

AFG-303x & AFG-302x Specifications

The specifications apply when the AFG-303x & AFG-302x is powered on for at least 30 minutes under +20°C~+30°C.

	AFG-3031	AFG-3032	AFG-3021	AFG-3022
Channels	1	2	1	2
Features				
I/O signal ground for the instrument chassis	Isolation			
Connector shells for channel output(s), Sync output, 10MHz REF Input, Mod Input and Mod output are isolated from the instrument's chassis. Maximum allowable voltage on isolated connector shells is ± 42 Vpk. (DC + AC Peak)				
Each of the signal ground of CH1 & CH2	-	Isolated	-	Isolated
Standard Waveforms	Sine, Square, Triangle, Ramp, Pulse, Noise, Harmonic			
Arbitrary Waveforms				
Sample Rate	250 MSa/s			
Repetition Rate	125MHz			
Waveform Length	8M points			
Amplitude Resolution	16 bits			
Non-Volatile Memory	Ten 8M waveforms (1)			
User define Output Section	Any section from 2 to 8M points			
Trigger	External			
Built-in Arbitrary Waveforms	Sine, Square, Ramp, Sinc,Pulse, DC, Sin(x)/x, Exponential Rise, Exponential Fall, Negative Ramp, Absatan, Havercosine, Sinever, Absin, Haversine, Stair_down, Absinehalf, N_pulse, Stair_UD, Ampalt, Negramp, Stair_up, Attalt, Rectpuls1, Stepresp, Diric_even, Roundhalf, Trapezia, Diric_odd, Sawtoot, Tripuls1, Gauspuls1, Sinetra, Dlorentz, In, Sqrt, Exporise, Lorentz, Xsquare, Expofall, Gauss, Since, Arccos, Arctan, Sech, Arccot, Arctanh, Sinh, Arccsc, Cosh, Tan, Arcsec, Cot, Tanh, Arcsin, Csc, Arcsinh, Sec, Barthannwin, Chebwin, Kaiser, Bartlett, Flattopwin, Triang, Blackman, Hamming, Tukeywin, Bohmanwin, Hann			
Frequency Characteristics				
	Sine / Square	1uHz to 30MHz		1uHz to 20MHz
	Pulse	1uHz to 25MHz		1uHz to 20MHz
	Triangle / Ramp	1uHz to 1MHz		
Resolution	1uHz			
Accuracy	Stability	± 1 ppm 0 to 50°C		
		± 0.3 ppm 18 to 28°C		
	Aging	± 1 ppm, per 1 year		
	Tolerance	≤ 1 uHz		
Output Characteristics (2)				
Amplitude	Range	1 mVpp to 10 Vpp (into 50 Ω) 2 mVpp to 20 Vpp (into open-circuit)		
	Accuracy	$\pm 1\%$ of setting ± 1 mVpp (at 1 kHz / into 50 Ω without DC offset)		

	Resolution	0.1 mV or 4 digits			
	Flatness	0.1dB <10 MHz			
		0.2 dB 10 MHz to 30 MHz (sinewave relative to 1 kHz/into 50Ω)			
	Units	Vpp, Vrms, dBm,			
Offset	Range	±5 Vpk ac +dc (into 50Ω)			
		±10Vpk ac +dc (into open circuit)			
	Accuracy	1% of setting + 2 mV+ 0.5% of amplitude			
Waveform Output	Impedance	50Ω typical (fixed)			
		> 10MΩ (output disabled)			
	Protection	Short-circuit protected			
		Overload relay automatically disables main output			
SYNC Output	Level	TTL-compatible into>1kΩ	-	TTL-compatible into>1kΩ	-
	Impedance	50Ω nominal			
Sine wave Characteristics					
Harmonic Distortion(5)	-60 dBc DC~ 1 MHz, Ampl < 3 Vpp				
	-55 dBc DC~ 1 MHz, Ampl > 3 Vpp				
	-45 dBc 1MHz~ 5 MHz, Ampl > 3 Vpp				
	-30 dBc 5MHz~ 30 MHz, Ampl > 3 Vpp				
Total Harmonic Distortion	< 0.2%+0.1mVrms				
	DC to 20 kHz				
Spurious (non-harmonic)(5)	-60 dBc DC~ 1 MHz				
	-50 dBc 1MHz~ 20MHz				
	-50 dBc+ 6 dBc/octave 1MHz~ 30MHz (AFG-3031/3032)				
Phase Noise	< -110dBc/Hz typical, 15 kHz offset, fc = 10MHz,				
Square wave Characteristics					
Rise/Fall Time	<8 ns (3)				
Overshoot	< 5%				
Asymmetry	1% of period+1 ns				
Variable Duty Cycle	20.0% to 80.0%, ≤ 25 MHz			20.0% to 80.0%, ≤ 20 MHz	
	40.0% to 60.0%, 25 to 30MHz				
Jitter	0.01%+525ps < 2 MHz				
	0.1%+75ps > 2 MHz				
Ramp Characteristics					
Linearity	< 0.1% of peak output				
Variable Symmetry	0% to 100% (0.1% resolution)				
Pulse Characteristics					
Pulse Width	20ns to 999,830s				
	Period ≥ Width-0.625 [(Rise Time-0.6ns)+(Fall Time-0.6ns)]				

Duty setting range	0.017% to 99.983%	
Period	40ns to 1,000,000s	
Rise Time and Fall Time	9.32 ns to 799,900s (0.01ns or 3 digit resolution)	
Resolution	0.0001%	
Overshoot	<5%	
Jitter	100 ppm + 50 ps	
Harmonic		
Harmonic order	≤ 8	
Harmonic Type	Even, Odd, All, User ; Amplitude and Phase can be set for all harmonics	
AM		
Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse, Arb	
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp	
Modulating Frequency	2 mHz to 20 kHz	
Depth	0% to 120.0%	
Source	Internal / External	
FM		
Carrier Waveforms	Sine, Square, Triangle, Ramp	
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp	
Modulating Frequency	2 mHz to 20 kHz	
Peak Deviation	DC to 30 MHz (1uHz resolution)	DC to 20 MHz (1uHz resolution)
Source	Internal / External	
PM		
Carrier Waveforms	Sine, Triangle, Ramp	
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp	
Phase Deviation	0° to 360°, 0.1° resolution	
Modulating Frequency	2 mHz to 20 kHz	
Source	Internal	
PWM		
Carrier Waveforms	Square	
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp	
Modulating Frequency	2 mHz to 20 kHz	
Deviation	0% ~ 100.0% of pulse width, 0.1% resolution	
Source	Internal / External	
Additive modulation (Sum)		
Carrier Waveforms	Sine, Triangle, Ramp, Pulse, Noise	
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp	
Ratio	0% to 100% of carrier amplitude, 0.01% resolution	
Modulating Frequency	2 mHz to 20 kHz	

Source	Internal / External			
FSK				
Carrier Waveforms	Sine, Square, Triangle, Ramp			
Modulating Waveforms	50% duty cycle square			
Internal Rate	2 mHz to 1 MHz			
Frequency Range	DC to 30 MHz	DC to 30MHz	DC to 20MHz	DC to 20MHz
Source	Internal / External			
SWEEP				
Waveforms	Frequency Sweep: Sine, Square, Triangle, Ramp Amplitude Sweep: Sine, Square, Triangle, Ramp, Pulse, Noise, ARB			
Type	Frequency, Amplitude			
Functions	Linear or Logarithmic			
Direction	Up or Down			
Start F / Stop FREQ	Any frequency within the waveform's range			
Sweep Time	1 ms to 500 s (1 ms resolution)			
Trigger Mode	Single, External, Internal			
Trigger Source	Internal / External			
BURST				
Waveforms	Sine, Square, Triangle, Ramp, Pulse, Noise			
Frequency	1 uHz to 30 MHz (4)		1uHz to 20MHz	
Burst Count	1 to 1,000,000 cycles or Infinite			
Start / Stop Phase	-360.0° to +360.0° (0.1° resolution)			
Internal Period	1 us to 500 s			
Gate Source	External Trigger (pulse waveforms can only be used in gate mode)			
Trigger Source	Single, External or Internal Rate			
Trigger Delay	N-Cycle, Infinite: 0us to 100s (1us resolution)			
External Modulation Input				
Type	AM, FM, PWM			
Voltage Range	± 5V full scale			
Input Impedance	10kΩ			
Frequency	DC to 20 kHz			
Modulation Output	AFG-3031/3021 only			
Type	AM, FM, PM, PWM, SUM, Sweep			
Amplitude Range	≥ 1Vpp			
Impedance	> 10kΩ typical			
External Trigger Input				
Type	For FSK, Burst, Sweep, N Cycle ARB			
Input Level	TTL Compatibility			
Slope	Rising or Falling (Selectable)			
Pulse Width	> 100 ns			

Input rate		DC to 1 MHz	
Input Impedance		10kΩ,DC coupled	
Latency	Sweep	< 10 us (typical)	
	Burst	< 100 ns (typical)	
Jitter	Sweep	2.5 us	
	Burst	1 ns; except pulse,300 ps	
10MHz Reference Output			
Output voltage		1 Vp-p / 50 Ω square wave	
Output Impedance		50 Ω, AC coupled	
Output Frequency		10MHz	
10MHz Reference Input			
Input Voltage		0.5Vpp to 5Vpp	
Input Impedance		1k Ω, unbalanced, AC coupled	
Input Frequency		10MHz ± 10Hz	
Waveform		Sine or Square (50±5% duty)	
Ground Isolation		42Vpk max.	
External-Sync			
Phase Delay (max.)		Series Connection: $39+(N-2)*39 \pm 25nS$ Parallel connection: $(N-1)*6 \pm 25nS$ (where N=number of connected units)	
Maximum number of connected units		Series Connection: 4 Parallel Connection: 6	
Applicable Functions		Sine, Square, Triangle, Pulse, Ramp, Harmonic, MOD, Sweep, Burst	
Store/Recall		10 Groups of Setting Memories	
Interface		GPIB(Optional), LAN, USB	
Display		4.3 inch TFT LCD, 480 × 3 (RGB) × 272	
General Specifications			
Power Source		AC 100~240V , 50~60Hz	
Power Consumption		50VA	85VA
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	
Pollution Degree		IEC 61010 Degree 2, Indoor Use	
Storage Temperature		-10 ~ 70°C, Humidity: ≤70%	
Dimensions (WxHxD)		Bench Top : 265 (W) x 107 (H) x 374 (D)	
Weight		Approx. 4kg	

Safety Designed to	EN61010-1
EMC Tested to	IEC-61326, EN 55011
Accessories	Test cable(GTL-110×1 for AFG-3031/AFG-3021, GTL-110×2 for AFG-3032/AFG-3022), User Manual Compact Disk × 1, Quick Start Guide × 1, Power cord × 1
(1). A total of ten waveforms can be stored. (Every waveform can composed of 8M points maximum.)	
(2). Add 1/10th of output amplitude and offset specification per °C for operation outside of 0°C to 28°C range (1-year specification).	
(3). Edge time decreased at higher frequency.	
(4). Sine and square waveforms above 25 MHz are allowed only with an "Infinite" count.	
(5). Harmonic distortion and Spurious noise at low amplitudes is limited by a -70 dBm floor.	