

DDS 임의 함수 발생기

## Protek GD-2000N 시리즈



### 특징

- Protek 고유의 쉬운 펄스 & DDS 디지털 통합 기술
- 4.3" TFT 컬러 와이드 LCD 화면
- 500MSa/s의 최고 샘플링 속도, 14bit 분해능, 1 $\mu$ Hz 주파수 분해능
- 파형 길이: 512kpts
- Sine, Pulse, Square, Ramp, Gaussian Noise, DC, Arb 등 24종류의 파형
- 변조 ( AM, DBS-AM, FM, PM, ASK, FSK, PWM, Sweep, Burst )
- 200MHz 주파수 카운터 내장
- USB 호스트 & 디바이스

(Ver.GSI-DH01)

혁신적이고 쉬운 펄스 기술은 과거 기술과 비교하여 다음과 같은 우수한 이점을 가지고 있습니다.

- 낮은 주파수 (1Hz 미만) 출력시 펄스의 빠른 상승 하강에지 조절(6ns) 가능
- 낮은 주파수에서 12ns까지 펄스 폭 조정 과 함께 낮은 듀티비 제어가 가능
- 펄스 파라미터는 어떠한 파형 데이터의 업데이트 없이 쉽게 즉시 변경될 수 있다
- 펄스 에지 또는 폭을 넓게 조정할 수 있다

## Specification

Model	GD 2162M	GD 2122M	GD 2082M
Max. output frequency	160MHz	120MHz	80MHz
Output channels	2		
Sample rate	500 MSa/s		
Arbitrary waveform length	Ch1: 16 kpts	CH2: 512 kpts	
Frequency resolution	1 $\mu$ Hz		
Vertical resolution	14 bits		
Waveform	Sine, Square, Ramp, Pulse, Gaussian Noise, DC, Built-in arbitrary waveforms		
Modulation	AM, DSB-AM, FM, PM, FSK, ASK, PWM, Sweep, Burst		
Frequency counter	Frequency range:100mHz-200MHz		
Standard interface	USB Host & Device		
Dimension	Width x Heigth x Depth=261mm x 105mm x 344mm		

### Attention:

All these specifications apply to the GD2000N Series Function/Arbitrary Waveform Generator unless otherwise explanation. To satisfy these specifications, the following conditions must be met first:

- 1.The instrument has been operating continuously for more than 30 minutes within specified operating temperature range (18°C-28°C).
- 2.The temperature variation does not exceed 5°C.
- 3.Unless otherwise stated,all specifications apply with a 50 $\Omega$  resistive load and auto range ON.

**Note:** All specifications are guaranteed unless where noted 'typical'.

Typical:The characteristic performance,which 80% or more of manufactured instruments will meet,This data is not warranted,does not include measurement uncertainty,and is valid only at room temperature(approximately 23° C).

### Frequency Specification

Model	GD 2162M	GD 2122M	GD 2082M
Waveform	Sine, Square, Ramp, Triangle, Pulse, Noise, Arb		
Sine	1 $\mu$ Hz ~160MHz	1 $\mu$ Hz ~120MHz	1 $\mu$ Hz ~80MHz
Square	1 $\mu$ Hz ~50MHz	1 $\mu$ Hz ~40MHz	1 $\mu$ Hz ~30MHz
Pulse	1 $\mu$ Hz ~40MHz	1 $\mu$ Hz ~30MHz	1 $\mu$ Hz ~20MHz
Ramp/Triangular	1 $\mu$ Hz ~4MHz	1 $\mu$ Hz ~3MHz	1 $\mu$ Hz ~2MHz
Gaussian white noise	100MHz ( -3dB )	100MHz ( -3dB )	100MHz ( -3dB )
Arbitrary	1 $\mu$ Hz ~ 40MHz	1 $\mu$ Hz ~ 30MHz	1 $\mu$ Hz ~ 20MHz
Resolution	1 $\mu$ Hz		
Temperature coefficient	1 year, 18°C ~ 28°C , $\pm$ 1 ppm		
Coefficient	$\pm$ 1ppm, 0°C~55°C		

<b>Sine Spectrum Purity</b>		
Harmonic Distortion	DC – 1 MHz	< –56dBc
	1MHz – 10MHz	< –46dBc
	10MHz – 100MHz	< –35dBc
	100MHz – 160MHz	< –26dBc
Total harmonic waveform distortion	DC – 20 kHz, 1Vpp < 0.2%	
Spurious signal (non-harmonic)	DC – 160MHz < –70 dBc + 20 dB/spectrum phase	
Phase noise	100kHz Offset, –116 dBc / Hz (typical value)	
<b>Square Specification</b>		
Rise/fall time	< 6ns ( 10% ~ 90% )	
Overshoot	< 3%	
Duty Cycle	≤ 10 MHz	20% – 80%
	10 MHz – 40MHz	40% ~ 60%
	40 MHz – 50MHz	50%
Asymmetric(50% Duty Cycle)	1% of period + 5ns (typical, 1kHz, 1Vpp, 1kHz, 1Vpp)	
Jitter(cycle-to-cycle)	DC – 1MHz, ≤ 200ps ± 2ppm	
	1MHz – 50MHz, ≤ 500ps	
<b>Ramp/Triangle Specification</b>		
Linearity	< 0.1% of Peak value output ( typical, 1kHz, 1Vpp, 100% symmetry )	
Symmetry	0% – 100%	
<b>Pulse Specification</b>		
Periods	1000000s, Max. 25ns, Min	
Pulse width	≥ 12ns, 100ps resolution	
Duty	0.0001% – 99.9999%	
Rise/Fall time (10% ~ 90%)	6ns – 6s, 100ps resolution	
Overshoot	< 3%	
Jitter(cycle to cycle)	DC – 1MHz, ≤ 200ps ± 2ppm	
	1MHz – 50MHz, ≤ 500ps	
<b>Arbitrary Specification</b>		
Output	CH1	Ch2
Waveform length	16 Kpts	16 Kpts / 512 Kpts
Vertical resolution	14 bits	14 bits
Sample rate	500 MSa/s	500 MSa/s
Min. Rise/Fall time	6ns	6 ns
Jitter(cycle to cycle) Storage in	DC – 40MHz, ≤ 2.1ns ± 10ppm	
Non-volatile RAM memory	8 waveforms @ 512Kpts; 24 waveform @ 16Kpts	

Output Specification		
Output	Ch1	Ch2
Amplitude	DC- <40MHz:1mVpp-10Vpp(50Ω)	DC-<40MHz:1mVpp-10Vpp(50Ω)
	40MHz-<100MHz:1mVpp-5Vpp(50Ω)	40MHz-<100MHz:1mVpp-5Vpp(50Ω)
	100MHz-160MHz:1mVpp-1.5Vpp(50Ω)	100MHz-160MHz:1mVpp-1.5Vpp(50Ω)
	DC-<40MHz:1mVpp-20Vpp(Hi Z)	DC- <40MHz:1mVpp-20Vpp(Hi Z)
	40MHz- <100MHz:1mVpp-10Vpp(Hi Z)	40MHz-<100MHz:1mVpp-10Vpp(Hi Z)
	100MHz-160MHz:1mVpp-3Vpp(Hi Z)	100MHz-160MHz:1mVpp-3Vpp(Hi Z)
Vertical accuracy <sup>1,2</sup> (spec)	±+11% of setting ± 1mVpp) at 10KHz	±+11% of setting ± 1mVpp) at 10KHz
Amplitude flatness (compared to 100 kHz sine,5Vpp)	≤80MHz ± 0.2 dB	≤80MHz ± 0.2 dB
	≤160MHz ± 0.8 dB	≤160MHz ± 0.8 dB
Output Current Max only	± 200mA	± 200mA
Cross talk	<-60dB	
Output Connector	BNC	

1. Add 1/10th of the output amplitude and offset accuracy specification per °C for operation at temperatures beyond 23°C ± 5°C

DC Offset Specification		
Output	Ch1	Ch2
Range(DC)	± 5 V ( 50 Ω )	± 5 V ( 50 Ω )
	± 10 V (high impedance)	± 10V (high impedance)
Offset accuracy	± (  setting offset value *1%+2 mV )	± (  setting offset value *1%+2 Mv )
Resolution	1mv	1mv
Waveform Output		
Impedance	50 Ω (typical) ,Hz	50 Ω (typical) ,Hz
Protection	short-circuit protection	short-circuit protection
Isolation	Connector shells for channel output(s),Sync,and Mod In are connected together but isolated from the instrument's chassis,Maximum allowable voltage on isolated connector shells is ± 42Vpk	
AM / DSB-AM Modulation ( CH1/CH2 )		
Carrier	Sine, Square, Ramp, Arbitrary(except DC)	
Source	Internal/External	
Modulation waveform	Sine, Square, Ramp, Noise, Arbitrary	
Modulation depth	0%~120%	
Modulation Frequency	1mHz-50kHz	
Fm Modulation ( CH1/CH2 )		
Carrier	Sine, Square, Ramp, Arbitrary(except DC)	
Source	Internal/External	
Modulation waveform	Sine, Square, Ramp, Noise, Arbitrary	
Modulation Frequency	1mHz-50kHz	

<b>PM Modulation ( CH1/CH2 )</b>	
Carrier	Sine, Square, Ramp, Arbitrary(except DC)
Source	Internal/External
Modulation waveform	Sine, Square, Ramp, Noise, Arbitrary
Phase Deviation	0–360° ,0.1° Resolution
Modulation Frequency	1mHz–50kHz
<b>FSK Modulation ( CH1/CH2 )</b>	
Carrier	Sine, Square, Ramp, Arbitrary(except DC)
Source	Internal/External
Modulation waveform	50%duty–cycle square waveform
Modulation Frequency	1mHz–1MHz
<b>ASK Modulation ( CH1/CH2 )</b>	
Carrier	Sine, Square, Ramp, Arbitrary(except DC)
Source	Internal/External
Modulation waveform	50%duty–cycle square waveform
Modulation Frequency	1mHz–1MHz
<b>PWM Modulation ( CH1/CH2 )</b>	
Carrier	Pulse
Source	Internal/External
Modulation waveform	Sine, Square, Ramp, Arbitrary(except DC)
Modulation Frequency	1mHz–50kHz
<b>Sweep ( CH1/CH2 )</b>	
Carrier	Sine, Square, Ramp, Arbitrary(except DC)
Type	linear/logarithmic
Direct	Up/down
Sweep time	1 ms –500s ± 0.1%
Trigger source	Manual, external, internal
Sweep Range @Max Sample Rate	1uHz to Bandwidth frequency 500MSa/s
<b>Burst ( CH1/CH2 )</b>	
Waveform	Sine, Square, Ramp, Pulse, Arbitrary(except DC)
Carrier Frequency	2mHz~100MHz
Type	Count(1 ~ 1,000,000 periods),infinite, Gated
Start/Stop phrase	0°–360°
Internal period	1 μ s–1000s ± 1%
Trigger delay	280ns–34s
Gated source	External trigger
Trigger source	Manual, External or Internal

<b>External modulation</b>	
Connector	Rear–panel BNC,isolated from chassis
Voltage level	± (4.5–5)V=100%modulation
	>10kΩ input impedance
Note: The external input voltage can't be over ± 5 Vpk, otherwise instrument gets damaged.	
<b>Trigger Input</b>	
Connector	Rear–panel BNC,chassis–referenced
Voltage Level	CMOS compatible
Slope	Up or down (optional)
Pulse width	> 50 ns
Input impedance	> 5 k Ω , DCcoupling
Reaction time	380ns(typical)
Tigger Input period of external burst	>160ns
Input Latency	CH1–366 ± 30ns CH2–386 ± 30ns
<b>Trigger Output</b>	
Connector	Rear–panel BNC,chassis–referenced
Voltage Level	CMOS compatible
Pulse width	> 60 ns
Output impedance	50 Ω (typical)
Max Frequency	1MHz
Output Connector	Through Rear Panel
	Ext Trig/Gate/FSK/Burst
<b>SYNC Output</b>	
Connector	Rear–panel BNC,isolated from chassis
Voltage level	VOH(min)>4.5v,VOL(max)<0.5V; (IOL/IOH=8mA)
Pulse width	> 50 ns(typical)
Output impedance	50 Ω (typical)
Max Frequency	10MHz
<b>Frequency reference input</b>	
Connector	Rear–panel BNC,isolated from chassis and all connector.
Frequency range	10MHz ± 1kHz
Min Voltage level	2.3V
<b>Frequency reference output</b>	
Connector	Rear–panel BNC,chassis–referenced
Frequency	10MHz
Voltage level	>1Vpp
Output impedance	50 Ω AC–coupled



## Frequency Counter

Measurement		Frequency, Period, Positive/negative pulse width, duty cycle	
Frequency range		Single Channel:100MHz~200MHz	
Frequency resolution		6bit/s	
Voltage range (non-modulated signal)		DC offset range	± 1.5VDC
Manual	DC coupling	100mHz~100MHz	50mVrms~ ± 2.5V
		100mHz~200MHz	100mVrms~ ± 2.5V
	AC coupling	1Hz ~ 200 MHz	100mVrms ~ 5 Vpp
Pulse width and duty-cycle measurement		1Hz~10MHz(50mVrms~5Vpp)	
Input adjustment		Input impedance	1 MΩ
		Coupling mode	AC, DC
		High-frequency rejection	ON/OFF
Trigger level range		-3~1.8v	

## General Specification

<b>Display</b>	
Display type	4.3inch'TFT-LCD
Resolution	480 × 272, (RGB)
Color depth	24bits
Contrast Ratio	500:1(typical)
Luminance	300cd/m <sup>2</sup> (typical)
<b>Power</b>	
Voltage	100-240 ACVrms, 50/60Hz, CAT II
Consumption	MAX 50W
Fuse	F1.25AL,250V
<b>Environment</b>	
Temperature	Operation: 0℃~40℃
	Storage: -20℃~60℃
Humidity range	Below +30℃: ≤90%relative humidity
	+30℃~+40℃: ≤60%relative humidity
Altitude	Operation: below 3,000 meters
	Storage: below 15,000 meters
Electromagnetic Compatibility	2004/108/EC Directive, Applicable standards EN 61326-1:2006
	EN 61000-3-2:2006 + A2:2009
	EN 61000-3-3:2008
Safety	2006/95/EC Low Voltage Directive
	UL 61010-1:2012,CAN/CSA-C22.2 No.61010-1:2012,
	UL 61010-2-030:2012,CAN/CSA-C22.2 No.61010-2-030:2012
<b>Others</b>	
Dimension	Width: 261mm
	Height: 105mm
	Depth: 344mm
Weight	N.W: 2.8kg
<b>IP protection</b>	IP20
<b>Calibration Cycle</b>	1year

# Purchase Information

Product Name	Protek GD2000N Series Function/Arbitrary Waveform Generator	
Models	GD2162N	160MHz
	GD2122N	120MHz
	GD2082N	80MHZ
Standard Accessories	A Quick Start	
	A Calibration Certificate	
	An CD(including EasyWave computer software system)	
	A Power Cord that fits the standard of destination country	
	A USB Cable	
Optional Accessories	BNC cable	
	GPIB-USB Adapter	

## 참고

본 데이터시트상 사양은 당사 공장 출하 전을 기준으로 하며, 제품 성능 향상 및 품질 개선에 따라 사전 예고 없이 변경 될 수 있습니다.

## 제품 보증

GSI의 계측기기 브랜드인 "Protek"의 공식대리점 및 특약점등 정식으로 유통된 제품에 한해, 고객 인도일로 부터 " 2년간 " 제품의 하자나 내부 부품의 이상이 있는 부분에 대하여, 제품 하자를 보증 합니다. 단 사용자의 실수나 귀책, 고객 과실, 천재지변, 국가재난 등으로 인해서 손상된 제품이나 당사의 허가 없이 임의로 제품을 변경 개조 등을 한 것에 대해서 당사는 하자보증이행 책임이 없습니다.



### HEAD OFFICE

#### GS Instruments Co.,Ltd.

70, Gilpa-ro 71beon-gil, Nam-gu, Incheon 402-854, Korea  
 Tel : +82-1688-6820  
 Fax : +82-32-870-5640  
 isale@gsinstrument.com  
 www.gsinstrument.com

### USA OFFICE

#### GS Teletech Inc.

320 NW Victoria Dr, Lee's Summit MO64086, USA  
 Tel : +1-913-469-6699  
 Fax : +1-913-861-0163  
 protek@gsteletechinc.com  
 www.gsteletechinc.com

### CHINA OFFICE

#### HCQ Electronics Co., Ltd.

Danshan Industrial Park, Chengyang District, Qingdao, Shandong, China  
 Tel : +86-532-66913900  
 Fax : +86-532-66910908  
 sales@hcqelectronic.com  
 www.hcqelectronic.com

[www.gsi-protek.com](http://www.gsi-protek.com)