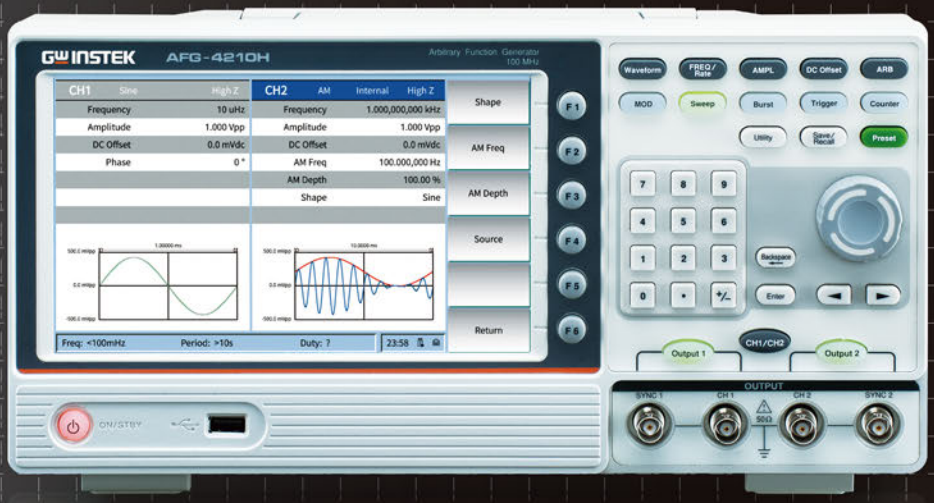


AFG-4000 Series

Arbitrary Function Generator

FEATURES

- Provide Single-channel or Dual-channel Output
  Single Channel : AFG-4125E/4125AE(25MHz)
  Dual Channel : AFG-4225E/4235/4260/4280/4210H/4225H(25/35/60/80/100/250MHz)
- Built-in Sine, Square, Triangle, Ramp, Pulse, Noise, Harmonic Wave, Arbitrary Wave
- Min. Resolution : 1μHz
- Sampling Rate : AFG-4225H : 1.25GSa/s; AFG-4235/4260/4280/4210H : 500MSa/s;
  AFG-4125E/4125AE/4225E : 125MSa/s
- Amplitude Resolution : AFG-4125E/4125AE/4225E : 14bits;
  AFG-4235/4260/4280/4210H/4225H : 16bits
- Memory Length : AFG-4225E/4235/4260/4280/4210H/4225H : 10M/per channel;
  AFG-4125E/4125AE : 16k/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

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

AFG-4000 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 25MHz, and dual- channel models feature 250MHz/100MHz/80MHz/60MHz/35MHz/25MHz frequency bandwidth selections. The entire series provides high resolution of 1□Hz and has built-in standard waveforms such as sine wave, square wave, triangle wave, pulse wave, noise wave, harmonic wave, etc. The highest bandwidth 250MHz model provides 1.25GSa/s sample rate; the mid-range models ranging from 35MHz ~ 100MHz provide 500MSa/s sample rate; and the 25MHz entry-level models have a sampling rate of 125MSa/s. For vertical resolution, the 35MHz ~ 250MHz models feature 16-bit resolution, and 25MHz entry-level models provide 14-bit resolution. In addition, in terms of memory depth, dual channel 25MHz ~ 250MHz models provide 10M memory depth, and entry-level single channel 25MHz 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 10W, and the amplification factor reaches 10 times to produce a maximum output of 22V. The independent input/output power amplifier provides a bandwidth range from 5Hz 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 35MHz 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 25MHz models: AFG-4125E/4125AE/ 4225E have a built-in USB Host/Device interfaces, and the models with higher bandwidths ranging from 35MHz to 250MHz 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)	25MHz		25MHz	35MHz	60MHz	80MHz	100MHz	250MHz
Sample Rate (Sa/s)	125M		500M					1.25G
Amplitude Resolution	14 bits		16 bits					
Memory Length	16k/CH		10M/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 35MHz 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.

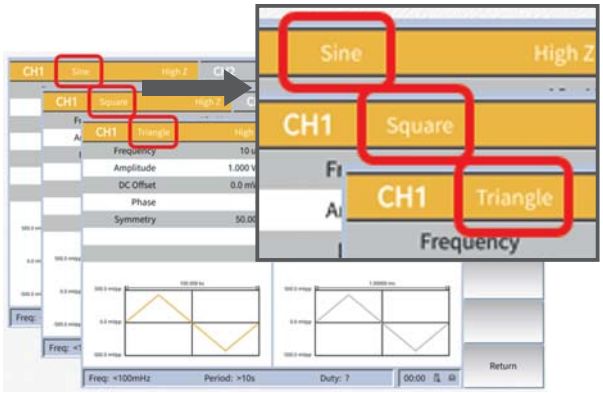
B. WIDE FREQUENCY SELECTION

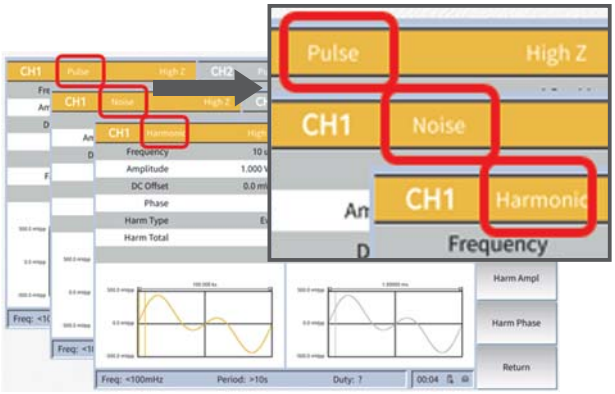
Channel	Model	Display	Main Output
Dual-CH	AFG-2225	3.5" TFT LCD	25MHz
	AFG-4225E	8" TFT LCD	25MHz
	MFG-2230M	4.3" TFT LCD	30MHz
	AFG-4235	8" TFT LCD Touch Screen	35MHz
	AFG-4260	8" TFT LCD Touch Screen	60MHz
	MFG-2260M	4.3" TFT LCD	60MHz
	MFG-2260MFA	4.3" TFT LCD	60MHz
	MFG-2260MRA	4.3" TFT LCD	60MHz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

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

The bandwidth range covers from 25MHz to 250MHz. 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.

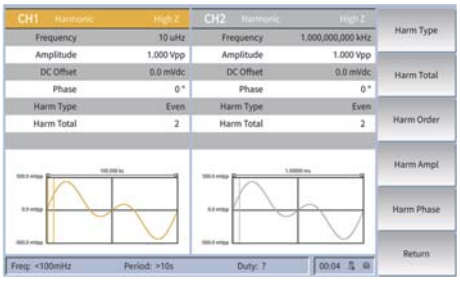
C. BUILT-IN VARIOUS STANDARD WAVEFORMS





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.

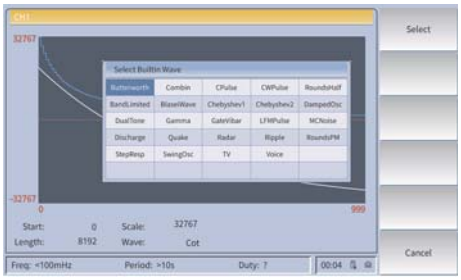
D. HARMONIC SIGNAL GENERATOR



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 16th order harmonics.

E. RICH BUILT-IN ARBITRARY WAVEFORM SELECTIONS

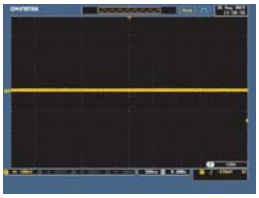


Users can use the built-in 146 application arbitrary waveforms for signal editing and output.

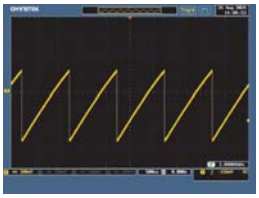
ARB's built-in waveforms include Common, Medical, Standard, or Math and Trigonometric, Window, Engineer, and Segmented Modulation related waveforms.

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

COMMON WAVEFORMS INCLUDE DC AND ABSSINEHALF WAVEFORMS

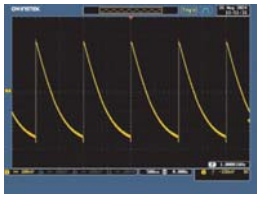


DC

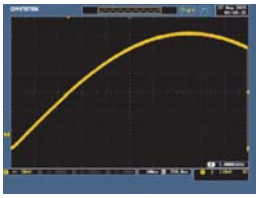


ABSSinehalf

MATH WAVEFORMS INCLUDE AIRY AND BESSELJ WAVEFORMS



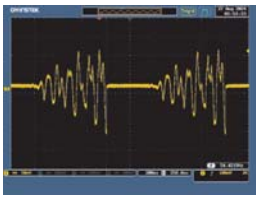
Airy



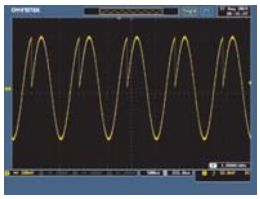
Besselj

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

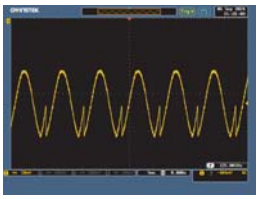
TV



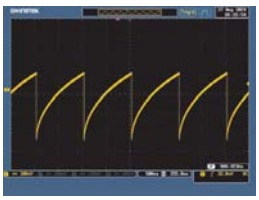
Voice



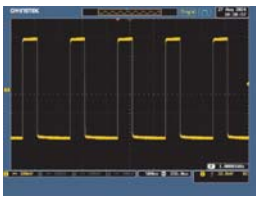
Cwpulse



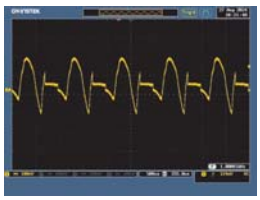
SwingOsc



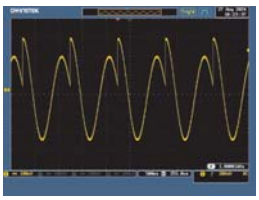
Roundshalf



Bandlimit

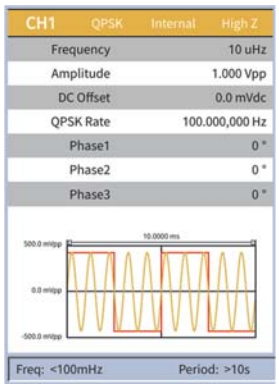


Blaseiwave

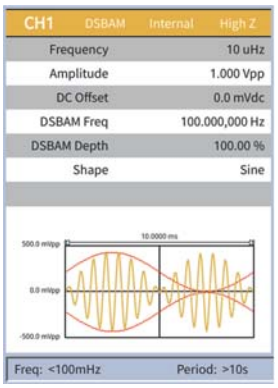


DepandOSC

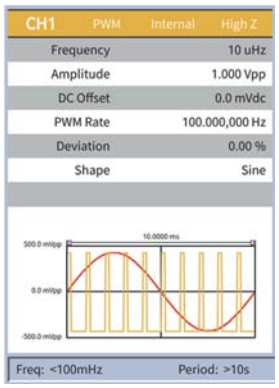
F. BUILT-IN RICH MODULATION WAVEFORMS



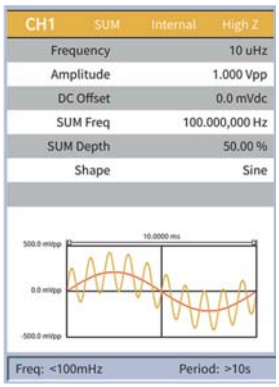
QPSK



DSBAM



PWM

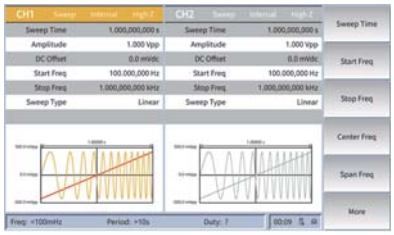


SUM

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.

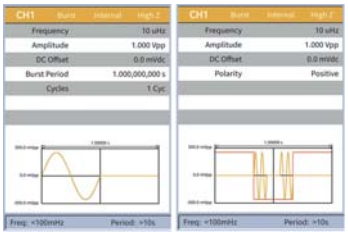
Suitable for various tests such as fundamental frequency function of communications system, motor control and lighting adjuster, etc.

G. PROVIDES SWEEP, BURST, COUNTER FUNCTIONS



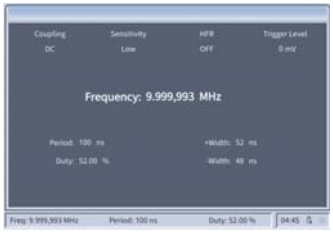
Sweep

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

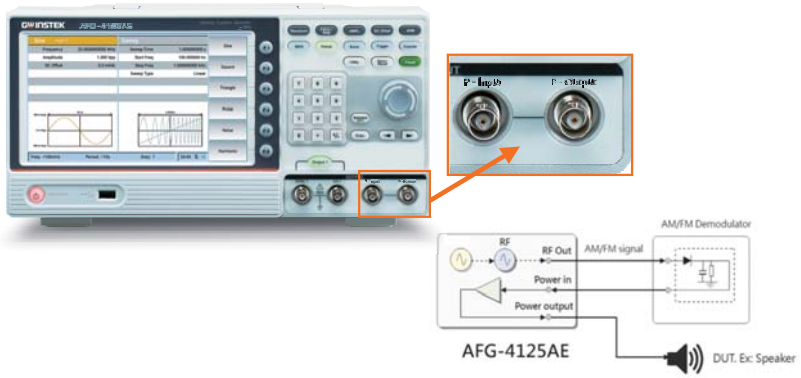
Supports N-cycle or Gate mode triggering, and can adjust its duration, operating frequency, waveform polarity and internal or external triggering to achieve discontinuous output related applications.



Counter

Provides 100mHz ~ 200MHz frequency counter function

H. POWER AMPLIFIER



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

This power amplifier has a bandwidth of 5Hz-100kHz 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, 10W 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. 10MHz In/Out/Counter Connector
20. Mod/FSK/Trig Connector

* No.12–15 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)		125MSa/s			500MSa/s				1.25GSa/s
Repetition Rate (Arbitrary Wave)		15MHz			30MHz				
Waveform Length		2 ~ 16K points		2 ~ 10M points					
Amplitude Resolution		14 bits			16 bits				
Minimum Rise and Fall Time		< 10 ns			< 8ns				< 5ns
Jitter		8ns							
Non-Volatile Memory		32MB							
User-defined Output Section		From point 2 ~ 16,384		From point 2 ~ 10,240,000					
User-defined Output Marker Section		From point 2 ~ 16,384		From point 2 ~ 10,240,000					
Output Mode		1 ~ 1,000,000 cycles or infinite mode							
Frequency Characteristics									
Sine		25MHz			35MHz	60MHz	80MHz	100MHz	250MHz
Square		5MHz			15MHz	30MHz			50MHz
Pulse		5MHz			15MHz	25MHz			
Triangle, Ramp		1MHz			3MHz				5MHz
Noise (-3dB)		25MHz BW			35MHz BW	60MHz BW	80MHz BW	100MHz BW	120MHz BW
Harmonic Wave		12.5MHz			17.5MHz	30MHz	40MHz	50MHz	125MHz
Resolution		1 µHz or 10 significant figures							
Accuracy Stability		±2 ppm at 25°C ± 5°C							±1 ppm at 0 ~ 40°C
Aging		±1 ppm, per 1 year							
Tolerance		±1 ppm							
Output Characteristics(*2)									
Output Amplitude	Into 50Ω	1mVpp ~ 10Vpp, for ≤ 25MHz ; 1mVpp ~ 5Vpp, for ≤ 60MHz ; 1mVpp ~ 2.5Vpp, for ≤ 100MHz							1mVpp ~ 10Vpp, for ≤ 40MHz ; 1mVpp ~ 5Vpp, for ≤80MHz 1mVpp ~ 2.5Vpp, for ≤120MHz ; 1mVpp ~ 1Vpp, for ≤250MHz
	Open-circuit	2mVpp ~ 20 Vpp, for ≤ 25MHz ; 2mVpp ~ 10 Vpp, for ≤ 60MHz ; 2mVpp ~ 5 Vpp, for ≤ 100MHz							2mVpp ~ 20 Vpp, for ≤ 40MHz ; 2mVpp ~ 10 Vpp, for ≤80MHz 2mVpp ~ 5 Vpp, for ≤120MHz ; 2mVpp ~ 2 Vpp, for ≤250MHz
Bandwidth Fatness		≤10MHz: ±0.2dB ; ≤60MHz: ±0.3dB ; ≤100MHz: ±0.5dB ; (relative to 100 kHz Sine wave, 1 Vpp,50Ω)							≤10MHz:±0.2dB;≤60MHz:±0.3dB;≤100MHz:±0.5dB;≤160MHz:±1dB; ≤250MHz: ±1.5dB ; (relative to 1kHz Sine wave, 1 Vpp,50Ω)
Accuracy		± (2% of setting + 1 mVpp) (1kHz sine,0V offset, >10mVpp)							
Resolution		0.1mVpp or 4 digits (The amplitude ≥ 1Vpp is 1mVpp)							
Output Impedance		50Ω (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~1MHz: <-65dBc ; 1MHz~10MHz: <-60dBc ; 10MHz~60MHz: <-55dBc ; 60MHz~100MHz: <-50dBc Typical (0dBm)							DC~1MHz: <-65dBc ; 1MHz~10MHz: <-60dBc 10MHz~120MHz:<-50dBc;120MHz~250MHz:<-45dBc Typical(0dBm)
Total Harmonic Distortion		< 0.05 %, 10 Hz to 20 kHz, 1 Vpp							
Non-harmonic Distortion		≤10MHz: <-70dBc; >10MHz: <-70dBc + 6dB/sound interval; Typical (0dBm)							
Phase Noise		10MHz: ≤-110dBc/Hz Typical (0dBm, 10kHz offset)							
Square Wave Characteristics									
Rise/Fall Time		< 30ns			< 8ns				< 5ns
Overshoot		Typical (100 kHz, 1 Vpp) < 5%, (1 Vpp, 50Ω)			Typical (100 kHz, 1 Vpp) < 3%, (1 Vpp, 50Ω)				
Duty Cycle		50.00% (fixed)							
Ramp Wave Characteristics									
Linearity		< 0.1% of peak output (typical 1 kHz, 1 Vpp, symmetry 50%)							
Symmetry		0.0% ~ 100.0%							
Pulse Wave Characteristics									
Period		200ns~1000ks			66.667ns~1000ks	40ns~1000ks			20ns~1000ks
Pulse Width		≥ 48ns			≥ 18ns	≥ 12ns			≥7ns
Duty cycle		0.1% ~ 99.9% (limited by the frequency setting)							
Rise and fall time		≥ 32ns (limited by the pulse width setting)			≥ 8ns (limited by the pulse width setting)				≥7ns (limited by the pulse width setting)
Overshoot		Typical (100 kHz, 1 Vpp) < 5%			Typical (100 kHz, 1 Vpp) < 3%				
Jitter		< 2ns			≤5MHz: 2ppm + 300ps , >5MHz: 300ps (rms), typical (1Vpp, 50Ω)				
Noise Wave Characteristics									
Types		Gaussian white noise							
Bandwidth (-3dB)		25MHz BW			35MHz BW	60MHz BW	80MHz BW	100MHz BW	120MHz BW
Harmonic Wave Characteristics									
Harmonic number		≤16							
Frequency Range		1µHz~12.5MHz			1µHz~17.5MHz	1µHz~30MHz	1µHz~40MHz	1µHz~50MHz	1µHz~125MHz
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 ~ 1000,000 cycles), Infinite, gated							
Counter Function		Support frequency range: 100 mHz ~ 200 MHz							
Power Amplifier Function		-	Built-in	-					
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 × 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 ~ 240 V (±10%), 50/60 Hz							
	Power Consumption	Less than 50VA							
	Fuse	250V, F2AL							
Operating Environment	Temperature to Satisfy	18 °C ~ 28 °C							
	Operating Temperature	0 °C ~ 40 °C							
	Relative Humidity	Less than 35°C : ≤ 90% relative humidity ; 35°C ~ 40°C : ≤ 60% relative humidity							
	Installation Category	CAT II							
	Operating Altitude	Operating 3,000 meters ; Non-operation 12,000 meters							
Storage Temperature		-20 °C ~ 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) × 177 (H) × 90 (D) mm ; Approx. 2.5kg							

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 30MSa/s)
*2. Not specifically labeled, the load defaults to 50Ω. *3. DC offset set to zero.

Specifications subject to change without notice. AFG-4000D1_E_BH_202409

ORDERING INFORMATION

AFG-4125E	25MHz, 1-Channel Arbitrary Function Generator
AFG-4125AE	25MHz, 1-Channel Arbitrary Function Generator, Plus Power Amplifier
AFG-4225E	25MHz, 2-Channel Arbitrary Function Generator
AFG-4235	35MHz, 2-Channel Arbitrary Function Generator
AFG-4260	60MHz, 2-Channel Arbitrary Function Generator
AFG-4280	80MHz, 2-Channel Arbitrary Function Generator
AFG-4210H	100MHz, 2-Channel Arbitrary Function Generator
AFG-4225H	250MHz, 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. 1100mm
GTL-110	BNC Cable, BNC (P/M) to BNC (P/M), approx. 1000mm