



Multi-Channel Signal Outputs

Satisfy Your Diversified Signal Requirements



GW INSTEK MFG-2160 SERIES

Multi-Channel Function Generator

New Product Announcement

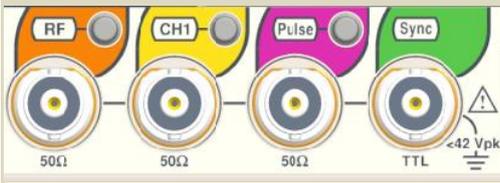
This document allows GW Instek's partners to quickly grasp product's main features, FAB and ordering information.

Multi-channel signal outputs to satisfy your diversified signal requirements

GW Instek launches the brand new MFG-2100 series multi-channel function generator. The output channels of MFG-2100 models include one single-channel 10M/20M/30M/60MHz ARB generator ; one 25MHz pulse generator ; one 160MHz or 320MHz RF signal generator (MFG-2160MF/MFG-2160MR) and one power amplifier (MFG-2120MA only).

The AFG channel of the MFG-2100 series outputs sine, square, and triangle, etc. The series features true point-by-point output arbitrary waveform characteristics of 200 MHz sample rate, 100MHz waveform repetition rate, 14 bit resolution, and 16k point memory depth. Some models provide various modulation methods such as AM/FM/PM/FSK/PWM, Sweep, Burst, Trigger, 150MHz Frequency Counter. Synchronized dual channel models provide correlated functions, including synchronization, delay, sum, and coupling. RF signal generator, a complete AFG signal source (including ARB), features various modulations, Sweep, and digital modulations such as ASK and PSK and its sine wave frequency is up to 320MHz. A full-function pulse generator with 25 MHz is equipped to all models and its pulse width, rise edge time, fall edge time are adjustable that can be applied as trigger signals. Independent input/output power amplifier with 20W, 10dB, DC-100KHz bandwidth, and distortion less than 0.1% can be applied to the audio application.

Isolated Channel Design



The overall design of the MFG-2100 series is earth ground isolation among output/input terminals and instrument chassis that can only be found in high-level signal sources. The output channels can sustain maximum isolation voltage up to $\pm 42\text{Vpk}$ (DC+ AC peak value) to earth ground that is ideal for floating circuit tests. Multi-unit outputs can be executed without factoring in grounding reference issue. There is no additional isolation requirement for experiments such as “full-wave rectification” and “voltage doubler” which are easy and safe. An external power supply can bring up the DC bias voltage to $\pm 42\text{Vpk}$ to meet the requirements of higher DC bias voltage such as automotive and educational applications.

Arbitrary Waveform Editing Software

The AFG of the MFG-2100 series collocating with AWES (Arbitrary Waveform Editing Software) allows users to easily and quickly edit arbitrary waveforms. DWR (Direct Waveform Reconstruction) allows users to collocate with GDS series digital oscilloscopes to retrieve waveforms and upload them to arbitrary generator to achieve direct waveform reconstruction. 66 built-in waveforms allow users to edit arbitrary waveforms and to output the whole segment or divided segments.

Satisfied various application

With the multi-functionality channels, the MFG-2100 series provides different industrial sectors with special dual channel waveforms, IQ modulation signals, low-frequency vibration simulation, automotive sensors, AM/FM broadcast signals, PWM motor or fan control signals, pulse synchronized signals, pulse noise, audio circuit or devices such as speaker tests. The series is ideal for various fields, including scientific research, education, research and development, production and quality control.

Major Specifications and Functions

Main Features

- Maximum 4 channels including one arbitrary function generator channel, full-function pulse generator, full-function RF signal generator, power amplifier, can be output simultaneously.
- The frequency range of AFG channel is from 1uHz to 10/20/30/60MHz
- The output frequency bandwidth of RF channel(including FG/ARB/Modulation functions): 160/320MHz
- Pulse generator reaches 25MHz
- Low frequency power amplifier is 100kHz and its output power is 20W
- Genuine point-by-point output arbitrary waveform function features 200MSa/s, 100 waveform repetition rate, 14 bit resolution and 16k point memory depth
- Circuit design for ground isolation among output/input terminals and instrument chassis
- 150MHz, 8 bit frequency counter
- Various modulation methods : AM, FM, PM, ASK, FSK, PSK, SUM and PWM
- Instrument control interface : USB Host/ USB Device
- 4.3 inch TFT color display

Interface

- USB device port ,host port

Software and Driver

- USB driver
- AWES (Arbitrary Waveform Editing Software) PC software

Customers and Applications

Customers

- Educational institutions
- Automotive electronics

Applications

- Signal source outputs signals with DC offset
- Diodes in series carrier
- Full wave bridge rectifier
- Simulate diode's V-I characteristics curve
- Doubler circuit
- Automotive electronics such as transmission rotation, ABS system, power steering system, ignition control or inverter, etc.

Product model selection

The entire MFG-2100 series has 6 models. The specific functions for each model are as follows:

MFG-2100 series specific functions					
	CH1	25MHz Pulse Generator	RF Generator (Function With ARB)	Power Amplifier	Modulation /Sweep/Burst/ Frequency Counter
	Function With ARB				
MFG-2110	●10MHZ	●			
MFG-2120	●20MHZ	●			
MFG-2120MA	●20MHZ	●		●	●
MFG-2130M	●30MHZ	●			●
MFG-2160MF	●60MHZ	●	●160MHZ		●
MFG-2160MR	●60MHZ	●	●320MHZ		●

The MFG-2100 series can maximally and simultaneously output four functional channels. The functionalities of each channel are as follows:

Channel 1	1uHz-60MHz max. FG With 200MSa/s ARB	AM ,FM ,PM,FSK PWM ,Sweep ,Burst , Trigger, Frequency Counter	
RF Channel	1uHz-320MHz max. FG With 200MSa/s ARB		ASK,PSK
Pulse Generator	25MHz Full Function pulse Generator (Frequency /Width/duty Cycle /Rise and Fall Edge adjustable)		
Power Amplifier	20W Power Amplifier (20W (RL=8Ω)/20dB/DC-100kHz/<0.1% (Ampl >1Vpp 20Hz~20kHz)		

Product model selection guide

The MFG-2100 has 6 models. The specific functions for each model are as follows:

MFG-2110	CH1 1uHz - 10MHz Functions With 200MSa/s ARB	25MHz Full Function Pulse Generator
MFG-2120	CH1 1uHz - 20MHz Functions With 200MSa/s ARB	25MHz Full Function Pulse Generator

MFG-2120MA	CH1 1uHz -20MHz Functions With 200MSa/s ARB	25MHz Full Function Pulse Generator	AM,FM,PM, FSK,PWM, Sweep,Burst, Trigger, Frequency Counter	20W Power Amplifier
MFG-2130M	CH1 1uHz - 30MHz Functions With 200MSa/s ARB	25MHz Full Function Pulse Generator	AM,FM,PM, FSK,PWM, Sweep,Burst, Trigger, Frequency Counter	
MFG-2160MF	CH1 1uHz - 60MHz Functions With 200MSa/s ARB	25MHz Full Function Pulse Generator	ASK ,PSK ,AM,FM,PM, FSK,PWM, Sweep,Burst, Trigger, Frequency Counter	RF 1uHz - 160MHz Functions With 200MSa/sARB
MFG-2160MR	CH1 1uHz - 60MHz Functions With 200MSa/s ARB	25MHz Full Function Pulse Generator	ASK ,PSK ,AM,FM,PM, FSK,PWM, Sweep,Burst, Trigger, Frequency Counter	RF 1uHz - 320MHz Functions With 200MSa/sARB

Features/Advantages/Benefits

Features	Advantages	Benefits
One of a kind multi-channel functionality output signal source	Four full-function channels can be operated simultaneously to facilitate users' various applications.	An all-in-one signal source is superior to so many instruments.
Earth ground isolation design among output/input terminals and instrument chassis can only be found in high-level signal sources.	Connectors can sustain maximum isolation voltage up to $\pm 42\text{Vpk}$ (DC+ AC peak value). An external power supply can bring up the DC bias voltage to $\pm 42\text{Vpk}$.	Ideal for floating circuit tests. Multi-unit output can be achieved without factoring in grounding reference. There is no additional isolation requirement for experiments such as "full-wave rectification" and "voltage doubler". The experiments are easy and safe.
The MFG-2100 series has a built-in full-function pulse generator.	General signal sources only provide the adjustable DUTY pulse function which can not compete with the full-function pulse generator.	Satisfy the test requirements of amplifier design, digital control, switching power supply and simulate signal triggering or noise and surge applications, etc.
Full-function RF signal generator channel	Based on a full-function AFG (including the arbitrary waveform function), the frequency range is extended to 320MHz RF	Satisfy the test requirements of analog AM/FM or digital FSK/ASK/PSK radio experiments.

	bandwidth, which can be applied as simulated signals of analog or digital broadcast stations or carrier signals of local oscillators.	
Low frequency power amplifier channel	It can be applied as an audio amplifier or a driver amplifier for piezoelectric components and conducts power component characteristics tests, magnetization characteristics tests of magnetic materials.	Built-in power amplifier is very convenient and it saves cost and space. Users do not have to use an external power amplifier.
Genuine point-by-point output arbitrary waveform function features 200MHZ sample rate, 100MHz waveform repetition rate, 14 bit resolution, and 16k point memory depth.	General signal sources have only built in basic arbitrary waveforms. The limited sample rate, repetition rate and memory depth of general signal sources restrict ARB's full function.	Provide many arbitrary waveform editing methods and also provide whole segment or segmented output.
AM/FM/PM/ASK/FSK/PSK/PWM modulation methods	Provide many analog and digital modulation functions	Satisfy the experiment test requirements of scientific research and educational domain
Waveform reconstruction function	Simple operation to obtain signals retrieved by GDS series digital oscilloscopes.	A trouble shooting tool for users.

Position

The MFG-2100 series is one of a kind, multi-channel functionality output signal source. All terminals are earth ground isolated that is the design only for high-level signal sources. GW Instek leads the industry to incorporate this design into the MFG-2100 series which is conducive to educational experiments and automotive electronics tests.

Key Dates for Product Announcement

1. Global Market Announcement: (Dec 28, 2016)
2. Order Queue Open: (Nov 28, 2016)

Service Policy

1. One year warranty. The MFG-2100 series carries a standard one year warranty.
2. Service Support. The service instructions in the Service Manual will help distributors repair defective units promptly. Should the board replacement is necessary to fix the defective unit, the board swapping service support is provided by Good Will Instrument to facilitate the repair jobs done at the distributor's site.
3. Good Will Instrument continues to provide the after sales support through its website. The most updated version of firmware and PC software of the MFG-2100 series will be posted on the distributor zone of Good Will Instrument Website at <http://www.gwinstek.com> for free download via USB Flash Drive.

Order information

MFG-2110	10MHz Single channel Arbitrary Function Generator with pulse generator
MFG-2120	20MHz Single channel Arbitrary Function Generator with pulse generator
MFG-2120MA	20MHz Single channel Arbitrary Function Generator with pulse generator, modulation, power amplifier
MFG-2130M	30MHz Single channel Arbitrary Function Generator with pulse generator, modulation
MFG-2160MF	60MHz Single channel Arbitrary Function Generator with pulse generator, modulation, 160MHz RF signal generator
MFG-2160MR	60MHz Single channel Arbitrary Function Generator with pulse generator, modulation, 320MHz RF signal generator

Standard Accessories

GTL-101, BNC-Alligator Test Lead *1 (MFG-2110, MFG-2120, MFG-2120MA, MFG-2130M, MFG-2160MF, MFG-2160MR)

Quick Start Guide *1, CD-ROM with MFG software and user manual *1

Optional Accessories

GTL-246, USB Type A to Type B cable

Free Download

Arbitrary Waveform Editing Software ;USB driver

Detailed product information

1. Feature description	9
2. Product appearance	16
3. Product specifications.....	18

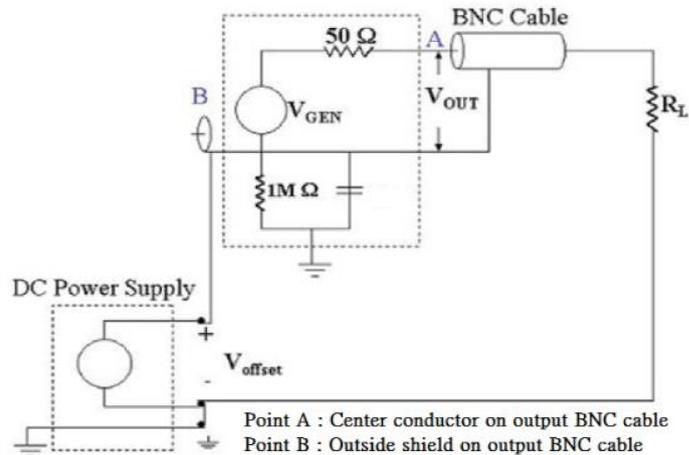
Feature introduction

Circuit Design for Ground Isolation among Output/Input Terminals and Instrument Chassis

Input / Output terminal isolated from instrument chassis

Output channels, synchronization and modulation input/output connector grounding are isolated from instrument chassis. These connectors can sustain maximum isolation voltage up to $\pm 42\text{Vpk}$ (DC+ AC peak value) to earth ground that is ideal for floating circuit tests. Multi-unit outputs can be executed without factoring in grounding reference issue.

The built-in DC bias voltage of the MFG-2100 series can be applied on various waveforms. The DC bias voltage is $\pm 5\text{V}$ under 50 ohm load. An external power supply can be used to bring up the DC bias voltage to $\pm 42\text{Vpk}$ (DC+ AC peak value) for higher DC bias applications.



Connection diagram for MFG connecting with a power supply to increase D.C. bias voltage to $\pm 42\text{Vpk}$ (DC+ AC peak value).

Isolated signal source

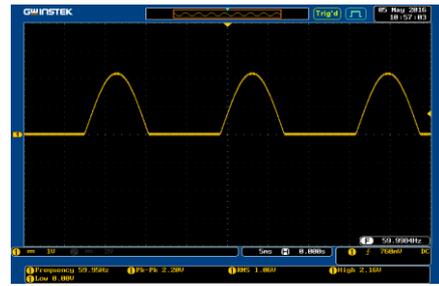
Compared with the general signal sources, isolated signal sources have a wider range of applications.

Take full-wave rectification, the frequented experiment, as an example

1. A general signal source was utilized for the experiment.

The standard waveform output	
Since the comm. ground between Function generator's GND and circuit's GND, thus the D1 diode will short.	

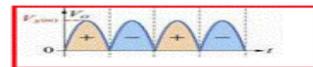
The standard theoretical waveform is different from the result of the actual measurement!!



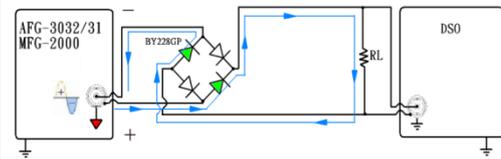
The actually waveform output

2. An isolated signal source was utilized for the experiment.

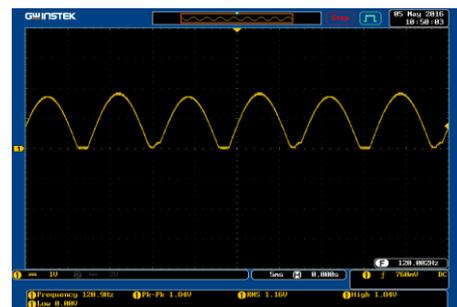
The standard waveform output



When use MFG-2100 isolated signal source ,D1 will not short .



The standard theoretical waveform is the same as the result of the actual measurement!!

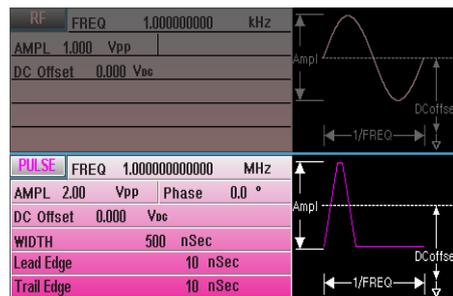


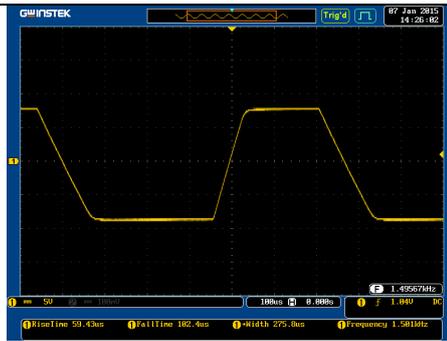
The actually waveform output

Multi-function signal generator

All model provide
Pulse Generator

Each model of the series has a built-in pulse generator and its output frequency reaches 25 MHz. Users can set pulse width, duty cycle, rise edge time, fall edge time and edge time to support trigger signal.





RF Signal Generator

RF signal generator is a full function AFG signal source. It can output sine, square, ramp, pulse, noise, etc. Its sine wave frequency reaches 160MHz or 320MHz. And its true point-by-point output arbitrary waveform function supports 200 MHz sample rate, 100MHz waveform repetition rate, 14 bit resolution, 16k point memory depth, frequency sweep and various modulation methods such as AM/FM/PM/FSK/PWM/PSK/ASK. RF signal generator can be applied as a high frequency arbitrary waveform generator, simulated signals of analog or digital broadcast stations or carrier signals of local oscillator.

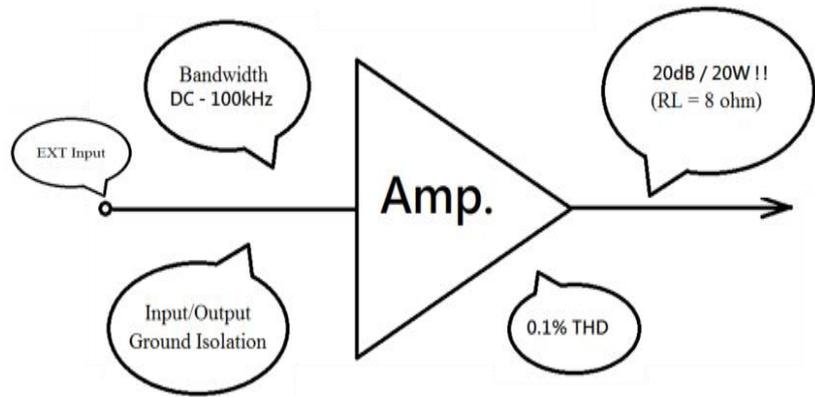
RF Channel	ASK, PSK
	AM, FM, PM, FSK, PWM, Sweep, Burst, Trigger, Frequency Counter
	ARB (200MHz)
	Other Waveform
	Triangle, Ramp (1MHz)
	Square (25MHz)
Sine wave FREQ. Up to 320MHz max.	

The full function of RF signal generator.

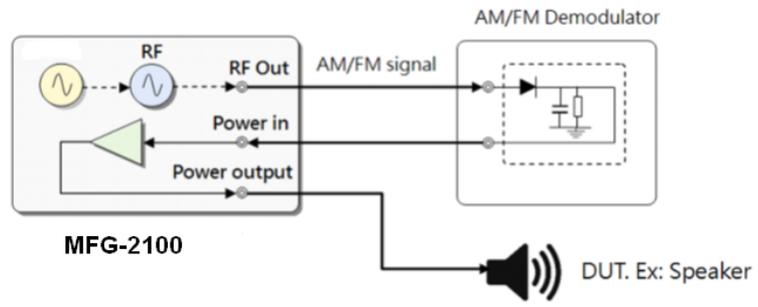
Multi-function signal generator

Power amplifier

MFG-2120MA provides a 20W/20dB power amplifier, which has a bandwidth of DC-100KHz and less than 0.1% distortion. The low frequency power amplifier can be applied as an audio amplifier or a driver amplifier for piezoelectric components (collocating with an impedance transformer, 20W output) and conducts power component characteristics tests, magnetization characteristics tests (B-H curve) of magnetic materials such as ferrite and amorphous materials (collocating with an impedance transformer, 20W output) .



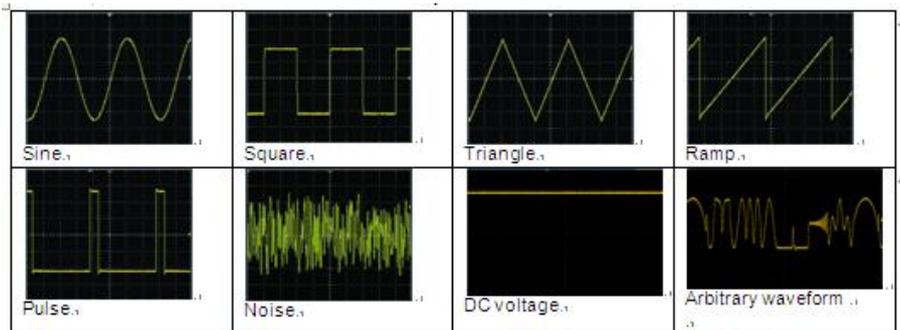
Users can connect a speaker with the low frequency power amplifier of the MFG-2100 series to realize various physics experiments. The frequented educational application is as follows:



Versatile Output Waveform Selections

Built-in 66 waveforms

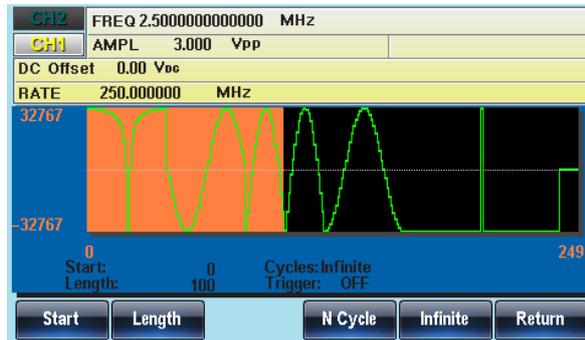
There are standard waveforms for the series such as sine, square, triangle, ramp, pulse, noise, DC voltage. In addition, 66 built-in waveforms allow users to easily select desired waveforms.



Provide four methods to obtain arbitrary waveforms

Front Panel Operation

Via single unit's panel, arbitrary waveforms can be selected, edited, stored, recalled, output, triggered from 66 built-in waveforms.



CSV File Upload

Support CSV file upload produced by MATLAB and Excel.

	A	B	C
1	Start:	0	
2	Length:	629	
3	Sample Rate:	200000000	
4	0		
5	328		
6	655		
7	983		
8	1310		
9	1638		
10	1965		

```
% sine wave generation program
result=round(2^15*sin(0:0.01:2*pi));
save gensin.csv result /ascii;
% end
```

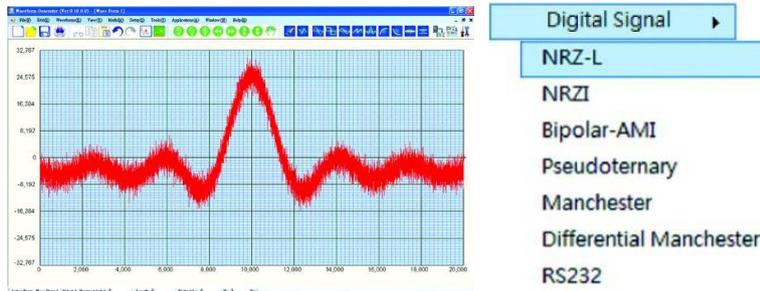
```
Start: 0
Length: 629
Sample Rate: 200000000
0
328
655
983
1310
1638
```

Direct Waveform Reconstruction

Collocate with GDS series digital oscilloscopes to retrieve waveforms and upload them to arbitrary generator to achieve direct waveform reconstruction

Arbitrary Waveform Editing PC Software

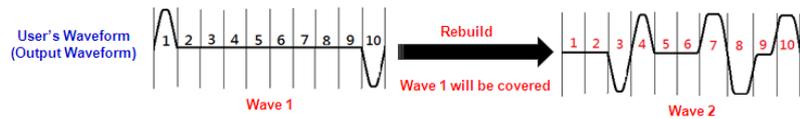
Use AWES to edit complex waveforms. The software supports waveform mathematical operation. The waveform series includes Uniform Noise, Gaussian Noise, Rayleigh Noise, various digital codes such as non zero code, Manchester and RS-232, etc.



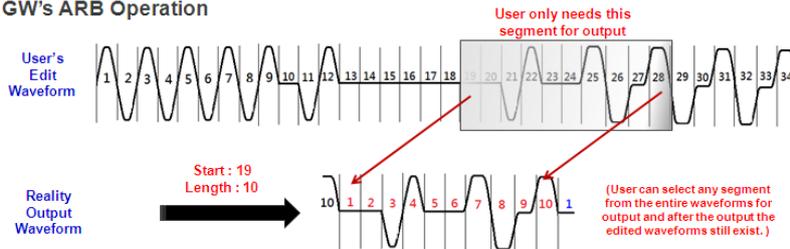
Flexible arbitrary editing

The operation mode of “user-defined retrieval of segmented output” increases arbitrary efficiency!!

Other Brand’s ARB Operation



GW’s ARB Operation



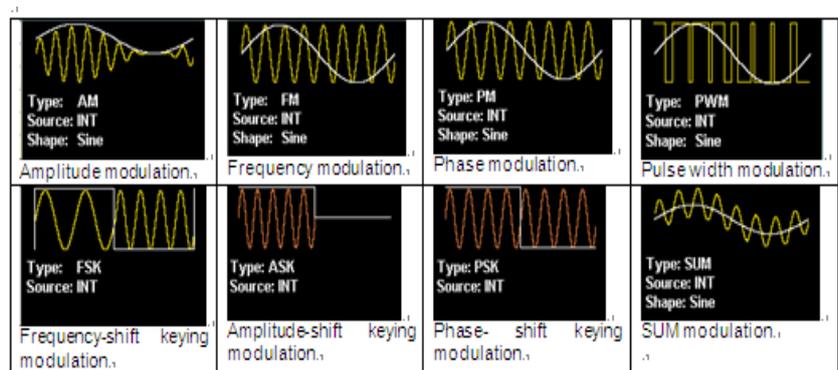
MFG-2100 waveform output can freely define starting points and wavelength. Similar waveforms do not require reediting that greatly increases ARB usage efficiency.

Other brands can only output waveform from point 0 and they can not define wavelength that greatly reduces usage flexibility.

Diversity application function

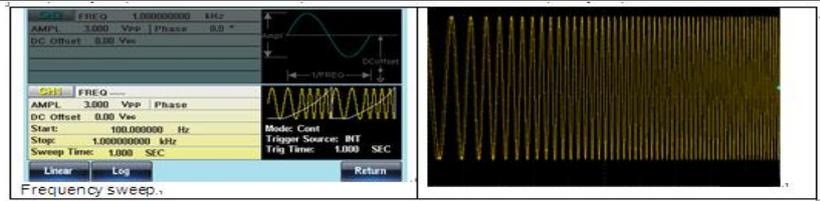
Various Modulation Function

The series supports AM, FM, PM, FSK, PWM and SUM modulation. RF channel not only has the above-mentioned modulation capabilities but also supports advanced modulations such as ASK and PSK Modulation. The most modulation sources can be internal or external. Applications include communications systems’ base band, motor control and light adjustment.



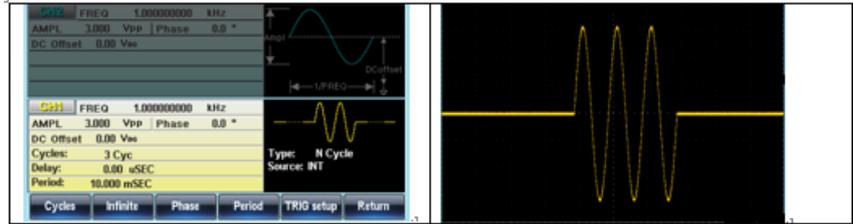
Sweep Function

The series supports frequency sweep and amplitude sweep that can also integrate other functions, including linear/logarithm, one-way (saw tooth)/two-way (triangle) waveforms, continuous/single trigger/gated trigger to meet various application requirements by different sweep methods. Frequency sweep carries out tests on the frequency response of electronic components such as filter and low frequency amplifier.



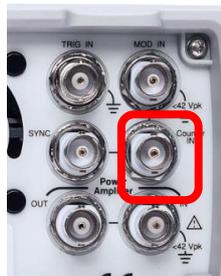
Burst Function

The series supports N-period or gated trigger. Phase angle, duration time, frequency, waveform infinite can be adjusted to meet non-continuous output applications.

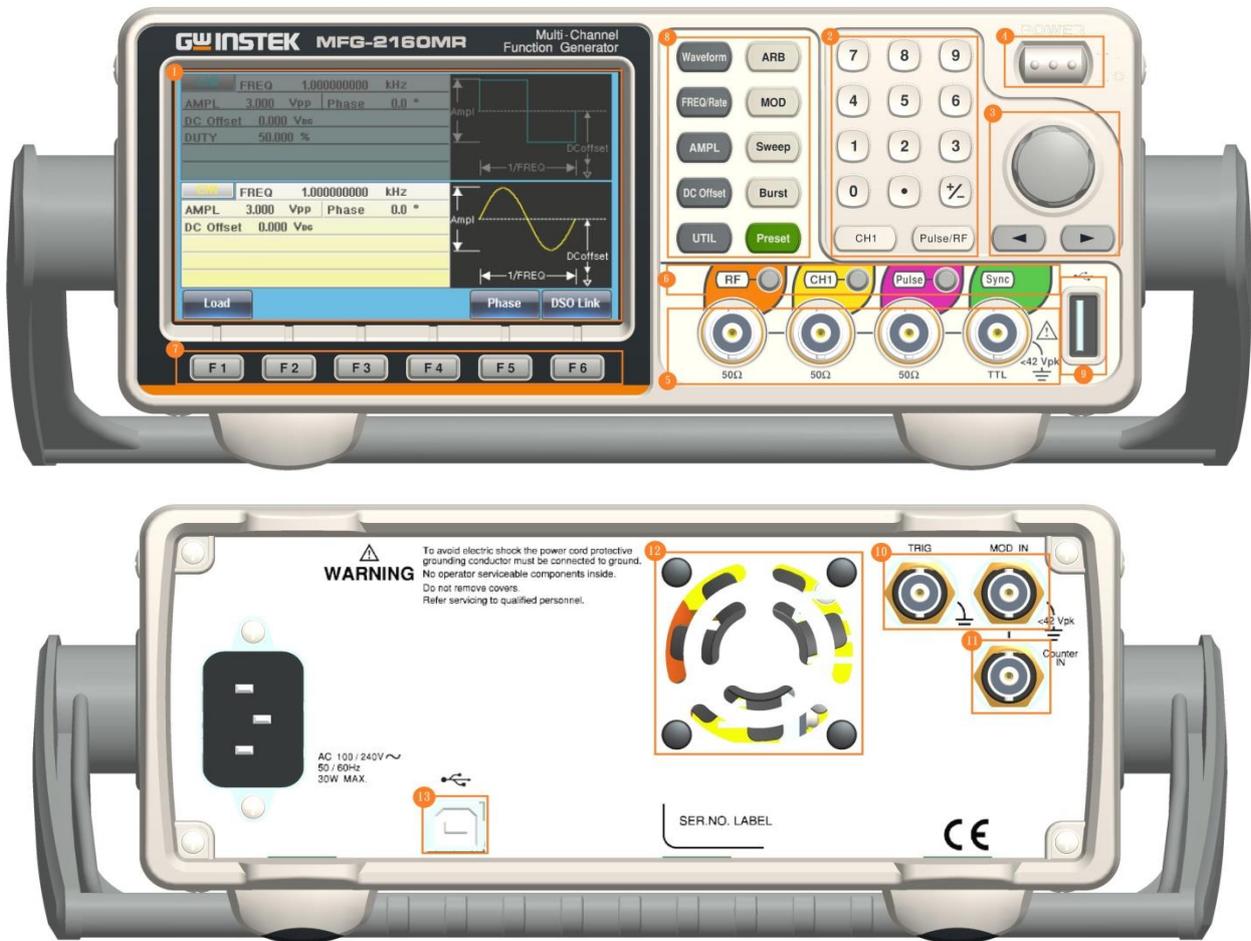


Frequency counter function

One standard 150MHz bandwidth /8 bits frequency counter .It provides 35mVrms high input sensitivity.



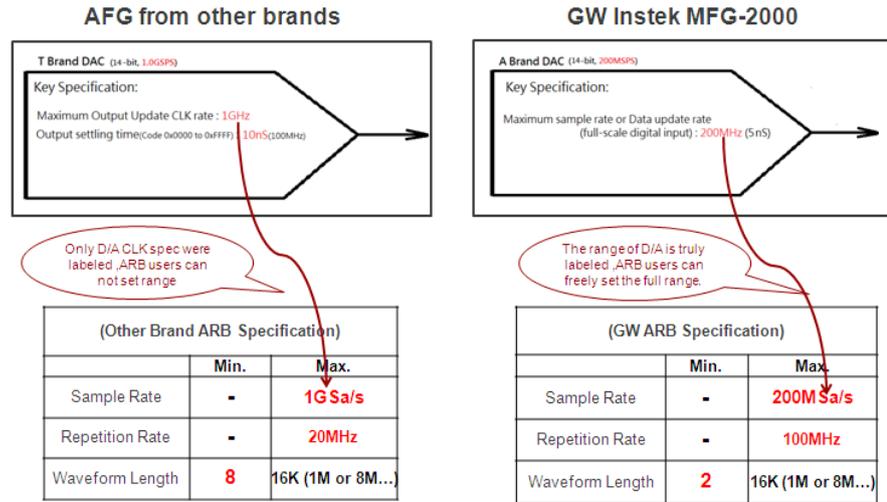
Panel Introduction



- | | | |
|--------------------------------|--------------------------------|----------------------------|
| 1. TFT LCD Panel | 6. Main Output Switch | 11. Sync and Counter input |
| 2. Number Panel | 7. Function Keys | 12. Fan |
| 3. Scroll Knob & Selection Key | 8. Operation Keys | 13. USB Device |
| 4. Power switch | 9. USB Host | |
| 5. Output Terminal | 10. Trigger & Modulation Input | |

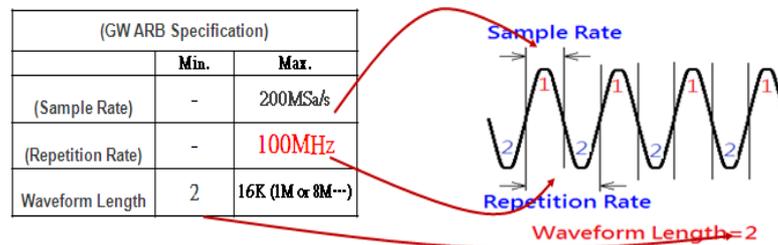
Arbitrary Waveform Comparison

MFG-2100 true point by point output function

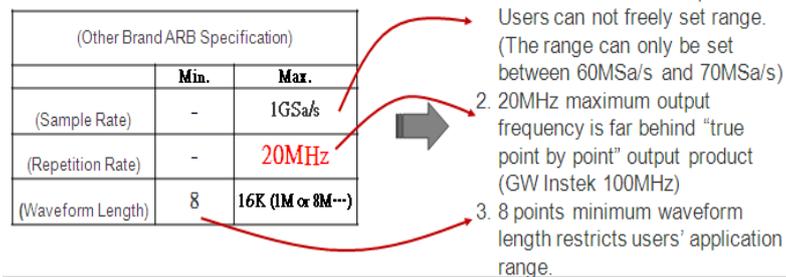


Sample rate is different from other brands' "true ARB sample rate"
 Other brands label D/A Clock as sample rate, and users can not set 1GSa/s sample rate, the maximum is 75MSa/s.
 MFG-2100 provides higher sample rate of 200MSa/s.
 With the higher sample rate of 200MSa/s, MFG-2100 can satisfy the highest frequency to produce waveform = sample rate/wavelength
 (100MHz=200MSa/s/2), which indeed is true point-by-point output ARB waveform function.

"True point-by-point output ARB"---->Sample rate /waveform length=the maximum frequency of the waveform



"True point by point: output ARB----> sample rate /waveform length=the maximum frequency of the waveform"

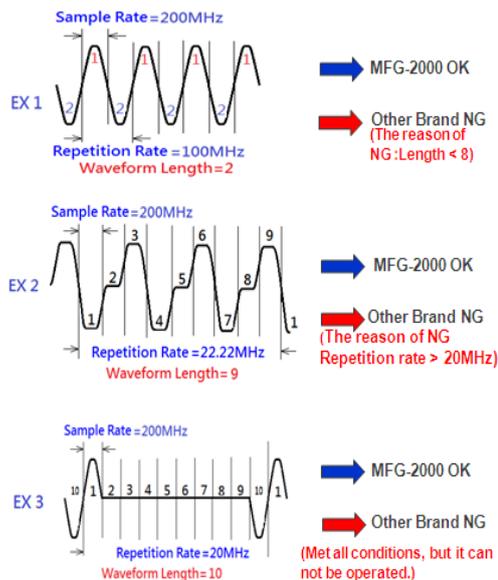


The maximum waveform frequency: MFG-2100 is higher than that of other brands.
 MFG-2100:200MSa/s /2=100MHz.
 Siglent SDG-2000X only provide :75MSa/s /8=9.375MHz
 Rigol DG-1000Zonly provide :60MSa/s /8=7.5MHz

“True point-by-point”
output can maximize the
effectiveness of arbitrary
waveform

GWARB Specification		
	Min.	Max.
Sample Rate	-	200MSa/s
Repetition Rate	-	100MHz
Waveform Length	2	16K (1M or 8M...)

Other Brand ARB Specification		
	Min.	Max.
Sample Rate	-	1G Sa/s
Repetition Rate	-	20MHz
Waveform Length	8	16K (1M or 8M...)



The above waveform output required a sample rate of 20M*10=200MSa/s. Other brands, with sample rates of 75M(Siglent SDG-2000X) and 60M (Rigol DG-1000Z), could not produce the required waveform.

Specifications

The specifications apply when the function generator is powered on for at least 30 minutes under 18°C~28°C.

MFG-2100 series specific functions					
	CH1 Function With ARB	25MHz Pulse Generator	RF Generator (Function With ARB)	Power Amplifier	Modulation /Sweep/Burst/ Frequency Counter
MFG-2110	●10MHZ	●			
MFG-2120	●20MHZ	●			
MFG-2120MA	●20MHZ	●		●	●
MFG-2130M	●30MHZ	●			●
MFG-2160MF	●60MHZ	●	●160MHZ		●
MFG-2160MR	●60MHZ	●	●320MHZ		●

CH1

Arbitrary Functions

ARB function	Built-in
Sample Rate	200 MSa/s
Repetition Rate	100MHz
Waveform Length	16k points
Amplitude Resolution	14 bits
Non-Volatile Memory	10sets 16k points(1)
User-defined output section	From point 2~16384
User-defined output marker section	From point 2 ~ 16384
Output mode	1~1048575 cycles or infinite mode

Frequency Characteristics

Range	Sine	60MHz(max)
	Square	25MHz(max)
	Triangle, Ramp	1MHz
Resolution		1μHz
Accuracy Stability	±20 ppm	

	Aging	±1 ppm, per 1 year
	Tolerance	≤1μHz
Output Characteristics(2)		
	Amplitude Range	1mVpp to 10 Vpp (into 50Ω) 2mVpp to 20 Vpp (open-circuit)
	Accuracy	±2% of setting ±1 mVpp (at 1 kHz/into 50Ω without DC offset))
	Resolution	0.1mV or 4 digits
	Flatness	± 1% (0.1dB) ≤1MHz ± 3% (0.3dB) ≤50 MHz ± 10% (0.9dB) ≤160MHz ± 30% (3dB) ≤320MHz (sinewave relative to 1 kHz/into 50Ω)
	Units	Vpp, Vrms, dBm
	Offset Range	±5 Vpk ac +dc (into 50Ω) ±10Vpk ac +dc (Open circuit)
	Accuracy	1% of setting + 5mV+ 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 Ground Isolation	42Vpk max
	Range	TTL-compatible into>1kΩ
	Impedance	50Ω standard
	Ground Isolation	42Vpk max
Sine wave Characteristics(3)		
	Harmonic distortion	-60 dBc DC ~ 200kHz, Ampl>0.1 Vpp -55 dBc 200kHz ~ 1 MHz, Ampl>0.1 Vpp -45 dBc 1MHz ~ 10 MHz, Ampl > 0.1Vpp -30 dBc 10MHz ~ 320MHz, Ampl > 0.1Vpp
	Total harmonic distortion	< 0.1% (Ampl>1Vpp) DC~100 kHz
Square wave Characteristics		
	Rise/Fall Time	<15ns
	Overshoot	<5%
	Asymmetry	1% of period +5 ns
	Variable duty Cycle	0.01% to 99.99%(limited by the current frequency setting)
	Jitter	20ppm+500ps(4)
Ramp Characteristics		
	Linearity	< 0.1% of peak output
	Variable Symmetry	0% to 100%
Pulse Characteristics		
	Frequency	1uHz~25MHz
	Pulse Width	≥20nS(limited by the current frequency setting)
	Variable duty Cycle	0.01%~99.99%(limited by the current frequency setting)
	Overshoot	<5%
	Jitter	20ppm +500ps(4)
Pulse Generator		
	Amplitude	1mVpp to 2.5 Vpp (into 50Ω) 2mVpp to 5 Vpp (open-circuit)
	Offset	±1 Vpk ac +dc (into 50Ω) ±2Vpk ac +dc (Open circuit)
	Frequency	1uHz~25MHz
	Pulse Width	20nS~999.9ks(limited by the current frequency setting)
	Variable duty Cycle	0.01%~99.99%(limited by the current frequency setting)

Leading and Trailing Edge Time(5)	10nS~ 20S(1ns resolution) (limited by the current frequency and pulse width settings)
Overshoot	<5%
Jitter	100ppm +500ps(4)

RF Generator

Arbitrary Functions

ARB function	Built-in
Sample Rate	200 MSa/s
Repetition Rate	100MHz
Waveform Length	16k points
Amplitude Resolution	14 bits
User-defined output section	From point 2~16384 (optional)
Jitter	20ppm +5ns

Frequency Characteristics

Range	Sine	1uHz~160MHz(MFG-2XXXMF) 1uHz~320MHz(MFG-2XXXMR)
	Square	25MHz(max)
	Triangle, Ramp	1MHz
Resolution		1μHz
Accuracy Stability	±20 ppm	
Aging	±1 ppm, per 1 year	
Tolerance	≤1μHz	

Output Characteristics(2)

Amplitude(into 50Ω)	1mVpp to 2 Vpp (MFG-2XXXMF) 1mVpp to 1 Vpp (MFG-2XXXMR)	
Accuracy	±2% of setting ±1 mVpp (at 1 kHz/into 50Ω without DC offset))	
Resolution	0.1mV or 4 digits	
Flatness	± 1% (0.1dB) ≤ 1MHz ± 3% (0.3dB) ≤ 50 MHz ± 10% (0.9dB) ≤ 160MHz ± 30% (3dB) ≤ 320MHz (sinewave relative to 1 kHz/into 50Ω)	

Offset

±1 Vpk ac +dc (into 50Ω)
±2Vpk ac +dc (Open circuit)

Waveform Output

Impedance	50Ω typical (fixed) > 10MΩ (output disabled)
-----------	---

Sine wave Characteristics(3)

Harmonic distortion	-60 dBc	DC ~ 200kHz, Ampl>0.1 Vpp
	-55 dBc	200kHz ~ 1 MHz, Ampl>0.1 Vpp
	-45 dBc	1MHz ~ 10 MHz, Ampl > 0.1Vpp
	-30 dBc	10MHz ~ 320MHz, Ampl > 0.1Vpp
Total harmonic distortion < 0.1% (Ampl>1Vpp) DC~100 kHz		

Square wave Characteristics

Rise/Fall Time	<15ns
Overshoot	<5%
Asymmetry	1% of period +5 ns
Variable duty Cycle	0.01% to 99.99%(limited by the current frequency setting)
Jitter	20ppm+500ps(4)

Ramp Characteristics

Linearity	< 0.1% of peak output
Variable Symmetry	0% to 100%

Modulation/Sweep

Modulation Type	AM,FM,PM,FSK,PWM (The detail same as CH1 modulation specification)
Sweep type	Frequency
Source	INT/EXT (INT only for AM,FM,PM, PWM)
PSK	
Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse
Modulating Waveforms	50% duty cycle square
Internal Frequency	2 mHz to 1 MHz
Phase Range	0° ~360.0°
Source	Internal / External
ASK	
Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse
Modulating Waveforms	50% duty cycle square
Internal Frequency	2 mHz to 1 MHz
Amplitude Range	0%~100.0%
Source	Internal / External
Power Amplifier	
Input Impedance	10K Ω
Input voltage	1.25Vpmax
Working Mode	Constant Voltage
Gain	20dB
Output Power (RL=8 Ω)	20W(Square)
Output Voltage	12.5Vpmax
Output Current	1.6Amax
Rise/Fall Time	<2.5 μ S
Full Power Bandwidth	DC-100KHz
Overshoot	5%
Total harmonic distortion	< 0.1% (Ampl>1Vpp) 20Hz~20 kHz
Ground Isolation	42Vpk max
Advanced Functions	
AM Modulation	
Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse, Arb
Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
Modulating Frequency	2mHz to 20kHz (Int) DC to 20kHz (Ext)
Depth	0% to 120.0%
Source	Internal / External
FM Modulation	
Carrier Waveforms	Sine, Square, Triangle, Ramp
Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
Modulating Frequency	2mHz to 20kHz (Int) DC to 20kHz (Ext)
Peak Deviation	DC to max frequency
Source	Internal / External
PM	
Carrier Waveforms	Sine, Square, Triangle, Ramp
Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
Modulation Frequency	2mHz to 20kHz (Int) DC to 20kHz (Ext)
Phase deviation	0° ~360.0°
Source	Internal / External
SUM	
Carrier Waveforms	Sine, Square, Triangle, Ramp
Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
Modulation Frequency	2mHz to 20kHz (Int) DC to 20kHz (Ext)
SUM depth	0%~100.0%
Source	Internal / External

PWM	Carrier Waveforms	Sine, Square, Triangle, Ramp
	Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp
	Modulation Frequency	2mHz to 20kHz (Int) DC to 20kHz (Ext)
	Phase deviation	0%~100.0% pulse width
	Source	Internal / External
	FSK	Carrier Waveforms
Modulating Waveforms		50% duty cycle square
Internal Frequency		2 mHz to 1 MHz
Frequency Range		1μHz to max frequency
Source		Internal / External
Sweep	Waveforms	Sine, Square, Triangle, Ramp
	Type	Linear or Logarithmic
	Sweep direction	Sweep up or sweep down
	Start/Stop Freq	1uHz to max frequency
	Sweep Time	1ms to 500s
	Source	Internal / External
	Trigger	Single, External, Internal.
	Marker	Marker signal on falling edge (programmable)
	Source	Internal / External
Burst	Waveforms	Sine, Square, Triangle, Ramp
	Frequency	1uHz~Max Frequency
	Pulse count	1~1000000 Cycles or infinite
	Start/ Stop Phase	-360.0° ~+360.0°
	Internal Frequency	1 us~500 s
	Gate source	External Trigger
	Trigger Source	Single, External, Internal.
	Trigger Delay	NCycle, Infinite
External Trigger Input	Type	For FSK, Burst, Sweep
	Input Level	TTL Compatibility
	Slope	Rising or Falling(Selectable)
	Pulse Width	>100ns
	Input Impedance	10kΩ · DC coupled
	External Modulation Input	Type
Voltage Range		±5V full scale
Input Impedance		10kΩ
Frequency		DC to 20kHz
Ground Isolation		42Vpk max
Trigger Output	Type	For FSK,Burst, Sweep
	Level	TTL Compatible into 50Ω
	Pulse Width	>450ns
	Maximum Rate	1MHz
	Fan-out	≥4 TTL Load
	Impedance	50Ω Typical
Frequency Counter	Range	5Hz to 150MHz
	Accuracy	Time Base accuracy±1count
	Time Base	±20ppm (23°C ±5°C)
	Resolution	The maximum resolution is: 100nHz for 1Hz, 0.1Hz for 100MHz.
	Input Impedance	1kΩ/1pf
	Sensitivity	35mVrms ~ 30Vms (5Hz to 150MHz)

	Ground Isolation	42Vpk max
Save/Recall		10 Groups of Setting Memories
Interface		LAN, USB
Display		4.3" TFT LCD 480 x 3 (RGB) x 272
General Specifications		
	Power Source	AC100~240V, 50~60Hz or AC100~120V, AC220~240V, 50~60Hz
	Power Consumption	30W or 80W(With power amplifier)
	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)	266(W) x 107(H) x 293(D) mm
	Weight	Approx. 2.5kg
	Safety designed to	EN61010-1
	Accessories	GTL-101x 1(MFG-21XX) Quick Start Guide x1 CD (user manual + software) x1 Power cordx1

- (1). A total of ten waveforms can be stored. (Every waveform can be composed of a maximum of 16k points.)
- (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). DC offset set to zero,
- (4). Jitter specification for RF Generator: 20ppm +5ns.
- (5). Only Pluse channel support

Please do not hesitate to contact us if you have any queries on the MFG-2100 series announcement.

Sincerely yours,

Overseas Sales Department
 Good Will Instrument Co., Ltd
 No. 7-1, Jhongsing Road, Tucheng Dist.,
 New Taipei City 23678, Taiwan R.O.C
 Email: marketing@goodwill.com.tw



www.gwinstek.com



www.facebook.com/GWInstek