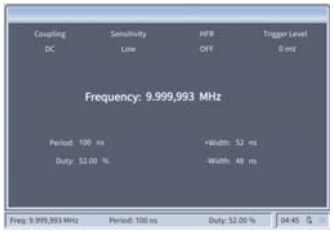
Sweep

Frequency sweeping function can be set to sine wave, square wave, triangle wave and arbitrary wave mode. Linear/logarithmic output can be set to meet various application requirements with different sweeping methods. Frequency sweep can test the frequency response of electronic components such as filters and low-frequency amplifiers, etc.



Burst

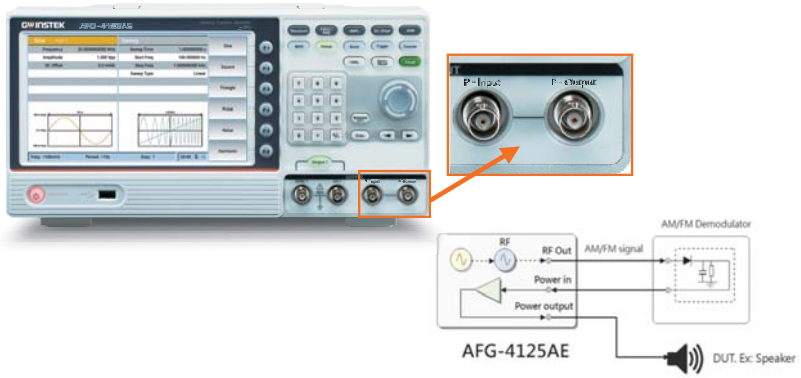
Supports N-cycle or Gate mode triggering, and can adjust its duration, operating frequency, waveform polarity and internal or external triggering to achieve discontinuous output related applications.



Counter

Provides 100 mHz to 200 MHz frequency counter function

H. POWER AMPLIFIER



AFG-4125AE features a power amplifier with a built-in amplifier that can independently input/output 10 W power and has a gain of 10 times.

This power amplifier has a bandwidth of 5 Hz to 100 kHz and can be used as an audio amplifier; or for a power component characteristic test; for a drive amplifier for piezoelectric components (collocate with an impedance transformer, 10 W output).

Users can connect the AFG-4125AE's low-frequency amplifier to a speaker and use it as the driver source for the speaker, which is a common educational application.

PANEL INTRODUCTION

CE | USB Host | USB Device | LAN

1. 8” Display
2. Menu Soft Keys
3. Function Keys
4. Numeric Input Keys
5. Selection Knob
6. Arrow Keys
7. Power Button
8. USB Host Port
9. Channel 1 Output Key
10. Sync 1 Output Port
11. Channel 1 Output Port
12. CH1/CH2 Setting Switch Key
13. Channel 2 Output Key
14. Channel 2 Output Port
15. Sync 2 Output Port
16. LAN Port (Available for Models Above 35MHz)
17. USB Device Port
18. Security Lock Hole
19. 10 MHz In/Out/Counter Connector
20. Mod/FSK/Trig Connector

* No.12 to15 for dual CH model only.

SPECIFICATIONS

Models	AFG-4125E	AFG-4125AE	AFG-4225E	AFG-4235	AFG-4260	AFG-4280	AFG-4210H	AFG-4225H
Channels								
	1		2					
Waveforms								
	Sine, Square, Triangle, Ramp, Pulse, Noise, Harmonic wave, Arbitrary wave							
Arbitrary Functions								
ARB Function	Built-in							
Sample Rate (*1)	125 MSa/s			500 MSa/s				1.25 GSa/s
Repetition Rate (Arbitrary Wave)	15 MHz			30 MHz				
Waveform Length	2 to 16 K points		2 to 10 M points					
Amplitude Resolution	14 bits			16 bits				
Minimum Rise and Fall Time	< 10 ns			< 8 ns				< 5ns
Jitter	8 ns							
Non-Volatile Memory	32 MB							
User-defined Output Section	From point 2 to 16,384		From point 2 to 10,240,000					
User-defined Output Marker Section	From point 2 to 16,384		From point 2 to 10,240,000					
Output Mode	1 to 1,000,000 cycles or infinite mode							
Frequency Characteristics								
Sine	25 MHz			35 MHz	60 MHz	80 MHz	100 MHz	250 MHz
Square	5 MHz			15 MHz	30 MHz			50 MHz
Pulse	5 MHz			15 MHz	25 MHz			
Triangle, Ramp	1 MHz			3 MHz				5 MHz
Noise (-3 dB)	25 MHz BW			35 MHz BW	60 MHz BW	80 MHz BW	100 MHz BW	120 MHz BW
Harmonic Wave	12.5 MHz			17.5 MHz	30 MHz	40 MHz	50 MHz	125 MHz
Resolution	1 µHz or 10 significant figures							
Accuracy Stability	±2 ppm at 25 °C ± 5 °C							±1 ppm at 0 to 40 °C
Aging	±1 ppm, per 1 year							
Tolerance	±1 ppm							
Output Characteristics(*2)								
Output Amplitude **Into 50 Ω**	1 mVpp to 10 Vpp, for ≤ 25 MHz ; 1 mVpp to 5 Vpp, for ≤ 60 MHz ; 1 mVpp to 2.5 Vpp, for ≤ 100 MHz							1 mVpp to 10 Vpp, for ≤ 40 MHz ; 1 mVpp to 5 Vpp, for ≤ 80 MHz 1 mVpp to 2.5 Vpp, for ≤ 120 MHz ; 1 mVpp to 1 Vpp, for ≤ 250 MHz
Open-circuit	2 mVpp to 20 Vpp, for ≤ 25 MHz ; 2 mVpp to 10 Vpp, for ≤ 60 MHz ; 2mVpp to 5 Vpp, for ≤ 100 MHz							2 mVpp to 20 Vpp, for ≤ 40 MHz ; 2 mVpp to 10 Vpp, for ≤ 80 MHz 2 mVpp to 5 Vpp, for ≤ 120 MHz ; 2 mVpp to 2 Vpp, for ≤ 250 MHz
Bandwidth Fatness	≤10 MHz: ±0.2 dB ; ≤60 MHz: ±0.3 dB ; ≤100 MHz: ±0.5 dB ; (relative to 100 kHz Sine wave, 1 Vpp,50 Ω)							≤10 MHz:±0.2 dB;≤60 MHz:±0.3 dB;≤100 MHz:±0.5 dB;≤160 MHz:±1 dB; ≤250 MHz: ±1.5 dB ; (relative to 1 kHz Sine wave, 1 Vpp, 50 Ω)
Accuracy	±(2% of setting + 1 mVpp)(1 kHz sine, 0 V offset, >10 mVpp)							
Resolution	0.1 mVpp or 4 digits (The amplitude ≥ 1 Vpp is 1 mVpp)							
Output Impedance	50 Ω (Typical)							
Output Protection	Short circuit protection, the output will be automatically turned off when overloaded							
DC Offset **Range**	± (10 Vpk – Amplitude Vpp / 2),(High resistance)							
Accuracy	± (3 % of |setting| + 5 mV + amplitude Vpp * 0.5 %)			± (1 % of |setting| + 5 mV + amplitude Vpp * 0.5 %)				
Resolution	0.1 mVpp or 4 digits (The amplitude > 1 Vpp is 1 mVpp)							
Sine Wave Characteristics								
Harmonic Distortion(*3)	DC to 1 MHz: <-65 dBc ; 1 MHz to 10 MHz: <-60 dBc ; 10 MHz to 60 MHz: <-55 dBc ; 60 MHz to 100 MHz: <-50 dBc Typical (0 dBm)							DC to 1 MHz: <-65 dBc ; 1 MHz to 10 MHz: <-60 dBc 10 MHz to 120 MHz:<-50 dBc;120 MHz to 250 MHz:<-45 dBc Typical(0 dBm)
Total Harmonic Distortion	< 0.05%, 10 Hz to 20 kHz, 1 Vpp							
Non-harmonic Distortion	≤10 MHz: <-70 dBc; >10 MHz: <-70 dBc + 6 dB/sound interval; Typical (0 dBm)							
Phase Noise	10 MHz: ≤-110 dBc/Hz Typical (0 dBm, 10 kHz offset)							
Square Wave Characteristics								
Rise/Fall Time	< 30 ns			< 8 ns				< 5 ns
Overshoot	Typical (100 kHz, 1 Vpp) < 5 %, (1 Vpp, 50 Ω)			Typical (100 kHz, 1 Vpp) < 3 %, (1 Vpp, 50 Ω)				
Duty Cycle	50.00 % (fixed)							
Ramp Wave Characteristics								
Linearity	< 0.1 % of peak output (typical 1 kHz, 1 Vpp, symmetry 50 %)							
Symmetry	0.0 % to 100.0 %							
Pulse Wave Characteristics								
Period	200 ns to 1000 ks			66.667 ns to 1000 ks	40 ns to 1000 ks			20 ns to 1000 ks
Pulse Width	≥ 48 ns			≥ 18 ns	≥ 12 ns			≥7 ns
Duty Cycle	0.1 % to 99.9 % (limited by the frequency setting)							
Rise and Fall Time	≥ 32 ns (limited by the pulse width setting)			≥ 8 ns (limited by the pulse width setting)				≥7 ns (limited by the pulse width setting)
Overshoot	Typical (100 kHz, 1 Vpp) < 5 %			Typical (100 kHz, 1 Vpp) < 3 %				
Jitter	< 2 ns			≤5 MHz: 2 ppm + 300 ps , >5 MHz: 300 ps (rms), typical (1 Vpp, 50 Ω)				
Noise Wave Characteristics								
Types	Gaussian white noise							
Bandwidth (-3 dB)	25 MHz BW			35 MHz BW	60 MHz BW	80 MHz BW	100 MHz BW	120 MHz BW
Harmonic Wave Characteristics								
Harmonic Number	≤16							
Frequency Range	1 µHz to 12.5 MHz			1µ Hz to 17.5 MHz	1 µHz to 30 MHz	1 µHz to 40 MHz	1 µHz to 50 MHz	1 µHz to 125 MHz
Harmonic Type	Odd, even, sequential, custom							
Harmonic Amplitude	Each harmonic amplitude can be set							
Harmonic Phase	Each harmonic phase can be set							
Advanced Waveform Characteristics								
Modulation Function	AM, DSB-AM, FM, PM, PWM, ASK, PSK, BPSK, QPSK, FSK, 3FSK, 4FSK, OSK, SUM							
Sweep Function	Support type: Linear, logarithmic, Step							
Burst Function	Support type: count (1 to 1000,000 cycles), Infinite, gated							
Counter Function	Support frequency range: 100 mHz to 200 MHz							
Power Amplifier Function	-	Support	-					
Input/Output Characteristics								
Channel Coupling	Channel copy, amplitude syn, frequency syn, align phase							
Input	External modulation input, External trigger input, External clock input							
Output	Internal clock output, Sync output							
General Specifications								
Display **Type**	8-inch color LCD display							
Resolution	800 Horizontal x 480 Vertical pixels							
Color	65,536 colors, 16 bits, TFT							
Touch Screen Capacitive	-			Multi-touch				
Communication Interface	USB Host, USB Device			USB Host, USB Device, LAN				
Power **Source**	100 to 240 V (±10%), 50/60 Hz							
Power Consumption	Less than 50 VA							
Fuse	250V, F2AL							
Operating Environment **Temperature to Satisfy**	18 °C to 28 °C							
Operating Temperature	0 °C to 40 °C							
Relative Humidity	Less than 35 °C : ≤ 90 % relative humidity ; 3 5°C to 40 °C : ≤ 60% relative humidity							
Installation Category	CAT II							
Operating Altitude	Operating 3,000 meters ; Non-operation 12,000 meters							
Storage Temperature	-20 °C to 60 °C, Humidity : ≤70 %							
Pollution Degree	IEC 61010 degree 2, Indoor use							
Safety Designed	EN61010-1							
Cooling Method	Smart fan cooling							
Dimensions & Weight	340 (W) x 177 (H) x 90 (D) mm ; Approx. 2.5 kg							

Note : *1. The User's available range of the sample rate is from 1 µ Sa/s to 75 MSa/s. (AFG-4125E/4125AE/4225E is from 1 µ Sa/s to 30 MSa/s)
*2. Not specifically labeled, the load defaults to 50 Ω. *3. DC offset set to zero.

Specifications subject to change without notice. AFG-4000D1_E_BH_202502

ORDERING INFORMATION

AFG-4125E	25 MHz, 1-Channel Arbitrary Function Generator
AFG-4125AE	25 MHz, 1-Channel Arbitrary Function Generator, Plus Power Amplifier
AFG-4225E	25 MHz, 2-Channel Arbitrary Function Generator
AFG-4235	35 MHz, 2-Channel Arbitrary Function Generator
AFG-4260	60 MHz, 2-Channel Arbitrary Function Generator
AFG-4280	80 MHz, 2-Channel Arbitrary Function Generator
AFG-4210H	100 MHz, 2-Channel Arbitrary Function Generator
AFG-4225H	250 MHz, 2-Channel Arbitrary Function Generator

ACCESSORIES

USB Cable x 1, Power Cord x 1
AFG-4125E/4125AE: Test Lead, BNC to Alligator Clips Cable x 1
AFG-4225E/4235: Test Lead, BNC to Alligator Clips Cable x 2
AFG-4260/4280/4210H/4225H: Test Lead, BNC Cable x 2

OPTIONAL ACCESSORIES

GTL-101	Test Lead, BNC (P/M) to Alligator, approx. 1100 mm
GTL-110	BNC Cable, BNC (P/M) to BNC (P/M), approx. 1000 mm

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