

# GW INSTEK

## Simply Reliable

2020 Good Will Instrument Co., Ltd. GENERAL CATALOG



[www.gwinstek.com](http://www.gwinstek.com)



# World-Class Quality and Performance

## Affordable Price

## A Wide Range of Selections

Originally known and founded in 1975 as Good Will Instrument, GW Instek is the first professional manufacturer in Taiwan specializing in electrical test and measurement instruments. GW Instek began as a manufacturer of power supplies and quickly expanded into developing high precision electronic test and measurement instruments. After 45 years in the test and measurement industry, GW Instek has grown to become one of the most recognized manufacturers of instruments in the world. Today, GW Instek has more than 300 items ranging from oscilloscopes, spectrum analyzers, signal sources, DC power supplies, AC power sources, digital meters, LCR meters, other specific application meters to video surveillance systems.

Think of the word "innovation" and it's easy to think of R&D, new inventions, faster processing and groundbreaking technologies. At GW Instek, we focus on another type of innovation that is based on flexibility, manageability and efficient performance in real-world test applications. We call this "customer-focused" innovation and we strongly believe in it. By listening to our customers around the world, we are able to anticipate their needs and respond quickly to emerging trends. So when one of our customers introduces an exciting new technology, GW Instek is ready to test it.

Whether our customers are designing products with the ability to change people's lives, educating and training the engineers of tomorrow, or discovering new technologies that solve complex problems, GW Instek can be trusted to perform reliably and accurately in even the most demanding test environments. How can we be sure? We have the numbers to back it up. Actually, we have just one : 40. That's the number of in-house quality and performance verification tests each GW Instek product must pass before it leaves our facilities. This thorough process starts with environmental, safety and durability testing in the product design phase, through to burn-in and shipping tests ahead of final inspection and packing. Furthermore, our two manufacturing facilities in Taiwan and China all adhere to ISO quality and environmental management standards, as well as European CE safety regulations. That's why GW Instek products can be trusted to test.

At GW Instek, quality is reflected not in higher cost, but in greater value. We pride ourselves on the quality, reliability and affordability of our test and measurement instruments. With each of our products often in use for decades, it's not hard to understand the importance of measuring a product's value not by price, but by lifetime cost. This importance is deep-rooted to us; we have consistently produced products with some of the industry's lowest total cost per ownership. Reducing the total cost per ownership of our products allows us to provide exceptional value, reliability and performance with leading service and support over the lifetime of a product. That's why year after year, GW Instek can be trusted to perform reliably.

The industries we serve are as diverse as they are specialized. Our experience and expertise allow us to deliver high-performance test solutions that address the unique requirements of each client. GW Instek provides customized solutions that are backed by reliable products, comprehensive after-sales support, warranty, calibration services, and one of the industry's lowest Total Cost per Ownership.





Simply Reliable

SINCE  
1975



45 Years of Reputation  
& Trust

We take prides in creating more than 45 years of satisfied customer experiences throughout the world. Today, GW Instek is considered the most Reliable Brand for professional measurement instruments with supreme quality and the **lowest TCO - Total Cost per Ownership**.

We invite you to be part of GW Instek success story and help perpetuate this value.

DURABLE



Uncompromised  
Durability

With an overriding commitment to provide highly durable products, GW Instek is your most **Reliable choice** when it comes to selecting the best measurement instruments with the **lowest TCO - Total Cost per Ownership**. Highly durable products mean long product lifetime capable of reducing operation & maintenance costs. This is definitely what you need to consider before investing.

TRUST &  
PROMISE



Your Most Trustworthy  
Partner

Being your most trustworthy and **Reliable Partner**, GW Instek promises to proactively provide insightful business solutions and products with the **lowest TCO – Total Cost per Ownership**, assisting your business to thrive in the highly competitive world. From feasibility evaluation, product selection, solution adaptation to timely after-sales service, we are dedicated to serving each individual customer and making your professional life easier than ever.



# Milestones

- 1975 Good Will Instrument Co., Ltd was established as a Power Supply manufacturer.
- 1983 The Kaohsiung branch was established.
- 1985 The Taichung branch was established.
- 1989 Good Will Southeast Asia (Malaysia) was established.
- 1991 Instek America Corp. was established.
- 1993 Taiwan headquarters was ISO-9002 certified.  
Granted the National Small and Medium Enterprise Award.  
Granted the Industrial Technology Advancement Award of Distinction.
- 1996 Good Will Southeast Asia (Malaysia) was ISO-9002 certified.
- 1998 Taiwan headquarters was ISO-9001 certified.
- 1999 Taiwan headquarters was ISO-14001 Environmental Management certified.  
Good Will Instrument Co., Ltd. delivered Initial Public Offer on Taiwan's Over-The-Counter Security Exchange (OTC).
- 2000 The CNLA Electricity Calibration Laboratory certification was granted.  
Good Will Instrument was went public on the Taiwan Stock Exchange.
- 2001 Good Will Instrument Suzhou was established.
- 2002 Taiwan headquarters was ISO-9001 : 2000 certified.
- 2003 Suzhou subsidiary was ISO-9001 : 2000 certified.
- 2004 Instek Electronics Shanghai was established.
- 2005 Global operational headquarters was established in Taiwan.  
The brand new CIS (Corporate Identity System) was introduced.
- 2006 Instek Japan Corporation was established.
- 2007 Good Will Instrument Korea was established.
- 2009 The Group Quality Award of Business Excellence Performance Model from the Chinese Society for Quality was granted.
- 2010 Marketing office was set up in India.
- 2011 GW Instek won Taiwan Excellence Award for GDS-1000-U Series, AFG-3000 Series, PEL-2000 Series and GDM-8261.
- 2012 GW Instek won Technology Innovation Award for GDS-3000 Series and GSP-930.  
Acquired Japan TEXIO technology corporation.
- 2013 Instek Digital was merged to become a member of GW Instek business group.  
GW Instek cooperated with Hitachi and EMIC to establish GW Alliance in Suzhou, China.  
GW Instek won Technology Innovation Award for PPH-1503 and AFG-2225.
- 2014 GW Instek won Technology Innovation Award (Gold) for GDS-300 full touch screen oscilloscope.  
European subsidiary was established in the Netherlands.
- 2015 GW Instek won Taiwan Excellence Award for GDS-300/200 Series and PEL-3000 Series.
- 2016 GW Instek won Taiwan Excellence Award for GDS-2000E Series and GSP-9330.
- 2017 GW Instek won Taiwan Excellence Award for C-1100 and GPM-8213.
- 2018 GW Instek won Taiwan Excellence Award for C-1200 and GDM-906X Series.
- 2019 GW Instek INDIA LLP was established.  
GW Instek won Taiwan Excellence Award for GPT-12000 Series and SKTS-5000.







Suzhou Plant

Headquarters & Plant



Europe Subsidiary

Malaysia Subsidiary

India Subsidiary

China Subsidiary

Japan Subsidiary

Korea Subsidiary

U.S.A. Subsidiary







## OSCILLOSCOPES

- Digital Storage Oscilloscope
- Mixed-signal Oscilloscope
- Mixed-domain Oscilloscope
- Handheld Digital Storage Oscilloscope
- Oscilloscope Education And Training Kit



## SPECTRUM ANALYZERS & COMMUNICATION TESTERS

- 3.25 GHz Spectrum Analyzer
- 3 GHz Spectrum Analyzer
- 1.8 GHz Spectrum Analyzer
- ASK/FSK/TPMS Tester
- IoT LoRa Tester
- RF Training System



## SIGNAL SOURCES

- Arbitrary Function Generator
- Multi-Channel Function Generator
- USB Modular Arbitrary Function Generator
- DDS Function Generator
- Analog Function Generator
- Audio Generator
- RF Signal Generator



## DC POWER SUPPLIES

- Programmable & Single Channel DC Power Supply
- Non-Programmable & Single Channel DC Power Supply
- Programmable & Multiple Channel DC Power Supply
- Non-Programmable & Multiple Channel DC Power Supply

## AC POWER SOURCES

- AC + DC Power Source
- AC Power Source

## DC ELECTRONIC LOADS

- DC Electronic Load



## DIGITAL MULTIMETERS

- Benchtop Digital Multimeter
- Handheld Digital Multimeter
- Digital Clamp Meter

## SAFETY TESTERS

- AC/DC/IR/GB Electrical Safety Analyzer
- AC/DC Withstanding Voltage/Insulation Resistance/Ground Bond Tester
- AC Ground Bond Tester
- Multiplex Scanner Box
- Leakage Current Tester

## LCR METERS

- Benchtop LCR Meter
- Handheld LCR Meter

## OTHER METERS

- DC Milli-Ohm Meter
- Battery Meter
- Digital IC Tester
- Precision Current Shunt Meter
- AC Power Meter
- Automatic Distortion Meter
- AC Millivolt Meter
- Digital Power Meter
- Frequency Counter
- Logic Probe & Pulsar
- AC Ground Bond Tester

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AD		
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ADB-006	Accessory – DC Block N-TYPE 50 Ohm 10MHz to 6GHz	B37
ADB-008	Accessory – DC Block SMA 50 Ohm 0.1MHz to 8GHz	B37
ADP-001	Accessory – Adaptor, 50Ω, BNC(I/F) - N(P/M)	B37
ADP-002	Accessory – Adaptor, 50Ω, SMA(I/F) - N(P/M)	B37
ADP-003	Accessory – Adaptor, 50Ω, N(I/F) - SMA(I/F)	C40
ADP-101	Accessory – Adaptor, 75Ω BNC(I/F) - 50Ω BNC(P/M)	B37
AF		
AFG-125	25MHz, Single Channel, USB Modular Arbitrary Function Generator	C26
AFG-125P	25MHz, Single Channel, USB Modular Arbitrary Function Generator Plus Power Supply	C26
AFG-2005	5MHz Arbitrary Waveform Function Generator	C23
AFG-2012	12MHz Arbitrary Waveform Function Generator	C23
AFG-2025	25MHz Arbitrary Waveform Function Generator	C23
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AFG-2112	12MHz Arbitrary Waveform Function Generator with Sweep Mode, AM/FM/FSK Modulation & Ext. Counter	C23
AFG-2125	25MHz Arbitrary Waveform Function Generator with Sweep Mode, AM/FM/FSK Modulation & Ext. Counter	C23
AFG-2225	25MHz True Dual Channel, Arbitrary Function Generator	C23
AFG-225	25MHz, Dual Channel, USB Modular Arbitrary Function Generator	C26
AFG-225P	25MHz, Dual Channel, USB Modular Arbitrary Function Generator Plus Power Supply	C26
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AFG-3032	30MHz Dual Channel Arbitrary Function Generator	C7
AFG-3021	20MHz Single Channel Arbitrary Function Generator	C7
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APS-004	Accessory – Output Frequency Capacity (45–999.9Hz)	D64
APS-007	Accessory – RS-232 interface card	D64
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APS-7200	2000VA Programmable Linear AC Power Source	D63
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AS		
ASR-001	Accessory – Air inlet filter	D60
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ASR-2100	1000VA Programmable AC/DC Power Source	D59
ASR-2050R	500VA Programmable AC/DC Power Source for 3U 1/2 Rack Mount	D59
ASR-2100R	1000VA Programmable AC/DC Power Source for 3U 1/2 Rack Mount	D59
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ATA-001	Accessory – Antenna, General FM Antenna, BNC(M)	B37
ATN-100	Accessory – Adaptor, 10dB Attenuator, 50Ω, N(I/F)-N(P/M)	B37
C		
C-1100	ASK/FSK/TPMS Tester	B26
C-1200	IoT LoRa Tester	B31
C-1201	Accessory – USB I/O Extension Box	B31
DS		
DS2-08LA	Accessory – 8-Channel Logic Analyzer, Includes 8-channel Logic analyzer card (GLA-08) and 8 channel Logic analyser probe (GTL-08LA)	A40
DS2-16LA	Accessory – 16-Channel Logic Analyzer, Includes 16-channel Logic analyzer card (GLA-16) and 16 channel Logic analyser probe (GTL-16LA)	A40
DS2-FGN	Accessory – DDS Function Generator, 5MHz, sine/square/triangle/pulse function	A40
DS2-FH1	Accessory – Module extension bay & USB Type A to Type A/B cable	A40
DS2-GPIB	Accessory – GPIB Interface	A40
DS2-LAN	Accessory – Ethernet & SVGA Output	A40
DS3-PWR	Accessory – Power Analysis Software: Power quality/Harmonic/Ripple/In-rush current measurement	A40
DS3-SBD	Accessory – Serial Bus Analysis software I2C / SPI / UART (for 4 channel model only)	A40
GA		
GAD-201G	Automatic Distortion Meter	E65
GAG-810	1MHz Audio Generator with Low Distortion	C37

GAK-001	Accessory – Adaptor, 50Ω Termination, N(P/M)	B37
GAK-002	Accessory – Adaptor, Cap with Chain, N(P/M)	B37
GAK-003	Accessory – Adaptor, 50Ω Termination, BNC(P/M)	A40
GAP-001	Accessory – AC-DC Adaptor	A40
GB		
GBK-001	Accessory – GRF-1300 Experiment Text Book of Teacher Version	B37
GBK-002	Accessory – GRF-1300A Experiment Text Book of Teacher Version	B37
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GCP-425P	Accessory – Current Probe - Power Supply, 4 Channel Power Supply for GCP-530/1030	A44
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GCT-9040	AC Ground Bond Tester	E45
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GDM-357	3 ½ Digit (1,999 Counts) Handheld Digital Multimeter	E17
GDM-360	6,000 Counts Handheld Digital Multimeter with True RMS Measurement and RS-232C Interface	E17
GDM-397	3 ¾ Digit (4,000 Counts) Handheld Digital Multimeter with RS-232C Interface	E17
GDM-398	3 ¾ Digit (4,000 Counts) Handheld Digital Multimeter	E17
GDM-452	4 ½ Digit (19,999 Counts) Handheld Digital Multimeter	E17
GDM-461	22,000 Counts Handheld Digital Multimeter with True RMS Measurement and RS-232C Interface	E17
GDM-8245	50,000 Counts Dual Display Digital Multimeter	E15
GDM-8255A	5 ½ Digit (199,999 Counts) Dual Measurement Multimeter	E9
GDM-8261A	6 ½ Digit (1,200,000 Counts) Dual Measurement Multimeter	E7
GDM-8341	50,000 Counts Dual Measurement Multimeter	E13
GDM-8342	50,000 Counts Dual Measurement Multimeter	E13
GDM-8351	5 ½ Digit (120,000 Counts) Dual Measurement Multimeter	E11
GDM-9060	6 ½ Digit (1200,000 Counts) Dual Measurement Multimeter	E3
GDM-9061	6 ½ Digit (1200,000 Counts) Dual Measurement Multimeter	E3
GDS-207	70MHz, 2-Channel, Full Touch Panel, Digital Storage Oscilloscope	A27
GDS-2072A	70MHz, 2-Channel, Digital Storage Oscilloscope	A7
GDS-210	100MHz, 2-Channel, Full Touch Panel, Digital Storage Oscilloscope	A27
GDS-220	200MHz, 2-Channel, Full Touch Panel, Digital Storage Oscilloscope	A27
GDS-307	70MHz, 2-Channel, Full Touch Panel, Digital Storage Oscilloscope	A27
GDS-310	100MHz, 2-Channel, Full Touch Panel, Digital Storage Oscilloscope	A27
GDS-320	200MHz, 2-Channel, Full Touch Panel, Digital Storage Oscilloscope	A27
GDM-SC1A	Accessory – Scanner Card, 16+2 Channels	E77
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GDS-1072-U	70MHz, 2-Channel, Digital Storage Oscilloscope	A37
GDS-1102-U	100MHz, 2-Channel, Digital Storage Oscilloscope	A37
GDS-1072A-U	70MHz, 2-Channel, Digital Storage Oscilloscope	A35
GDS-1102A-U	100MHz, 2-Channel, Digital Storage Oscilloscope	A35
GDS-1152A-U	150MHz, 2-Channel, Digital Storage Oscilloscope	A35
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GDS-3352	350MHz, 2-Channel, Visual Persistence Oscilloscope	A5
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GPC-6030D	375W, 3-Channel, Linear D.C. Power Supply	D56
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PSU-03C	Accessory – Cable for 4 units in parallel operation	D23
PSU-232	Accessory – RS232 Cable with DB9 connector kit	D23
PSU-485	Accessory – RS485 Cable with DB9 connector kit	D23
PSU-GPIB	Accessory – PSU GPIB Interface Card (Factory Installed)	D23
PSU-ISO-I	Accessory – Isolated Current Remote Control Card (Factory Installed)	D23
PSU-ISO-V	Accessory – Isolated Voltage Remote Control Card (Factory Installed)	D23
PSW160-14.4	720W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW160-21.6	1080W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW160-7.2	360W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW250-13.5	1080W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW250-4.5	360W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW250-9	720W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW30-108	1080W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW30-36	360W Multi-Range Programmable Switching D.C. Power Supply	D17

PSW30-72	720W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW800-1.44	360W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW800-2.88	720W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW800-4.32	1080W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW80-13.5	360W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW80-27	720W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW80-40.5	1080W Multi-Range Programmable Switching D.C. Power Supply	D17
PSW-001	Accessory – Accessory Kits	D18
PSW-002	Accessory – Simple IDC Tool	D18
PSW-003	Accessory – Contact Removal Tool	D18
PSW-004	Accessory – Basic Accessory Kit for 30V/80V/160V models	D18
PSW-005	Accessory – Series Operation Cable for 2 units (for 30V/80V/160V)	D19
PSW-006	Accessory – Parallel Operation Cable for 2 units	D19
PSW-007	Accessory – Parallel Operation Cable for 3 units	D19
PSW-008	Accessory – Basic Accessory Kit for 250V/800V models	D19
PSW-009	Accessory – Output terminal cover for 30V/80V/160V models	D19
PSW-010	Accessory – Large filter (Type II/III)	D19
PSW-011	Accessory – Output terminal cover for 250V/800V models	D19
PSW-012	Accessory – High voltage output terminal for 250V/800V model	D19
<b>PT</b>		
PT-100	Accessory – Temperature Probe, Approx. 1500mm	E73
<b>RL</b>		
RLB-001	Accessory – Return Loss Bride, 10MHz - 1GHz, Source/Load: B37 N(J/F), Coupling: N(P/M)	
<b>SF</b>		
SFG-1003	3MHz DDS Function Generator	C32
SFG-1013	3MHz Dual Display DDS Function Generator	C32
<b>SP</b>		
SPD-3606	375W, 3-Channel, Programmable Switching D.C. Power Supply	D52
SPS-1230	360W Switching D.C. Power Supply	D40
SPS-1820	360W Switching D.C. Power Supply	D40
SPS-2415	360W Switching D.C. Power Supply	D40
SPS-3610	360W Switching D.C. Power Supply	D40
SPS-606	360W Switching D.C. Power Supply	D40
<b>US</b>		
USG-0103	100MHz – 300MHz, USB RF Signal Generator	C38
USG-0818	800MHz – 1800MHz, USB RF Signal Generator	C38
USG-2030	2000MHz – 3000MHz, USB RF Signal Generator	C38
USG-3044	3000MHz – 4400MHz, USB RF Signal Generator	C38
USG-LF44	35MHz – 4400MHz, USB RF Signal Generator	C38



## New Products

### A 300/200/100MHz Mixed-domain Oscilloscope



#### MDO-2000A Series

NEW

- \* 300/200/100MHz Bandwidth Selections: 2 Channels
- \* Maximum Real Time Sampling Rate: 2 GSa/s
- \* MDO-2000A Equips with a Spectrum Analyzer ; MDO-2000AG Equips with a Spectrum Analyzer ; a Dual Channel 25MHz AWG
- \* Per Channel 20M Memory Depth and VPO Waveform Display Technology
- \* Waveform Update Rate up to 120,000 wfm/s
- \* 8" WVGA TFT LCD
- \* MDO-2000AG Provides Frequency Response Analysis Function
- \* Maximum 1M FFT Provides Higher Frequency Domain Resolution Measurements
- \* High Pass, Low Pass and Band Pass Filter Functions
- \* 29,000 Segmented Memory Sections and Waveform Search Function
- \* I<sup>2</sup>C/UART/CAN/LIN Serial Bus Trigger and Decoding Functions
- \* Data Log Function is able to Track Signal Changes up to 1000 Hours
- \* Mask Test Function & Network Storage Function

Page A15-20

### B 1.8GHz Spectrum Analyzer



#### GSP-818

NEW

- \* Frequency Range: 9kHz ~ 1.8GHz
- \* RBW: 10Hz ~ 3MHz, 10Hz ~ 500kHz in 1-10 steps
- \* Sensitivity: -140dBm @RBW 10Hz, PreAmp On
- \* Built-in AM/FM Demodulation
- \* Bandwidth Zoom Function
- \* Measurement Function: ACPR/OCBW/CHPW, NdB Bandwidth, Freq. Counter, Noise Marker, Limit Line
- \* Built-in 20dB Preamplifier Standard
- \* Interface: LAN, USB
- \* Screen: 10.4" SVGA Output (800x600)
- \* Options: Tracking Generator, EMI Filter & Detector (via software keycode)

Page B16-18

### B ASK/FSK/TPMS Tester



#### C-1100



NEW

- \* Four Rf Input Channels
- \* 315/433 MHz Modulated Output and LF 125 KHz Output
- \* Editable Modulation Output And LF Output Contents
- \* Two Sets of Trigger Output and One Set of External Trigger Input
- \* Multi-display Mode: Spectrum, Modulation Signal Waveform, Symbol, Modulation Parameter
- \* ASK/FSK Demodulation Analysis Function
- \* 10MHz External Reference Time Base Input
- \* Free PC Software With Complete Functions and Multi-display
- \* Support Fcc and Etsi Test Regulations
- \* Support LAN, USB, RS232 Interfaces
- \* Full Remote Control
- \* 1U Standard Height

Page B26-30

### B IoT LoRa Tester



#### C-1200



NEW

- \* 1 Low Power RF TX Port and 3 RF TRX Ports (Switching Type)
- \* The Minimum Output Level of Low Power TX Power: -148 dBm
- \* Support Full LoRa Test Demand
- \* Support LoRa/FSK Modulation Signals
- \* Support Sub-GHz and 2.4 GHz
- \* Complete PC Software and Built-in MP Test Function
- \* Built-in FCC 15.209/15.247 Test Regulations
- \* Built-in Temperature Control Calibration Signal
- \* Support SPI, UART, I<sup>2</sup>C Interfaces to Directly Control DUT (Must Collocate With IO Extension, C-1201)
- \* Simultaneously Test DUT's Current Consumption (Must Collocate With PPH-1503 DC Power Supply)

Page B31-36



## D FANLESS MULTI-RANGE D.C. POWER SUPPLY

CE GPIB USB RS-232 Analog Control LAN RS-485 Front/Rear Output



NEW

PFR-100L/100M

- \* Constant Power Output for Fivefold Multi-Range(V&I) Operation
- \* Natural Convection Cooling Design(Fanless Structure)
- \* Preset Memory Function
- \* Output ON/OFF Delay Function
- \* CV, CC Priority Mode
- \* Adjustable Slew Rate For Voltage and Current
- \* Bleeder Circuit Control
- \* Protection : OVP, OCP, AC FAIL and OTP
- \* Support Front Panel and Rear Panel Output
- \* Built-in USB and RS-232/485 Interface Optional LAN+GPIB
- \* Web Server Monitoring and Control
- \* External Analog Control and Monitor Function
- \* Remote Sensing Function

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## D Compact Programmable A.C./D.C. Power Source

CE RS-232 GPIB USB LAN Ext I/O



NEW

ASR-2000 Series

- \* Output Rating: AC 0 ~ 350 Vrms, DC 0 ~ ± 500 V
- \* Output Frequency up to 999.9 Hz
- \* DC Output (100% of Rated Power)
- \* Output Capacity: 500VA/1000VA
- \* Measurement Items: Vrms, Vavg, Vpeak, Irms, IpkH, Iavg, Ipeak, P, S, Q, PF, CF
- \* Voltage and Current Harmonic Analysis (THDv, THDi)
- \* Customized Phase Angle for Output On/Off
- \* Remote Sensing Capability
- \* OVP, OCP, OPP, OTP, AC Fail Detection and Fan Fail Alarm
- \* Interface: USB, LAN (std.); RS-232+GPIB (opt.)
- \* Built-in External Control I/O and External Signal Input
- \* Built-in Output Relay Control & Memory Function (up to 10 sets)
- \* Sequence and Simulation Function (up to 10 sets)
- \* Support Arbitrary Waveform Function & Built-in Web Server

Page D59-62

## E High Frequency LCR Meter

CE USB LAN RS-232 Handler Trigger GPIB



NEW

LCR-8200 Series

- \* Wide Test Frequency 10Hz~30/20/10/5MHz
- \* 7" LCD color Display
- \* 0.08% Basic Accuracy
- \* Displaying Four Measurement Results Simultaneously From 17 Selectable Measurement Parameters Freely
- \* 15 Steps List Measurement
- \* Two Curves Sweep Mode
- \* Internal DC Bias Voltage ±12V
- \* USB Storage Available
- \* ALC Function Available
- \* Standard Interfaces : RS-232C, USB Host/Device, LAN, GPIB and Handler
- \* Universal Power Input

Page E23-26

## E AC/DC/IR/GB Electrical Safety Analyzer

CE USB Host RS-232 GPIB USB Signal I/O Rear Output



NEW

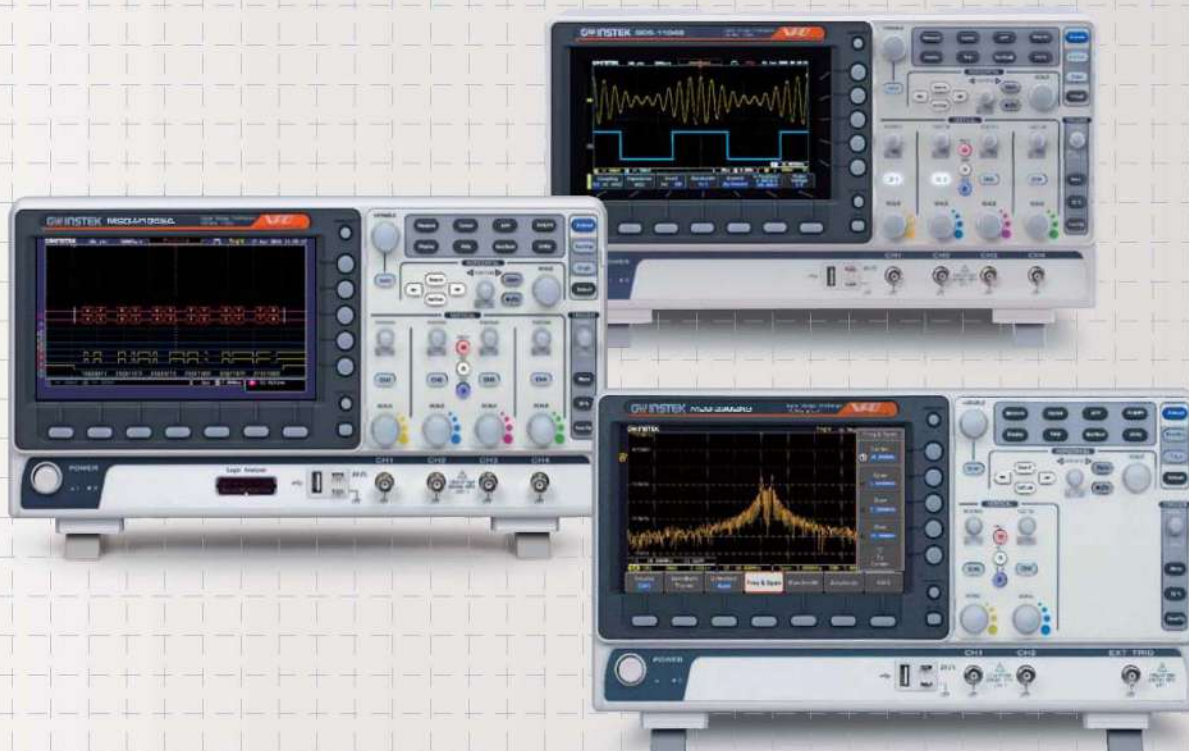
GPT-12000 Series



- \* 200VA AC Test Capacity
- \* Comply with IEC 61010-2-034
- \* 7" TFT LCD
- \* Manual / Auto Mode
- \* True RMS Current Measurement
- \* Zero Crossing Turn-on Operation
- \* Controllable Ramp-up & Ramp-down Time
- \* Capacitive Load Testing Capability up to 47μF(DCW 400V max.)
- \* Statistics Function
- \* Sweep Function for DUT Characteristic Analysis
- \* USB Storage Available & Rear Panel Output Available
- \* Interface : RS-232C, USB Host/Device, Signal I/O and GPIB(Opt.)
- \* Universal Power Input

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## OSCILLOSCOPES

The frequency bandwidth ranges from 50MHz to the high-class 500MHz. In addition, up to 5GSa/s realtime sampling rate and 20M points memory depth can pick up and hold the complete signal in order to preserve the accuracy. PC interfaces such as USB, LAN, GPIB, RS-232C, and Printer Port are integrated to the panel to satisfy data transmit/save needs.

The MSO-2000E series is a mixed-signal oscilloscope, which offers dual analog channels+16 digital channels or 4 analog channels+16 digital channels. MSO-2000E has a built-in 16-channel logic analyzer and MSO-2000EA has a built-in 16-channel logic analyzer and a dual channel 25MHz arbitrary function generator. The MDO-2000A series is multi-functional mixed domain oscilloscope. While entering the spectrum mode, MDO-2000A series will display a full screen of frequency domain. Users can input Center frequency, Span, Start frequency, and Stop frequency based upon test requirements so as to rapidly and intuitively observe required frequency range that allows users to experience the user interface of a real spectrum analyzer. MSO-2000EA, MDO-2000AG and MDO-2000E also provide frequency response analysis function, it allows users to obtain DUT's FRA characteristic curve plot (Bode plot).

## PRODUCTS

- Digital Storage Oscilloscope
- Mixed-signal Oscilloscope
- Mixed-domain Oscilloscope
- Handheld Digital Storage Oscilloscope
- Oscilloscope Education and Training Kit



## OSCILLOSCOPE OVERVIEW

Oscilloscopes are considered the most widely used instruments in the Electrical T&M field. With an Oscilloscope, it is possible to understand how an electrical signal changes over a time period graphically. In every electric application, from electronics laboratories, electronics R&D, product development, manufacturing QA, to After-Sales Service, there is a need for waveform representation by an Oscilloscope.

With the rapid advancement of technology, the oscilloscope market has also been shifting from conventional analog oscilloscopes, which displays the electronic waveforms through a CRT, towards Digital Storage Oscilloscopes (DSO). The major function of a DSO not only converts signals from analog to digital, but also stores testing data, allowing remote control and transmitting data through various interfaces. In spite of the strengths of DSOs, analog oscilloscopes still play an important role of providing real-time signal and waveform display.

There has been a growing need for detecting digital signals which are usually presented by 2 discrete voltage levels, a distinction from analog signals presented by continuous voltages. A logic analyzer is better suited for such digital signal measurements compared with an oscilloscope. A logic analyzer also has the benefit of multiple channel input measurements, which is usually limited to 2 or 4 channels in oscilloscopes.

To satisfy various needs of waveform observation in time domain, GW Instek provides an entire series of oscilloscope solutions, consisting of three groups: Digital Storage Oscilloscopes, Analog Oscilloscopes and Real Time/Digital Storage Oscilloscopes.

Bandwidth Oscilloscope Lineup	Type	500MHz	350MHz	300MHz	250MHz	200MHz	150MHz	100MHz	70MHz	50MHz	Page
GDS-3000 Series	Digital	✓	✓		✓		✓				A5-6
GDS-2000A Series	Digital			✓		✓		✓	✓		A7-8
MSO-2000E Series	Digital					✓		✓	✓		A9-14
MDO-2000A Series	Digital			✓		✓		✓			A15-20
MDO-2000E Series	Digital					✓		✓	✓		A21-24
GDS-2000E Series	Digital					✓		✓	✓		A25-26
GDS-300/200 Series	Digital					✓		✓	✓		A27-28
GDS-1000B Series	Digital							✓	✓	✓	A29-34
GDS-1000A-U Series	Digital						✓	✓	✓		A35-36
GDS-1000-U Series	Digital							✓	✓	✓	A37-38

MODEL	FUNCTION	Collocation Instrument	Page
GDB-03		GDS-3000/GDS-2000A/GDS-2000E/MSO-2000E/GDS-1000B Series	A39



## VPO TECHNOLOGY

When using a DSO to measure serial transmission signals, address/data/control buses on digital circuits, noise on signal components, composite video signals or modulated signals, the biggest challenge is that these signals have random, rapidly changing, incidental components or have components with non-periodic characteristics. Therefore it is necessary for a DSO to reduce the acquisition processing time (Dead time) to have the opportunity to capture these signal characteristics.

DSOs equipped with VPO (Visual Persistence Oscilloscope) technology use a high-density IC for hardware acceleration to transfer all the acquired data into the displayed waveform image. Figure A shows the compression and quantification of waveform data. GDS-3000 has a waveform display region of 750 frames in width, while the record length is 25k dots long. The hardware circuit cuts the waveform data into a number of data frames. The data in each data frame is passed through a count array and then written into a three-dimensional memory array. When all the frames have been quantized, a virtual 3D structure is created, shown in Figure B. The value in the memory array designates the appearance frequency of signal points constructing a waveform.

In Figure A, a count array consists of 256 computing units. Each unit is made of several comparators and counters. When 8-bit data passes through Acquire Memory, and then reaches counter array, comparators select corresponding counter that follows an increment in its value then. After some amount of data is processed, part of input waveform is statistically calculated by counter array.

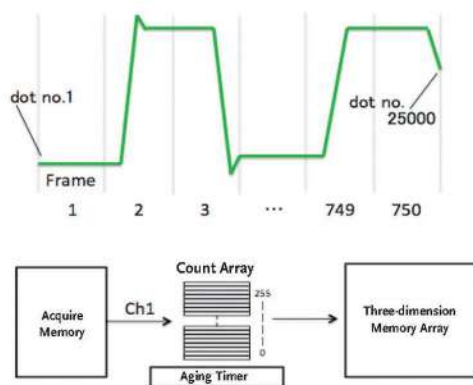


Figure A. The compression and quantization of waveform data

This process holds only for hundreds of micro seconds even if the calculation implemented by hardware architecture repeats for 750 times. The GDS-3000 Series uses such parallel processing structures to shorten the dead time. Take 4-channel GDS-3000 as an example. It has 1024 counter arrays to simultaneously process input waveform data.

In general it takes approximately 16ms for the LCD panel to read data sequentially from the 3D memory array, display the data on the screen, and to update the counter array. Obviously, if the count array doesn't do any processing and only writes (overwrites) the existing information, the 3D memory array will have changed several times during an LCD update and results in users not seeing these changes. Therefore a mechanism called an Aging timer, as shown in the figure, has been added to the VPO circuit to simulate the persisting and aging property of traditional CRTs. The Aging timer will operate with value in 3D memory array when count array is writing and result in only partial value of the value in the 3D memory array been changed. For example, if the count array is not 0 in value, the 3D memory array will gradually increase in value. On the contrary, if the count array is 0 in value, the 3D memory array will gradually decrease in value until it reaches to 0. In this way the latest waveform data can be updated while the previous waveform can be retained for some time, from 100ms up to several seconds. As a result, we can say that the 3D structure of the memory array is dynamic. Users can change this feature by adjusting the Persist time. The time for the circuit to process this data is too short to be detected by the eyes and the overall effect is that the entire screen is aging all together at the same time.

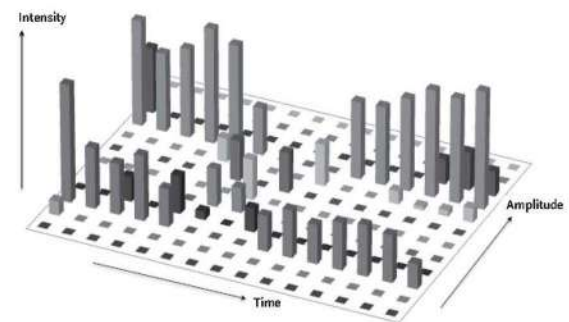


Figure B. Structure of 3D waveform data array

## MEMORY DEPTH

Three major factors, including bandwidth, sample rate and memory depth, contribute the selection of a digital oscilloscope. The number of samples an oscilloscope can store is defined as memory depth. Memory depth can be calculated by Record duration divided by Sample period as shown in the formula below. As indicated, memory depth has a positive relationship with the sampling rate. In other words, waveforms can be recorded over a long period of time when stored in a larger memory depth.

$$\begin{aligned} \text{Total Waveform Points Sampled} &= \text{Record Duration} / \text{Sample Period} = \text{Record Duration} \times \text{Sampling Rate} \\ \text{If Total Waveform Points Sampled} &> \text{DSO Memory Depth, all excessive points sampled need to be abandoned and the effective sampling rate is forced to slow down} \\ \text{Memory Depth} &= \text{Record Duration} \times \text{Effective Sampling Rate} \\ \text{Effective Sampling Rate} &= \text{Memory Depth} / \text{Record Duration} \\ \text{When Record Duration is long, Longer DSO Memory Depth means Faster Effective Sampling Rate} \end{aligned}$$

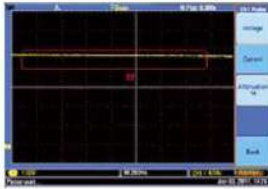
\*Sample period is 1/sample rate    \*\*Record duration = Time Base X 10 div



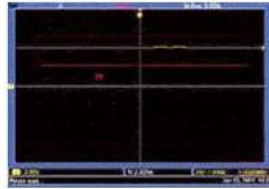
# DIGITAL STORAGE OSCILLOSCOPES

For relatively slow and repetitive signals, memory depth should be the primary consideration rather than sampling rate. The biggest shortcoming of short memory depth is Aliasing due to the lack of sample rate. Oscilloscope's sample rate should be 2x higher than DUT's frequency in order to restore the original waveforms. The following example is done by providing 1KHz/1V sine wave to TEK 1052B-EDU (2.5k memory depth) and GDS-1102B (10M/ch memory depth) via a GW Instek AFG-3021 function generator.

For TEK1052B-EDU under 250ms/div, its 1kSa/s sample rate cannot satisfy the Nyquist theory: Sample rate should be at least 2x higher than input frequency. As a result, TEK1052B-EDU produced Aliasing.



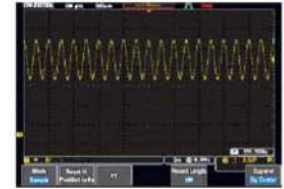
Aliasing due to the insufficient sample rate



After pressing pause and zooming in, signal is obviously distorted



Waveforms entered roll mode under 200ms/div



After pressing pause and zooming in, signal is restore without distortion

## DIGITAL STORAGE OSCILLOSCOPE SELECTION GUIDE

MODEL	GDS-3000 Series	GDS-2000A Series	MSO-2000E Series	MDO-2000A Series	MDO-2000E Series	GDS-2000E Series	GDS-1000B Series	GDS-1000A-U Series	GDS-1000-U Series
MAIN FUNCTION									
Bandwidth	500/350/250/150 MHz	300/200/100/70 MHz	200/100/70MHz	300/200/100MHz	200/100/70MHz	200/100/70MHz	200/100/70/50MHz	150/100/70MHz	100/70/50MHz
Display	8" TFT LCD SVGA	8" TFT LCD SVGA	8" TFT LCD WVGA	8" TFT LCD WVGA	8" TFT LCD WVGA	8" TFT LCD WVGA	7" TFT LCD WVGA	5.7" TFT LCD	5.7" TFT LCD
VPO	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	NA
Memory Depth	25k/ch	2M	10M/ch	20M/ch	10M/ch	10M/ch	10M/ch	2M	4k
Real Time Sampling Rate	500MHz model:4GSa/s others:5GSa/s	2GSa/s	1GSa/s	2GSa/s	1GSa/s	1GSa/s	1GSa/s	1GSa/s	250MSa/s
Channel	2 or 4	2 or 4	2 or 4	2	2 or 4	2 or 4	2 or 4	2	2
Input Impedance	1M/75/50 Ω	1MΩ (50Ωadapter is option)	1MΩ (50Ωadapter is option)	1MΩ (50Ωadapter is option)	1MΩ (50Ωadapter is option)	1MΩ (50Ωadapter is option)	1MΩ (50Ωadapter is option)	1MΩ (50Ωadapter is option)	1MΩ (50Ωadapter is option)
Vertical Resolution	8 bits 2mV~5V/div(@1MΩ) 2mV~1V/div(@75/50Ω)	8 bits 1mV~10V/div	8 bits 1mV~10V/div	8 bits 1mV~10V/div	8 bits 1mV~10V/div	8 bits 1mV~10V/div	8 bits 1mV~10V/div	8 bits 2mV~10V/div	8 bits 2mV~10V/div
Time Base Range	1ns~100s/div	1ns~100s/div	1ns~100s/div	1ns~100s/div	1ns~100s/div	1ns~100s/div	5ns~100s/div	1ns~50s/div	1ns~50s/div
Auto Measurement	28	36	38	38	38	38	36	27	19
1M FFT	-	-	Yes	Yes	Yes	Yes	Yes	-	-
Split Screen	Yes	-	-	-	-	-	-	-	-
Auto Range	Yes	-	-	-	-	-	-	-	-
Power Analysis	Yes	-	-	-	-	-	-	-	-
Serial Bus Decode	Optional (I2C,SPI,UART)	Yes (I2C,SPI,UART,CAN,LIN)	Yes (I2C,SPI,UART,CAN,LIN)	Yes (I2C,UART,CAN,LIN)	Yes (I2C,SPI,UART,CAN,LIN)	Yes (I2C,SPI,UART,CAN,LIN)	-	-	-
Waveform Search	-	Yes	-	Yes	Yes	-	-	-	-
Segmented Memory	-	Yes	-	Yes	Yes	-	-	-	-
Logic Analyzer	-	Optional 8 or 16 CH	Standard 16CH	-	-	-	-	-	-
Arbitrary Waveform Generator	-	Optional 5 or 25MHz	EA series provide dual channel 25MHz	Standard provide dual channel 25MHz	Standard provide dual channel 25MHz	-	-	-	-
Interface	USB host/device ;LAN;SVGA output ;RS232 ;Go/NoGo BNC GPIB (optional)	USB host/device ;LAN;SVGA output (optional) ; Go/NoGo BNC GPIB (optional)	USB host/device ;LAN;Go/NoGo BNC	USB host/device ;LAN;Go/NoGo BNC	USB host/device ;LAN;Go/NoGo BNC	USB host/device ;LAN;Go/NoGo BNC	USB host/device ;LAN;Go/NoGo BNC *LAN only 4th ch model	USB host/device	USB host/device
Page	A5-6	A7-8	A9-14	A15-20	A21-24	A25-26	A29-34	A35-36	A37-38



# 500/350/250/150 MHz Digital Storage Oscilloscope

**VPO**  
Visual Persistence Oscilloscope

Patent No.ZL201220307783.4  
ZL20121021617.9



## GDS-3000 Series (500/350/250/150 MHz)



### FEATURES

- \* 500/350/250/150MHz Bandwidth, 2/4 Input Channels
- \* 5GSa/s Real-time Sampling Rate and 100GSa/s Equivalent Time Sampling Rate
- \* 25k Points Memory for Each Input Channel
- \* VPO (Visual Persistence Oscilloscope) Technology to Display Less-Frequently-Occurred Signals
- \* 8"800 x 600 High Resolution TFT LCD Display
- \* Unique Split Screen System with Independent Setting and Display for Each Input Channel
- \* Three Built-in Input Impedance Selections : 50Ω/75Ω/1MΩ
- \* Optional Power Analysis Software for Power Source Measurement and Analysis
- \* Optional Serial bus Analysis Software for Trigger & Decode of I<sup>2</sup>C, SPI and UART Interfaces

### SPECIFICATIONS

		GDS-3152	GDS-3154	GDS-3252	GDS-3254	GDS-3352	GDS-3354	GDS-3502	GDS-3504
VERTICAL									
Channels		2Ch+EXT	4Ch+EXT	2Ch+EXT	4Ch+EXT	2Ch+EXT	4Ch+EXT	2Ch+EXT	4Ch+EXT
Bandwidth		DC~150MHz (-3dB) 2.3ns	DC~150MHz (-3dB) 2.3ns	DC~250MHz (-3dB) 1.4ns	DC~250MHz (-3dB) 1.4ns	DC~350MHz (-3dB) 1ns	DC~350MHz (-3dB) 1ns	DC~500MHz (-3dB) 700ps	DC~500MHz (-3dB) 700ps
Rise Time									
Bandwidth Limit		20MHz		20/100MHz		20/100/200MHz		20/100/200/350MHz	
Vertical Resolution		The bandwidth of the 75 Ω input impedance is limited to 150MHz only. 8 bits							
Vertical Resolution(1MΩ)		2mV~5V/div							
Vertical Resolution(50/75Ω)		2mV~1V/div							
Input Coupling		AC, DC, GND							
Input Impedance		1MΩ // 15pF							
DC Gain Accuracy		±3% full scale							
Polarity		Normal , Invert							
Maximum Input Voltage(1MΩ)		300Vrms, CAT I							
Maximum Input Voltage(50/75Ω)		5 Vrms, CAT I							
Offset Position Range		2mV/div ~ 100mV/div : ±0.5V ; 200mV/div ~ 5V/div : ±25V							
Waveform Signal Process		Add, Subtract, Multiply, and Divide waveforms, Differentiation, Integration (App installation required)FFT ; FFT : Spectral magnitude. Set FFT vertical scale to Linear RMS or dBV RMS, and FFT window to Rectangular, Hamming, Hanning or Blackman							
TRIGGER									
Source		2CH model: CH1, CH2, Line , EXT ; 4CH model: CH1 , CH2 , CH3 , CH4 , Line , EXT							
Trigger Mode		Auto (Supports Roll Mode for 100 ms/div and slower), Normal, Single							
Trigger Type		Edge, Pulse Width, Video, Runt, Rise & Fall, Alternate, Glitch Trigger, Duration Trigger, Slope Trigger Event-Delay(1~65,535 events),Time-Delay(10ns~10s),I <sup>2</sup> C,SPI,UART(optional)							
Trigger Holdoff Range		10ns ~ 10s							
Coupling		AC, DC, LF rej. , HF rej. , Noise rej.							
Sensitivity		DC~30MHz Approx. 1div or 10mV; 50MHz~150MHz Approx. 1.5div or 15mV; 150MHz~350MHz Approx. 2div or 20mV; 350MHz~500MHz Approx. 2.5div or 25mV							
EXT TRIGGER									
Range		±15V							
Sensitivity		DC~ 150MHz Approx. 100mV; 150MHz ~ 250MHz Approx. 150mV; 250MHz ~ 350MHz Approx. 150mV; 350MHz ~ 500MHz Approx. 200mV							
Input Impedance		1MΩ ±3%, ~16pF							
HORIZONTAL									
Range		1ns/div ~ 100s/div (1-2-5 increments; GDS-3502/3504 1-2.5-5 increments); ROLL : 100ms/div ~ 100s/div							
Pre-trigger		10 div maximum							
Post-trigger		1,000 div max (depend on time base)							
Accuracy		±20 ppm over any ≥ 1 ms time interval							
X-Y MODE									
X-Axis Input/Y-Axis Input		Channel 1; Channel 3/Channel 2; Channel 4							
Phase Shift		±3°at 100kHz							
SIGNAL ACQUISITION									
Real Time Sample Rate		2.5GSa/s	5GSa/s	2.5GSa/s	5GSa/s	5GSa/s	5GSa/s	4GSa/s	4GSa/s
ET Sample Rate		100GSa/s maximum for all models							
Memory Depth		25k points							
Acquisition Mode		Normal, Average, Peak detect, High resolution, Single Average: 2 ~ 256 waveforms ; Peak detect: 2ns							
CURSORS AND MEASUREMENT									
Cursors		Amplitude, Time, Gating available							
Automatic		28 sets: Vpp, Vamp, Vavg, Vrms, Vhi, Vlo, Vmax, Vmin, Rise Preshoot/Overshoot, Fall Preshoot/Overshoot							
Measurement		Freq, Period, Rise time, Fall time, Positive width, Negative width, Duty cycle,Phase, and eight different delay measurements (FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF)							
Cursors Measurement		Voltage difference between cursors (ΔV) Time difference between cursors (ΔT)							
Auto Counter		6 digits, range from 2Hz minimum to the rated bandwidth							
POWER MEASUREMENTS(OPTION)									
Power Quality Measurements		V RMS, I RMS, True Power, Apparent Power, Reactive Power, Frequency, Power Factor, Phase Angle, V Crest Factor, I Crest Factor, (+)V Peak,(-)V Peak,(+)I Peak, (-)I Peak, DC Voltage, DC Current, Impedance, Resistance, Reactance							
Harmonics		Frequency(Hz), Magnitude(%), Mag. RMS(A), Phase(°), Limit(A), Limit(%), Pass / Fail, Max all, Windows(A),200% Limit, POHC Limit, THD-F, THD-R,RMS, Overall, POHL, Input Power, Power Factor, Fundamental Current, Harmonic 3, Harmonic 5							
Ripple Measurements		Ripple, Nose							
In-rush Current		First peak, second peak							
CONTROL PANEL FUNCTION									
Autoset		Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo autoset							
Auto-range		Allow automatically adjusts the time base and/or the vertical scale of displayed waveform when the frequency and/or the amplitude of input signal changed.							
Save Setup		20 sets							
Save Waveform		24 sets							
DISPLAY SYSTEM									
TFT LCD Type		8" TFT LCD SVGA color display(LED Back-light)							
Waveform Update Rate		3500 wfms/sec							
Display Resolution		800 horizontal x 600 vertical pixels (SVGA)							
Interpolation		Sin(x)/x & Equivalent time sampling							
Waveform Display		Dots, Vectors, Variable persistence, Infinite persistence							
Display Graticule		8 x 10 divisions							
Display Brightness		Adjustable							





## GDS-3000 Series

### SPECIFICATIONS

		GDS-3152	GDS-3154	GDS-3252	GDS-3254	GDS-3352	GDS-3354	GDS-3502	GDS-3504
INTERFACE									
RS-232C	DB-9 male connector								
USB Port	2 sets USB 2.0 high-speed host port ;1 set USB high-speed 2.0 device port								
Ethernet Port	RJ-45 connector, 10/100Mbps								
SVGA Video Port	DB-15 female connector, monitor output for display on SVGA monitors								
GPIOB	GPIOB-to-USB Adapter (Optional)								
Go/NoGo BNC	5V Max/10mA TTL open collector output								
Internal Flash Disk	64MB								
Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock								
Line Output	3.5mm stereo jack for Go/NoGo audio alarm								
POWER SOURCE									
Line Voltage Range	AC 100V ~ 240V, 50Hz ~ 60Hz, auto selection; Power Consumption 96VA								
OPERATING ENVIRONMENT									
Temperature	0°C ~ 50°C, Relative Humidity≤80% at 40°C or below ; ≤45% at 41°C~50°C								
MISCELLANEOUS									
Multi-Language Menu	Available								
On-Line Help	Available								
Time clock	Time and data, provide the date/time for saved date								
DIMENSIONS & WEIGHT									
400(W) X 200(H) X 130(D)mm, Approx. 4 kg									

The specifications apply when the oscilloscope is powered on for at least 30 minutes under +20°C ~ +30°C.

### ORDERING INFORMATION

<b>GDS-3502</b>	500MHz, 2-Channel, Visual Persistence DSO
<b>GDS-3504</b>	500MHz, 4-Channel, Visual Persistence DSO
<b>GDS-3352</b>	350MHz, 2-Channel, Visual Persistence DSO
<b>GDS-3354</b>	350MHz, 4-Channel, Visual Persistence DSO
<b>GDS-3252</b>	250MHz, 2-Channel, Visual Persistence DSO
<b>GDS-3254</b>	250MHz, 4-Channel, Visual Persistence DSO
<b>GDS-3152</b>	150MHz, 2-Channel, Visual Persistence DSO
<b>GDS-3154</b>	150MHz, 4-Channel, Visual Persistence DSO

#### Accessories

User manual CD x 1, Power cord x 1  
 GTP-151R : 150MHz 10:1 passive probe for GDS-3152/3154 (one per channel)  
 GTP-251R : 250MHz 10:1 passive probe for GDS-3252/3254 (one per channel)  
 GTP-351R : 350MHz 10:1 passive probe for GDS-3352/3354 (one per channel)  
 GTP-501R : 500MHz 10:1 passive probe for GDS-3502/3504 (one per channel)

#### Option

<b>DS3-PWR</b>	Power analysis software: Power quality/Harmonic/Ripple/In-rush current measurements
<b>DS3-SBD</b>	Serial Bus analysis software: I <sup>2</sup> C/SPI/UART (only 4 channel models support SPI function)

#### Optional Accessories

<b>GUG-001</b>	GPIOB to USB adapter	<b>GDP-025</b>	25MHz High voltage differential probe
<b>GTP-033A</b>	35MHz 1:1 Passive probe	<b>GDP-050</b>	50MHz High voltage differential probe
<b>GTP-352R</b>	350MHz 20:1 Passive probe	<b>GDP-100</b>	100MHz High voltage differential probe
<b>GCP-020</b>	40kHz/240A Current probe	<b>GSC-008</b>	Soft Carrying Case
<b>GCP-100</b>	100kHz/100A Current probe	<b>GTL-110</b>	Test lead, BNC to BNC connector
<b>GCP-300</b>	300kHz/200A Current probe	<b>GTL-232</b>	RS-232C cable, 9-pin female to 9-pin female, Null modem for computer
<b>GCP-530</b>	50MHz/30A Current probe	<b>GTL-246</b>	USB 2.0 cable, A-B type cable 4P, 1800mm
<b>GCP-500</b>	500kHz/150A Current probe	<b>GRA-411</b>	Rack Mount Kit
<b>GCP-1030</b>	100MHz/30A Current probe	<b>GDB-03</b>	Oscilloscope Education and Training Kit
<b>GCP-1000</b>	1MHz/7A Current probe	<b>GKT-100</b>	Deskew fixture
<b>GCP-206P</b>	Power supply for current probe (2 input channel)		
<b>GCP-425P</b>	Power supply for current probe (4 input channel)		
<b>GTL-248</b>	GPIOB Cable, Double Shielded, 2000mm		

#### Free Download

<b>PC Software</b>	FreeWave software	<b>Driver</b>	USB driver; LabView driver
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### Rear Panel



### GUG-001 GPIOB to USB Adapter

For: GDS-3000 Series, PSW-Series



### GRA-411 Rack Adapter Panel

Rack Mounting (19", 6U)



### GDB-03 Oscilloscope Education and Training Kit

For: GDS-3000/2000A/2000E/1000B Series  
 MSO-2000E Series/MDO-2000A/2000E Series



### GSC-008 Soft Carrying Case





# 300MHz/200MHz/100MHz/70MHz Digital Storage Oscilloscope

**VPO**  
Visual Persistence Oscilloscope



## GDS-2000A Series (300/200/100/70 MHz)



### FEATURES

- \* 300/200/100/70MHz Bandwidth, 2 or 4 Input Channels
- \* 2GSa/s Maximum Real-Time Sampling Rate and 100GSa/s Equivalent Time Sampling Rate
- \* 2M points Maximum Record length
- \* VPO Technology to Display Less-Frequently-Occurred Signals
- \* Fast Update Rate of 80,000 Waveform Per Second
- \* Segmented Memory Acquisition and Waveform Search Function
- \* Standard Model Provides I<sup>2</sup>C, UART, SPI, CAN and LIN Serial Bus Trigger and Analysis Functionality
- \* Optional 8 or 16 Additional Digital Channels with Logic Analyzer(MSO)
- \* Upgradable DVM, H-Expansion, Data Log and Advanced Logic Functionality
- \* Optional 5MHz & 25MHz Function Generator
- \* Flexible Remote Control Connectivity (Standard : USB ; Optional : LAN/GPIB)

### GDB-03 Oscilloscope Education and Training Kit

For : GDS-3000/2000A/2000E/1000B Series  
MSO-2000E Series/MDO-2000A/2000E Series



### GSC-008 Soft Carrying Case



### SPECIFICATIONS

#### VERTICAL

	GDS-2072A	GDS-2074A	GDS-2102A	GDS-2104A	GDS-2202A	GDS-2204A	GDS-2302A	GDS-2304A
Channels	2Ch+EXT	4Ch+EXT	2Ch+EXT	4Ch+EXT	2Ch+EXT	4Ch+EXT	2Ch+EXT	4Ch+EXT
Bandwidth	DC~70MHz(-3dB)		DC~100MHz(-3dB)		DC~200MHz(-3dB)		DC~300MHz(-3dB)	
Rise Time	5ns		3.5ns		1.75ns		1.17ns	
Bandwidth Limit	20MHz				20M/100MHz		20M/100M/200MHz	
Vertical Resolution	8 bits@1M : 1mV*~10V (* : When the vertical scale is set to 1mV/div, the bandwidth limit will be set to 20MHz automatically)							
Input Coupling	AC, DC, GND							
Input Impedance	1MΩ // 16pF approx.							
DC Gain Accuracy(**)	±(3% X  Readout  + 0.1div + 1mV) when 2mV/div or greater is selected ±(5% X  Readout  + 0.1div + 1mV) when 1mV/div is selected (** : The measurement type is average of 216 waveforms with vertical position at zero)							
Polarity	Normal , Invert							
Maximum Input Voltage	300Vrms, CAT I							
Offset Position Range	1mV/div ~ 20mV/div : ±0.5V ; 50mV/div ~ 200mV/div : ±5V ; 500mV/div ~ 2V/div : ±25V ; 5V/div~10V/div : ±250V							
Waveform Signal	+, -, x, ÷, FFT, d/dt, ∫dt, √							
Process	FFT : Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS, and FFT Window to Rectangular, Hamming, Hanning , or Blackman							

#### TRIGGER

Source	CH1, CH2, CH3*, CH4*, Line, EXT, D0-D7 or D0-D15** ; *four channel models only **Logic analyzer option only
Trigger Mode	Auto (Supports Roll Mode for 100 ms/div and slower), Normal, Single
Trigger Type	Edge, Pulse Width, Video, Pulse Runt, Rise & Fall, Alternate, Glitch Trigger, Duration Trigger, Slope Trigger, Time out, Event-Delay (1~65,535 events), Time-Delay(10ns~10s), Logic*, Bus, *with DS2-08LA or DS2-16LA option
Trigger Holdoff Range	10ns ~ 10s
Coupling	AC, DC, LF rej., HF rej., Noise rej.
Sensitivity	DC ~ 100MHz Approx. 1div or 1.0mV ; 100MHz ~ 200MHz Approx. 1.5div or 15mV ; 200MHz ~ 300MHz Approx. 2div or 20mV

#### EXT TRIGGER

Range	±15V
Sensitivity	DC ~ 100MHz Approx. 100mV 100MHz ~ 200MHz Approx. 150mV ; 200MHz ~ 300MHz Approx. 150mV
Input Impedance	1MΩ ±3%, ~16pF

#### HORIZONTAL

Time Base Range	1ns/div ~ 100s/div (1-2-5 increments); ROLL : 100ms/div ~ 100s/div
Pre-trigger	10 div maximum
Post-trigger	1,000 div max (depend on time base)
Accuracy	±20 ppm over any ≥ 1 ms time interval
Real Time Sample Rate	Max. : 2GSa/s
ET Sample Rate	100GSa/s maximum for all models
Record Length	Max. : 2Mpts
Acquisition Mode	Normal, Average, Peak Detect, Single
Peak Detection	2ns (typical)
Average	Selectable from 2 to 256

#### X-Y MODE

X-Axis Input	Channel 1 ; Channel 3* (* : four channel models only)
Y-Axis Input	Channel 2 ; Channel 4* (* : four channel models only)
Phase Shift	±3° at 100kHz

#### CURSORS AND MEASUREMENT

Cursors	Amplitude, Time, Gating Available; Unit : Seconds(S), Hz(1/S), Phase (Degrees), Ratio(%)
Automatic Measurement	36 sets: Pk-Pk, Max, Min, Amplitude, High, Low, Mean, Cycle Mean, RMS, Cycle RMS, Area, Cycle Area, ROVShoot, FOVShoot, RPRESshoot, FPRESshoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, Duty Cycle, +Pulses, -Pulses, +Edges, -Edges, FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase
Control Panel Function	Cursors measurement
Auto Counter	6 digits, range from 2Hz minimum to the rated bandwidth
Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo Autoset
Save Setup	20set
Save Waveform	24set

#### DISPLAY SYSTEM

TFT LCD Type	8" TFT LCD SVGA color display(LED Back-light)
Display Resolution	800 horizontal x 600 vertical pixels (SVGA)
Interpolation	Sin(x)/x & Equivalent time sampling
Waveform Display	Dots, Vectors, Variable persistence(16ms~10s), Infinite persistence
Waveform Update Rate	80,000 waveforms per second, maximum
Display Graticule	8 x 10 divisions

#### INTERFACE

RS-232C	DB-9 male connector
USB Port	USB 2.0 Full-speed host port, USB 2.0 Full-speed device port
Ethernet Port	RJ-45 connector, 10/100Mbps with HP Auto-MDIX (option)
SVGA Video Port	SVGA output (option)
GPIB	GPIB module (option)
Co/NoGo BNC	5V Max/10mA TTL open collector output
Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock

The specifications apply when the oscilloscope is powered on for at least 30 minutes under +20°C~+30°C.  
Note : Three-year warranty, excluding probes & LCD display panel.





## GDS-2000A Series

### SPECIFICATIONS

#### LOGIC ANALYZER (OPTION)

Sample Rate	500MSa/s
Bandwidth	200MHz
Record Length	2M max
Input Channels	16 Digital (D15 - D0) or 8 Digital (D7-D0)
Trigger Type	Edge, Pattern, Pulse Width, Serial bus (I <sup>2</sup> C, SPI, UART, CAN, LIN), Parallel
Thresholds	Quad-D0 ~ D3, D4 ~ D7..Thresholds D8-D11*, D12-D15* (*: DS2-16LA only)
Threshold Selections	TTL, CMOS, ECL, PECL, User Defined
Threshold Accuracy	±100mV
User-defined Threshold Range	±10V
Maximum Input Voltage	±40V
Minimum Voltage Swing	±500mV
Input Impedance	101KΩ probe loading 8 pF
Vertical Resolution	1 bit

#### OPERATING ENVIRONMENT

Temperature	0°C ~ 50°C, Relative Humidity ≤ 80% at 40°C or below; ≤ 45% at 41°C~50°C
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#### POWER SOURCE MISCELLANEOUS

Line Voltage Range	AC 100V ~ 240V, 50Hz ~ 60Hz, auto selection
Multi-Language Menu	Available
On-Line Help	Available
Time clock	Time and date, provide the date/time for saved data

#### DIMENSIONS & WEIGHT

380(W) X 220(H) X 145(D)mm, Approx. 4.2 kg
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### ORDERING INFORMATION

GDS-2304A	300MHz, 4-Channel, Digital Storage Oscilloscope
GDS-2302A	300MHz, 2-Channel, Digital Storage Oscilloscope
GDS-2204A	200MHz, 4-Channel, Digital Storage Oscilloscope
GDS-2202A	200MHz, 2-Channel, Digital Storage Oscilloscope
GDS-2104A	100MHz, 4-Channel, Digital Storage Oscilloscope
GDS-2102A	100MHz, 2-Channel, Digital Storage Oscilloscope
GDS-2074A	70MHz, 4-Channel, Digital Storage Oscilloscope
GDS-2072A	70MHz, 2-Channel, Digital Storage Oscilloscope

#### Accessories :

User manual	CD x 1, Power cord x 1
GTP-070B-4	: 70MHz (10:1/1:1) Switchable passive probe for GDS-2072A/2074A(one per channel)
GTP-150A-2	: 150MHz (10:1/1:1) Switchable passive probe for GDS-2102A/2104A(one per channel)
GTP-250A-2	: 250MHz (10:1/1:1) Switchable passive probe for GDS-2202A/2204A(one per channel)
GTP-350A-2	: 350MHz (10:1/1:1) Switchable passive probe for GDS-2302A/2304A(one per channel)

#### OPTION

DS2-LAN	Ethernet & SVGA output	DS2-16LA	16-Channel Logic Analyzer includes 16 Channel Logic Analyzer Card(GLA-16) 16 Channel Logic Analyzer Probe(GTL-16LA)
DS2-GPIB	GPIB Interface	DS2-08LA	8-Channel Logic Analyzer : includes 8-Channel Logic Analyzer Card(GLA-08) 8-Channel Logic Analyzer Probe(GTL-08LA)
DS2-FGN	DDS Function Generator		
AFG-125	25MHz Single channel USB Modular Arbitrary Function Generator		
AFG-225	25MHz Dual channel USB Modular Arbitrary Function Generator		

#### OPTIONAL ACCESSORIES

GTL-08LA	8-Channel Logic Analyzer Probe	GCP-020	40kHz/240A Current probe
GTL-16LA	16-Channel Logic Analyzer Probe	GCP-100	100kHz/100A Current probe
GLA-08	8-Channel Logic Analyzer Card	GCP-300	300kHz/200A Current probe
GLA-16	16-Channel Logic Analyzer Card	GCP-530	50MHz/30A Current probe
GRA-420	Rack Mount Kit	GCP-500	500kHz/150A Current probe
GAK-003	50Ω Impedance Adapter	GCP-1030	100MHz/30A Current probe
DS2-FH1	Module extension bay & USB Type A to Type A/B cable	GCP-1000	1MHz/7A Current probe
GTL-232	RS-232C Cable, 9-pin, F-F Type, null modem, 2000mm	GCP-206P	Power supply for current probe (2 input channel)
GTL-246	USB Cable, USB 2.0, A-B Type, 1200mm	GCP-425P	Power supply for current probe (4 input channel)
GTL-248	GPIB Cable, Double Shielded, 2000mm	GSC-008	Soft Carrying Case
GTP-033A	Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M)	GDP-025	25MHz High voltage differential probe
GDB-03	Oscilloscope Education & Training Kit	GDP-050	50MHz High voltage differential probe
		GDP-100	100MHz High voltage differential probe

#### FREE DOWNLOAD

PC Software	FreeWave software	Driver	USB driver, LabView Driver
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### Rear Panel



### DS2-16LA 16-Channel Logic Analyzer



### DS2-08LA 8-Channel Logic Analyzer



### DS2-LAN Ethernet & SVGA Output



### DS2-GPIB GPIB Interface



### DS2-FGN DDS Function Generator





# 200MHz/100MHz/70MHz Mixed-signal Oscilloscope



## MSO-2000E Series (200/100/70 MHz)



### FEATURES

- \* 200/100/70MHz Bandwidth Selections :  
2 or 4 Channels
- \* Real Time Sample Rate Per Channel : 1GSa/s  
(2 Channel Models); Maximum Real Time  
Sample Rate : 1 GSa/s (4 Channel Models)
- \* MSO-2000E Equips with a 16 Channel Logic  
Analyzer
- \* MSO-2000EA Equips with a 16 Channel  
Logic Analyzer and a Dual Channel 25MHz  
Arbitrary Waveform Generator
- \* Free Frequency Response Analyzer Software  
for MSO-2000EA
- \* Per Channel 10M Memory Depth and VPO  
Waveform Ddisplay Technology
- \* Waveform Update Rate up to 120,000 wfms/s
- \* 8" WVGA TFT LCD
- \* Maximum 1M FFT Provides Higher Frequency  
Domain Resolution Measurements
- \* High Pass, Low Pass and Band Pass Filter  
Functions
- \* 29,000 Segmented Memory Sections and  
Waveform Search Function
- \* I<sup>2</sup>C/SPI/UART/CAN/LIN Serial Bus Trigger  
and Decoding Functions
- \* Data Log Function is Able to Track Signal  
Changes up to 1000 Hours
- \* Mask Test Function
- \* Network Storage Function

### SPECIFICATIONS

	MSO-2072E(A)	MSO-2074E(A)	MSO-2102E(A)	MSO-2104E(A)	MSO-2202E(A)	MSO-2204E(A)
VERTICAL SENSITIVITY						
Channels	2Ch+EXT	4Ch	2Ch+EXT	4Ch	2Ch+EXT	4Ch
Bandwidth	DC~70MHz (-3dB)		DC~100MHz (-3dB)		DC~200MHz (-3dB)	
Rise Time	5ns		3.5ns		1.75ns	
Bandwidth Limit	20MHz		20MHz		20M/100MHz	
Vertical Resolution	8 bits : 1mV ~ 10V/div					
Input Coupling	AC, DC, GND					
Input Impedance	1MΩ// 16pF approx.					
DC Gain Accuracy	±(3% when 2mV/div or greater is selected ; ±(5%) when 1mV/div is selected					
Polarity	Normal & Invert					
Maximum Input Voltage	300Vrms , CAT I (300Vrms CAT II with GTP-070B-4/100B-4/200B-4, 10 : 1 probe)					
Offset Position Range	1mV/div ~ 20mV/div : ±0.5V ; 50mV/div ~ 200mV/div : ±5V ; 500mV/div ~ 2V/div : ±25V ; 5V/div~10V/div : ±250V					
Waveform Signal Process	+ , - , × , ÷ , FFT, User Defined Expression FFT : 1Mpts ; FFT : Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS ; FFT Window Displays : Rectangular, Hamming, Hanning, Blackman-Harris					
TRIGGER						
Source	CH1, CH2, CH3, CH4, Line, EXT* ; *dual channel models only					
Trigger Mode	Auto (Supports Roll Mode for 100 ms/div and slower), Normal, Single Sequence					
Trigger Type	Edge, Pulse Width(Glitch), Video, Pulse Runt, Rise & Fall(Slope), Alternate, Time out, Event-Delay (1~65,535 events), Time-Delay(Duration;4ns~10s), Bus					
Trigger Holdoff Range	4ns ~ 10s					
Coupling	AC, DC, LF rej. , Hf rej. , Noise rej.					
Sensitivity	1div					
EXT TRIGGER						
Range	±15V					
Sensitivity	DC ~ 100MHz Approx. 100mV; 100MHz ~ 200MHz Approx. 150mV					
Input Impedance	1MΩ±3%, ~16pF					
HORIZONTAL						
Time Base Range	1ns/div ~ 100s/div (1-2-5 increments); ROLL : 100ms/div ~ 100s/div					
Pre-trigger	10 div maximum					
Post-trigger	2,000,000 div maximum					
Time Base Accuracy	±50 ppm over any ≥ 1 ms time interval					
Real Time Sample Rate	Max. : 1GSa/s (4ch model); Per channel 1GSa/s (2ch model)					
Record Length	10Mpts/CH					
Acquisition Mode	Normal, Average, Peak Detect, Single					
Peak Detection	2ns (typical)					
Average	Selectable from 2 to 256					
X-Y MODE						
X-Axis Input	Channel 1 ; Channel 3* ( * : four channel models only )					
Y-Axis Input	Channel 2 ; Channel 4* ( * : four channel models only )					
Phase Shift	±3° at 100kHz					
CURSORS AND MEASUREMENT						
Cursors	Amplitude, Time, Gating Available; Unit : Seconds(S), Hz(1/S), Phase (Degrees), Ratio(%)					
Automatic Measurement	38 sets : Pk-Pk, Max, Min, Amplitude, High, Low, Mean, Cycle Mean, RMS, Cycle RMS, Area, Cycle Area, ROVShoot, FOVShoot, RPRESShoot, FPRESShoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, Duty Cycle, +Pulses, -Pulses, +Edges, -Edges, %Flicker, Flicker Idx., FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase Cursors measurement					
Control Panel Function	Cursors measurement					
Auto Counter	6 digits, range from 2Hz minimum to the rated bandwidth					
Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo Autoset					
Save Setup	20set					
Save Waveform	24set					
DISPLAY SYSTEM						
TFT LCD Type	8" TFT LCD WVGA color display					
Display Resolution	800 horizontal x 480 vertical pixels (WVGA)					
Interpolation	Sin(x)/x					
Waveform Display	Dots, Vectors, Variable persistence(16ms~10s), Infinite persistence					
Waveform Update Rate	120,000 waveforms per second, maximum					
Display mode	YT ; XY					
Display Graticule	8 x 10 divisions					
INTERFACE						
USB Port	USB 2.0 High-speed host port x 1, USB 2.0 High-speed device port x 1					
Ethernet Port (LAN)	RJ-45 connector, 10/100Mbps with HP Auto-MDIX					
Go/NoGo BNC	5V Max/10mA TTL open collector output					
Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock					
LOGIC ANALYSER SPECIFICATIONS						
Sample Rate	Per Channel 1GSa/s					
Bandwidth	200MHz					
Record Length	Per Channel 10M pts (max)					
Input Channels	16 Digital (D15 - D0)					
Trigger Type	Edge, Pattern, Pulse Width, Serial bus (I <sup>2</sup> C, SPI, UART(RS232/422/485), CAN, LIN), Parallel Bus					
Thresholds Quad	D0~D3, D4~D7, D8~D11 , D12~D15 Thresholds					
Threshold Selections	TTL, CMOS(5V, 3.3V, 2.5V), ECL, PECL, 0V , User Defined					
User-defined Threshold Range	±5V					
Maximum Input Voltage	±40 V					
Minimum Voltage Swing	±250 mV					
Input Impedance	101KΩ probe loading 8pF					
Vertical Resolution	1 bit					





## MSO-2000E Series

### SPECIFICATIONS

		MSO-2072E(A)	MSO-2074E(A)	MSO-2102E(A)	MSO-2104E(A)	MSO-2202E(A)	MSO-2204E(A)
AWG SPECIFICATIONS (MSO-2000EA only)							
Channels	2						
Sample Rate	200 Msa/s						
Vertical Resolution	14 bits						
Max. Frequency	25 MHz						
Waveforms	Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac						
Output Range	20 mVpp to 5 Vpp, HighZ;10 mVpp to 2.5 Vpp, 50 $\Omega$						
Output Resolution	1mV						
Output Accuracy	2% (1 kHz)						
Offset Range	$\pm 2.5$ V, HighZ; $\pm 1.25$ V, 50 $\Omega$						
Offset Resolution	1mV						
FREQUENCY RESPONSE ANALYSIS							
Dynamic Range	> 80 dB (typical)						
Input and Output Sources	Channel 1 or 2 ( 3 or 4 for four channel model)						
Frequency Range	20 Hz to 25 MHz						
Number of Test Points	10 to 90 points per decade						
Test Amplitude	20 mVpp to 5 Vpp into High-Z Fixed amplitude across entire sweep						
Test Results	Logarithmic overlaid gain and phase plot						
Manual Measurements	Two pairs of tracking gain and phase markers						
Plot Scaling	Auto-scaled during test						
POWER SOURCE MISCELLANEOUS							
Line Voltage Range	AC 100V ~ 240V, 50Hz ~ 60Hz, auto selection						
Multi-Language Menu	Available						
On-Line Help	Available						
Time clock	Time and date, provide the date/time for saved data						
Operation Environment	Temperature: 0°C to 50°C. Relative Humidity: $\leq 80\%$ , 40°C or below; $\leq 45\%$ , 41°C ~ 50°C						
DIMENSIONS & WEIGHT							
384(W) X 208(H) X 127.3(D)mm, Approx. 2.8 kg							

Note : Three-year warranty, excluding probes & LCD display panel.

### ORDERING INFORMATION

<b>MSO-2204E(A)</b>	200MHz, 4 + 16 Channel, Mixed-signal Oscilloscope
<b>MSO-2202E(A)</b>	200MHz, 2 + 16 Channel, Mixed-signal Oscilloscope
<b>MSO-2104E(A)</b>	100MHz, 4 + 16 Channel, Mixed-signal Oscilloscope
<b>MSO-2102E(A)</b>	100MHz, 2 + 16 Channel, Mixed-signal Oscilloscope
<b>MSO-2074E(A)</b>	70MHz, 4 + 16 Channel, Mixed-signal Oscilloscope
<b>MSO-2072E(A)</b>	70MHz, 2 + 16 Channel, Mixed-signal Oscilloscope

"(A)" have built-in a Dual Channel 25MHz Arbitrary Waveform Generator

Accessories :

User manual CD x 1, Power cord x 1

**GCP-201**: Probe Clip, 20PCS **GTL-16E**: 16-Channel Logic Analyzer Probe

**GTP-070B-4**: 70MHz(10:1/1:1) Switchable passive probe for MSO-2072E(A)/2074E(A) (one per channel)

**GTP-100B-4**: 100MHz(10:1/1:1) Switchable passive probe for MSO-2102E(A)/2104E(A) (one per channel)

**GTP-200B-4**: 200MHz(10:1/1:1) Switchable passive probe for MSO-2202E(A)/2204E(A) (one per channel)

### OPTIONAL ACCESSORIES

<b>GTL-16E</b>	16-Channel Logic Analyzer Probe	<b>GCP-300</b>	300kHz/200A Current probe
<b>GRA-426</b>	Rack Mount Kit	<b>GCP-530</b>	50MHz/30A Current probe
<b>GAK-003</b>	50 $\Omega$ Impedance Adapter	<b>GCP-500</b>	500kHz/150A Current probe
<b>GSC-008</b>	Soft Carrying Case	<b>GCP-1030</b>	100MHz/30A Current probe
<b>GTL-246</b>	USB Cable, USB 2.0, A-B Type, 1200mm	<b>GCP-1000</b>	1MHz/7A Current probe
<b>GDB-03</b>	Oscilloscope Education & Training Kit	<b>GCP-206P</b>	Power supply for current probe (2 input channel)
<b>GTP-033A</b>	Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M)	<b>GCP-425P</b>	Power supply for current probe (4 input channel)
<b>GCP-020</b>	Current Probe, 40Hz ~ 40kHz, 240A	<b>GCP-201</b>	Probe Clip, 20PCS
<b>GCP-100</b>	Current Probe, DC ~ 100kHz, 100A	<b>GDP-025</b>	25MHz High voltage differential probe
		<b>GDP-050</b>	50MHz High voltage differential probe
		<b>GDP-100</b>	100MHz High voltage differential probe

### FREE DOWNLOAD

<b>PC Software</b>	OpenWave software	<b>Driver</b>	USB driver ; LabView driver
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### Rear Panel



### GDB-03 Oscilloscope Education and Training Kit

For : GDS-3000/2000A/2000E/1000B Series  
MSO-2000E Series/MDO-2000A/2000E Series



### GTL-16E 16-Channel Logic Analyzer Probe

For : MSO-2000E Series



### GCP-201 Probe Clip, 20PCS

For : MSO-2000E Series





# 200MHz/100MHz/70MHz Mixed-signal Oscilloscope

MSO-2000E SERIES SELECTION GUIDE

MODEL	MSO-2204E	MSO-2202E	MSO-2104E	MSO-2102E	MSO-2074E	MSO-2072E
Bandwidth	200MHz	200MHz	100MHz	100MHz	70MHz	70MHz
Channels	4	2	4	2	4	2
Record Length	10M / ch	10M / ch	10M / ch	10M / ch	10M / ch	10M / ch
Real-time Sampling Rate	Max. 1 GSa/s	Per channel 1 GSa/s	Max. 1 GSa/s	Per channel 1 GSa/s	Max. 1 GSa/s	Per channel 1 GSa/s
Built-in	16 Channel Logic Analyzer					

MSO-2000EA SERIES SELECTION GUIDE

MODEL	MSO-2204EA	MSO-2202EA	MSO-2104EA	MSO-2102EA	MSO-2074EA	MSO-2072EA
Bandwidth	200MHz	200MHz	100MHz	100MHz	70MHz	70MHz
Channels	4	2	4	2	4	2
Record Length	10M / ch	10M / ch	10M / ch	10M / ch	10M / ch	10M / ch
Real-time Sampling Rate	Max. 1 GSa/s	Per channel 1 GSa/s	Max. 1 GSa/s	Per channel 1 GSa/s	Max. 1 GSa/s	Per channel 1 GSa/s
Built-in	16 Channel Logic Analyzer and Dual Channel 25MHz Arbitrary Waveform Generator					

The MSO-2000E series is a mixed-signal oscilloscope, which offers dual analog channels + 16 digital channels or 4 analog channels + 16 digital channels. The MSO-2000E series includes MSO-2000E and MSO-2000EA. MSO-2000E has a built-in 16-channel logic analyzer and MSO-2000EA has a built-in 16-channel logic analyzer and a dual channel 25MHz arbitrary waveform generator. The entire series features bandwidth selections of 200MHz, 100MHz, and 70MHz. Dual analog channel models provide 1GSa/s real-time sampling rate per channel; four analog channel models provide 1GSa/s maximum real-time sampling rate. The 8-inch 800\*480 TFT LCD and the minimum 1mV/div vertical range allow the MSO-2000E series to measure complex feeble signals and clearly display measurement results.

For analog channels, the MSO-2000E series provides 10M long memory for users to completely retrieve and analyze waveforms. Users, based upon the application requirements, can select 1k, 10k, 100k, 1M or 10M memory depth. Short memory depth collocating with the high sampling rate allows users to observe fast-changing waveforms and, on the other hand, long memory depth aims for continuously changing waveforms. The MSO-2000E series is equipped with waveform search and segmented memory functions to expand the flexible applications of 10M long memory. The segmented memory can be divided the maximum into 29,000 sections for users to bypass any unimportant waveforms so as to swiftly search all required waveforms. With the segmented memory function, more meaningful waveforms can be saved and target waveforms can be displayed rapidly. Users, by using the waveform search function, can rapidly search desired waveforms according to the required trigger conditions.

16-channel logic analyzer has a memory depth of 10Mpts per channel, which can retrieve more and longer digital signals as well as clearly display digital signals to obtain sufficient information for analysis. The minimum input swing of logic analyzer represents the minimum operating voltage of  $\pm 250$  mV, which demonstrates that digital channels are highly sensitive with respect to input. The standard bus trigger and decoding functions include serial and parallel bus such as I<sup>2</sup>C, SPI, UART (RS232/422/485) and CAN/LIN bus for automotive communications. The parallel bus function is only for digital channels. Bus waveforms can be triggered and decoded in real time. The MSO-2000E series offers complete analysis and debugging capabilities with the economical pricing.

In addition to a 16-channel logic analyzer, MSO-2000EA has a built-in dual channel 25MHz arbitrary waveform generator with the modulation capability and also features 14 bits vertical resolution; sample rate of 200MSa/s; 13 standard output waveforms Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac; AM/FM/FSK modulation and sweep function. The user friendly interface is the ideal choice for applications such as circuit simulation and education tests.

MSO-2000EA also provides the frequency response analysis function (Bode plot). The FRA software can be directly downloaded from GW Instek website. Via arbitrary waveform generator, oscilloscope, and FRA software, users can obtain DUT's FRA characteristic curve plot. FRA has a very wide application range, including product circuit and component performance verification and analysis such as Feedback of Circuit Design, Filter Design, Amplifier Design, Resonant Circuit Design, Cable Frequency Response, and Signal Transformer Performance. Via FRA, users can preliminarily verify product and analyze component's characteristics without the expensive instrument.

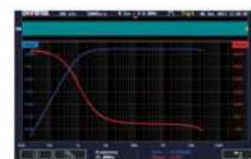
The frequency range of FRA is from 20Hz to 25MHz; the number of test point can be selected from 10 to 90 points per decade. After completing the Bode plot, users can select measurement curve by Cursor so as to retrieve each point's amplitude and phase on the curve.



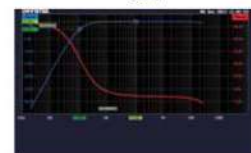
CAN Bus Trigger and Decode



Dual Channel Arbitrary Waveform Generator

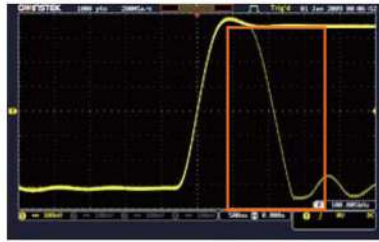


FRA of RC high-pass filter



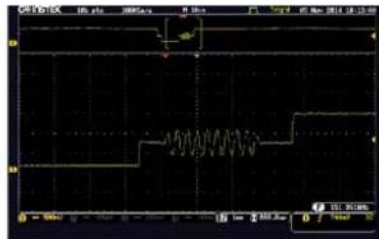
Cursor measurement for the determination at 3dB cut-off frequency of the high-pass filter.



**A. 120,000wfm/s WAVEFORM UPDATE RATE AND VPO WAVEFORM DISPLAY TECHNOLOGY**

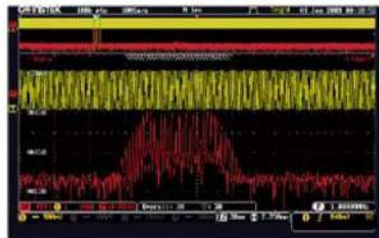
The MSO-2000E series oscilloscope allows users to easily and completely observe inrush signals and rare transient waveforms to increase waveform debugging efficiency by using features, including advanced VPO (Visual Persistence Oscilloscope) signal processing technology, waveform update rate as high as 120,000 wfm/s, and multi-layered afterglow display to enhance waveform display efficiency. Oscilloscope with VPO technology

displays signals with three dimensional waveforms constructed by amplitude, time and signal strength to show each waveform point. 256 color gradients yield clear waveform changes. Comparing with the conventional digital storage oscilloscope, the MSO-2000E series provides more natural and more genuine signal display effect which is very close to the original analog signal.

**B. DUAL DISPLAY SCREEN ZOOM-IN AND PLAY/PAUSE FUNCTIONS**

The MSO-2000E series provides the dual display screen zoom-in function to simultaneously display waveforms and major target areas. Users can zoom in display area by adjusting time/div. Under zoom-in mode, waveform can be played or paused so as to automatically view all input waveforms on the moving zoom-in screen. User can swiftly identify each desired event. Manual control play speed and direction can be adjusted according to users'

requirements. Press "Pause" to stop the play function. With "waveform search", all desired events from different stages can be rapidly identified and examined back and forth. The MSO-2000E series is capable of swiftly searching signals and observing signals' details. 10M long memory depth provides the function of complete waveform retrieval and analysis.

**C. 1M FFT FREQUENCY DOMAIN DISPLAY FUNCTION**

The FFT function of the MSO-2000E Series provides the maximum 1M display for more precision frequency domain display. The function supports four-window displays, including Rectangular, Hamming, Hanning, and Black-harris. Users select window display for frequency domain analysis according to test requirements. The

MSO-2000E series not only provides the FFT function but also FFTrms, vertical adjustment, and local zoom-in functions for users to adjust waveforms of frequency domain by their requirements. Via rapid waveform update rate and waveform search functions, users can precisely observe the test results of frequency domain.



# 200MHz/100MHz/70MHz Mixed-signal Oscilloscope

## D. 38 ITEMS OF AUTO MEASUREMENT SELECTION AND THE STATISTICS FUNCTION



The MSO-2000E series soundly provides 38 measurement items. Based upon the parameters such as voltage, current, time, frequency, and delay measurement, users can decide which measurement items to choose. On the single display screen, the MSO-2000E series

provides 8 measurement selections. The statistics mode can also be selected for users to analyze the mean value, the maximum, the minimum, and standard deviation of the retrieved waveforms to ensure signal's integrity and identify abnormal waveforms.

## E. SUPPORT I<sup>2</sup>C, SPI, UART, CAN, LIN BUS TRIGGER AND DECODING FUNCTION



Decode by Analog Channel



Decode by digital Channel



Display analog waveform converted from digital signal

The serial bus technology has been widely applied in the present embedded application design. To rapidly and correctly trigger and analyze serial bus data has posed a difficult challenge to engineers. The MSO-2000E series provides parallel and serial bus analysis function with 10M long memory depth. Users can select either analog or digital channels to trigger, decode, and analyze frequently used I<sup>2</sup>C, SPI and UART serial bus and CAN/LIN bus, which is often used by automotive communications. While using digital

channels, the analog waveform converted from digital channels can be observed so as to examine and analyze time-related analog and digital signals. The above-mentioned function can verify and analyze the conversion between analog and digital signals. Currently, many embedded designs are digital signals. The MSO series also provides digital channels for parallel bus analysis and decoding. The above standard serial and parallel bus functions are the best test platform for school courses and embedded circuit designs.

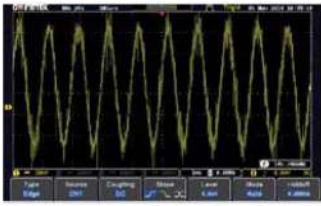
## F. WAVEFORM SEARCH FUNCTION



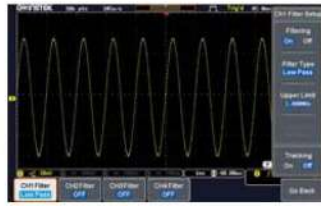
Users can rapidly search desired waveforms according to the trigger condition. After activating the search function, hollow inverted triangles will show the location met the trigger condition. The upper left hand corner Overall will show the total number of waveforms met the trigger condition. Users can set waveform search by the trigger condition such as Edge, pulse width, Runt, Rise/Fall, and Bus.

When the trigger condition is met, hollow inverted triangles will appear. Users can save all marks to compare with the next input signal. The front panel of the MSO-2000E series controls waveform zoom-out and play/pause function to swiftly identify each desired event. The function allows users to conveniently complete waveform search and save marks for rapid comparison and analysis.



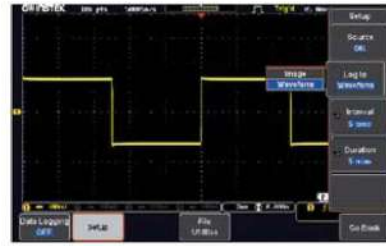
**G. DIGITAL FILTER FUNCTION**

**Unfiltered Waveform with  
Noise Interference**

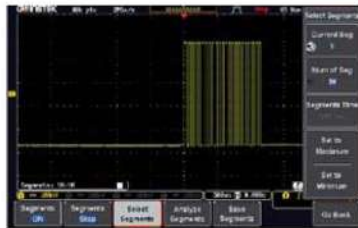


**Filtered Waveform,  
Noise Removed**

Engineers are often troubled by noise interference while measuring signals in the electric circuit tests. The MSO-2000E series features the digital filter function which can be set to high pass or low pass digital filter. Digital filter allows users to independently set filter frequency for each channel. The tracking on function rapidly sets same filter frequency for all channels.

**H. DATA LOG FUNCTION**

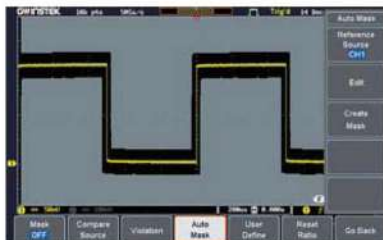
Users, via the data log function, can observe waveform changes in long periods of time to ensure product reliability or measure sporadically appeared signals. The data log function, based on the requirements, can set record time and interval. Record time can be selected from 5 minutes to 1000 hours, and record interval is 5 seconds, the minimum. Waveform type for record data and CSV file format for each channel can also be selected. Data can be stored in USB drive, the MSO-2000E series or the remote computer via LAN.

**I. SEGMENTED MEMORY FUNCTION**

**Users Can Also Select “Analyze Segments” to Conveniently Obtain The Analysis Results.**

To achieve the most ideal application for memory depth, the MSO-2000E series has the built-in segmented memory function. The segmented memory function allows users to select the desired important signals for observation. Hence, insignificant signals can be neglected and serial bus decoding; pulse or inrush signals can be identified when retrieving signals. The segmented memory

function of the MSO-2000E series allows users to select the number of sections. The maximum sections can be selected are 29,000. After activating the function, users can select and observe waveform for each segment by turning the Variable knob. The ultimate application of memory depth, therefore, is completely realized.

**J. MASK FUNCTION**

The MSO-2000E series provides the Mask function, which allows users to apply Auto Mask and user-defined Mask to determine whether the quality of the product meets the regulation. Via user-defined mask, users can set up to 8 areas and each area is up to

10 points to meet test requirements. Users can also refer to the examples from user manual to edit Mask by the PC to satisfy all test needs. By setting Save On, users can log and monitor signals, which violate test conditions.



# 300/200/100MHz Mixed-domain Oscilloscope

**VPO**  
Visual Persistence Oscilloscope



## MDO-2000A Series (300/200/100 MHz)

**NEW**



### FEATURES

- \* 300/200/100MHz Bandwidth Selections:  
2 Channels
- \* Maximum Real Time Sampling Rate: 2 GSa/s
- \* MDO-2000A Equips with a Spectrum Analyzer  
MDO-2000AG Equips with a Spectrum  
Analyzer ; a Dual Channel 25MHz AWG
- \* Per Channel 20M Memory Depth and VPO  
Waveform Display Technology
- \* Waveform Update Rate up to 120,000 wfms/s
- \* 8" WVGA TFT LCD
- \* MDO-2000AG Provides Frequency Response  
Analysis Function
- \* Maximum 1M FFT Provides Higher Frequency  
Domain Resolution Measurements
- \* High Pass, Low Pass and Band Pass Filter  
Functions
- \* 29,000 Segmented Memory Sections and  
Waveform Search Function
- \* I<sup>2</sup>C/UART/CAN/LIN Serial Bus Trigger and  
Decoding Functions
- \* Data Log Function is able to Track Signal  
Changes up to 1000 Hours
- \* Mask Test Function
- \* Network Storage Function

### SPECIFICATIONS

MDO-2102A/G		MDO-2202A/G		MDO-2302A/G	
VERTICAL SENSITIVITY					
Channels	2Ch+EXT		2Ch+EXT		2Ch+EXT
Bandwidth	DC~100MHz(-3dB)		DC~200MHz(-3dB)		DC~300MHz(-3dB)
Rise Time	3.5ns		1.75ns		1.17ns
Bandwidth Limit	20MHz		20M/100MHz		20M/100M200MHz
Vertical Resolution	8 bits : 1mV ~ 10V/div				
Input Coupling	AC, DC, GND				
Input Impedance	1MΩ // 16pF approx.				
DC Gain Accuracy	±(3% when 2mV/div or greater is selected ; ±(5%) when 1mV/div is selected				
Polarity	Normal & Invert				
Maximum Input Voltage	300Vrms , CAT I				
Offset Position Range	1mV/div ~ 20mV/div : ±0.5V ; 50mV/div ~ 200mV/div : ±5V ; 500mV/div ~ 2V/div : ±25V ; 5V/div~10V/div : ±250V				
Waveform Signal Process	+, -, ×, ÷, FFT, User Defined Expression FFT : 1Mpts ; FFT : Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS and FFT Window to Rectangular, Hamming , Hanning, or Blackman				
TRIGGER					
Source	Ch1 ,CH2, Line, EXT				
Trigger Mode	Auto (Supports Roll Mode for 100 ms/div and slower), Normal, Single Sequence				
Trigger Type	Edge, Pulse Width (Glitch), Video, Pulse Runt, Rise & Fall(Slope), Alternate, Time out, Event Delay (1~65,535 events),Time-Delay(Duration;4ns~10s), Bus				
Trigger Holdoff Range	4ns ~ 10s				
Coupling	AC, DC, LF rej. , HF rej. , Noise rej.				
Sensitivity	1div				
EXT TRIGGER					
Range	±15V				
Sensitivity	DC ~ 100MHz Approx. 100mV; 100MHz ~ 200MHz Approx. 150mV; 200MHz ~ 300MHz Approx. 150mV				
Input Impedance	1MΩ±3%, ~16pF				
HORIZONTAL					
Time Base Range	1ns/div ~ 100s/div (1-2-5 increments); ROLL : 100ms/div ~ 100s/div				
Pre-trigger	10 div maximum				
Post-trigger	2,000,000 div maximum				
Time Base Accuracy	±50 ppm over any≥ 1 ms time interval				
Real Time Sample Rate	Max. : 2GSa/s (shared)				
Record Length	Per Channel 20Mpts				
Acquisition Mode	Normal, Average, Peak Detect, Single				
Peak Detection	2ns (typical)				
Average	Selectable from 2 to 256				
X-Y MODE					
X-Axis Input	Channel 1				
Y-Axis Input	Channel 2				
Phase Shift	±3° at 100kHz				
CURSORS AND MEASUREMENT					
Cursors	Amplitude, Time, Gating Available; Unit : Seconds(S), Hz(1/S), Phase (Degrees), Ratio(%)				
Automatic Measurement	38 sets : Pk-Pk, Max, Min, Amplitude, High, Low, Mean, Cycle Mean, RMS, Cycle RMS, Area, Cycle Area, ROVShoot, FOVShoot, RPRESshoot, FPRESshoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, Duty Cycle, +Pulses, -Pulses, +Edges, -Edges, %Flicker, Flicker Idx., FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase				
CONTROL PANEL FUNCTION					
Auto Counter	6 digits, range from 2Hz minimum to the rated bandwidth				
Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo Autoset				
Save Setup	20 sets				
Save Waveform	24 sets				
DISPLAY SYSTEM					
TFT LCD Type	8" TFT LCD WVGA color display				
Display Resolution	800 horizontal x 480 vertical pixels (WVGA)				
Interpolation	Sin(x)/x				
Waveform Display	Dots, Vectors, Variable persistence(16ms~4s), Infinite persistence				
Waveform Update Rate	120,000 waveforms per second, maximum				
Display Mode	YT ; XY				
Display Graticule	8 x 10 divisions				
INTERFACE					
USB Port	USB 2.0 High-speed host port x 1, USB 2.0 High-speed device port x 1				
Ethernet Port (LAN)	RJ-45 connector, 10/100Mbps with HP Auto-MDIX				
Go/NoGo BNC	5V Max/10mA TTL open collector output				
Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock				
SPECTRUM ANALYZER SPECIFICATIONS					
Frequency Range	DC~1GHz(Max.) (Max. bandwidth ~1GHz uncalibrated)				
Span	1kHz ~ 1GHz(Max.)				
Resolution Bandwidth	1Hz ~ 1MHz(Max.)				
Reference Level	-50 dBm to +40dBm in steps of 5dBm				
Vertical Units	dBV RMS; Linear RMS; dBm				
Vertical Position	-12divs to +12divs				
Vertical Scale	1dB/div to 20dB/div in a 1-2-5 Sequence				
Display Average Noise Level	1V/div < -50dBm, Avg : 16 ; 100mV/div < -70dBm, Avg : 16 ; 10mV/div < -90dBm, Avg : 16				
Spurious Response	2nd harmonic distortion< 40dBc ; 3rd harmonic distortion< 45dBc				
Frequency Domain	Normal ; Max Hold ; Min Hold ; Average (2 ~ 256)				
Trace Types	Sample ; +Peak ; -Peak ; Average				
Detection Methods	FFT Factor : Hanning 1.44 ; Rectangular 0.89 ; Hamming 1.30 ; Blackman 1.68				
FFT Windows					
AWG SPECIFICATIONS (MDO-2000AG only)					
Channels	2				
Sample Rate	200 Msa/s				
Vertical Resolution	14 bits				
Max. Frequency	25 MHz				
Waveforms	Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaston, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac				
Output Range	20 mVpp to 5 Vpp, HighZ;10 mVpp to 2.5 Vpp, 50 Ω				
Output Resolution	1mV				
Output Accuracy	2% (1 kHz)				
Offset Range	±2.5 V, HighZ;±1.25 V, 50 Ω				
Offset Resolution	1mV				





Rear Panel



## MDO-2000A Series

SPECIFICATIONS			
	MDO-2102A/G	MDO-2202A/G	MDO-2302A/G
Sine	Frequency Range : 100mHz~25MHz ; Flatness : $\pm 0.5$ dB ; Harmonic Distortion : -40 dBc ; Stray (Non-harmonic) : -40 dBc ; Total Harmonic Distortion : 1% ; S/N Ratio : 40 dB		
Square/Pulse	Frequency Range : 100mHz~15MHz ; Rise/Fall time : <15ns ; Overshoot : <3% ; Duty cycle Square : 50% & Pulse : 0.4%~99.6% ; Min. Pulse Width : 30 ns ; Jitter:500 ps		
Ramp	Frequency Range :100mHz~1MHz ; Linearity : 1% ; Symmetry : 0~100%		
FREQUENCY RESPONSE ANALYSIS (MDO-2000AG only)			
Dynamic Range	> 80 dB (typical)		
Input and Output Sources	Channel 1 or 2		
Frequency Range	20 Hz to 25 MHz		
Number of Test Points	10 to 90 points per decade		
Test Amplitude	20 mVpp to 5 Vpp into High-Z ; Fixed test amplitude or custom amplitude for each decade		
Test Results	Logarithmic overlaid gain and phase plot		
Manual Measurements	Two pairs of tracking gain and phase markers		
Plot Scaling	Auto-scaled during test		
MISCELLANEOUS			
Line Voltage Range	AC 100V ~ 240V, 50Hz ~ 60Hz, auto selection		
Multi-Language Menu	Available		
On-Line Help	Available		
Time Clock	Time and date, provide the date/time for saved data		
Operation Environment	Temperature: 0°C to 50°C. Relative Humidity: $\leq 80\%$ at 40°C or below; $\leq 45\%$ , 41°C ~ 50°C		
Dimensions & Weight	384(W) X 208(H) x 127.3(D) mm, Approx. 3kg		

Note : Three-year warranty, excluding probes & LCD display panel.

## ORDERING INFORMATION

**MDO-2302AG** 300MHz, 2-channel, Digital Storage Oscilloscope, Spectrum Analyzer, dual channel 25MHz AWG  
**MDO-2202AG** 200MHz, 2-channel, Digital Storage Oscilloscope, Spectrum Analyzer, dual channel 25MHz AWG  
**MDO-2102AG** 100MHz, 2-channel, Digital Storage Oscilloscope, Spectrum Analyzer, dual channel 25MHz AWG  
**MDO-2302A** 300MHz, 2-channel, Digital Storage Oscilloscope, Spectrum Analyzer  
**MDO-2202A** 200MHz, 2-channel, Digital Storage Oscilloscope, Spectrum Analyzer  
**MDO-2102A** 100MHz, 2-channel, Digital Storage Oscilloscope, Spectrum Analyzer

Accessories :

User manual CD x 1, Power cord x 1,

**GTL-110** BNC-BNC cable x 2 (only on MDO-2000AG)

**GTP-100B-4** : 100MHz(10:1/1:1) Switchable passive probe for MDO-2102A/2102AG(one per channel)

**GTP-200B-4** : 200MHz(10:1/1:1) Switchable passive probe for MDO-2202A/2202AG(one per channel)

**GTP-300B-4** : 300MHz(10:1/1:1) Switchable passive probe for MDO-2302A/2302AG(one per channel)

## OPTIONAL ACCESSORIES

<b>GRA-426</b>	Rack Adapter Panel	<b>GCP-100</b>	Current Probe, DC~100KHz, 100A, Current Probe
<b>GAK-003</b>	50 $\Omega$ Impedance Adapter	<b>GCP-300</b>	300kHz/200A Current probe
<b>GSC-008</b>	Soft Carrying Case	<b>GCP-530</b>	50MHz/30A Current probe
<b>CTL-246</b>	USB Cable, USB 2.0, A-B Type, 1200mm	<b>GCP-500</b>	500kHz/150A Current probe
<b>GCP-020</b>	Current Probe, 40Hz~40kHz, 240A, Current Probe	<b>GCP-1030</b>	100MHz/30A Current probe
<b>GTP-033A</b>	Oscilloscope Probe, 35MHz 1:1 Passive Probe	<b>GCP-1000</b>	1MHz/7A Current probe
<b>GDP-025</b>	Differential Probe, 25M High Voltage Differential Probe	<b>GCP-206P</b>	Power supply for current probe (2 input channel)
<b>GDP-050</b>	Differential Probe, 50M High Voltage Differential Probe	<b>GCP-425P</b>	Current Probe - Power Supply, 4 Channel Power Supply for GCP-530/1030

## FREE DOWNLOAD

PC Software	OpenWave software	Driver	USB driver ; LabView driver
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# 300/200/100MHz Mixed-domain Oscilloscope

## SELECTION GUIDE

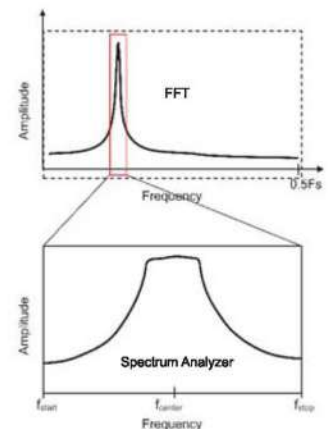
MODEL	MDO-2302AG	MDO-2202AG	MDO-2102AG	MDO-2302A	MDO-2202A	MDO-2102A
Bandwidth	300MHz	200MHz	100MHz	300MHz	200MHz	100MHz
Channels	2	2	2	2	2	2
Record Length	20M / ch	20M / ch	20M / ch	20M / ch	20M / ch	20M / ch
Real-time Sampling Rate	Max. 2 GSa/s	Max. 2 GSa/s	Max. 2 GSa/s	Max. 2 GSa/s	Max. 2 GSa/s	Max. 2 GSa/s
Built-in	MDO-2000A : Spectrum Analyzer MDO-2000AG : Spectrum Analyzer ; Dual Channel 25MHz Arbitrary Waveform Generator					

MDO-2000A is an advanced version of MDO-2000E. The selectable bandwidth range is upgraded to 300MHz. The full bandwidth ranges include 300MHz, 200MHz and 100MHz. The sampling rate has upgraded to Max. 2GSa/s and the memory depth has also been upgraded to 20M/CH. Hence, the three major specifications of oscilloscopes have been improved. The new models of the series feature 2 channels including MDO-2000A and MDO-2000AG. The entire series offers the functions of oscilloscope and spectrum analyzer. On top of that, MDO-2000AG features a dual-channel 25MHz arbitrary waveform generator. The new generation MDO-2000A series provides better sampling rate and memory depth for users to obtain more realistic signal integrity, and higher bandwidth selections meet the measurement requirements of higher frequencies.

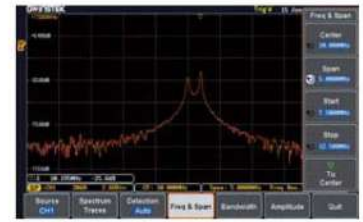
In addition to advanced oscilloscope specifications, the MDO-2000A series is also a dual-domain test platform. For frequency domain analysis, the spectrum analyzer measurement mode is provided to allow users to have frequency domain analysis with higher resolution. The FFT operation on the oscilloscope is limited by the horizontal level setting (sampling rate), and most oscilloscopes only provide 1k FFT points, so users often cannot get the correct frequency domain display. The frequency domain provided by MDO-2000A has an operation interface the same as the general spectrum analyzer. Its fast frequency domain update is like a real time spectrum analyzer. While operating the spectrum analyzer of MDO-2000A, users can input Center frequency, Span, Start frequency, and Stop frequency based upon test requirements so as to rapidly and intuitively observe required frequency range that allows users to experience the user interface of a real spectrum analyzer. While observing frequency domain display, engineers can observe waveform characteristics, which are not easily to be seen from time domain waveforms, for instance, the harmonic composition of a waveform and the frequency characteristics of a modulation signal.

The figure on the right shows why the resolution of the spectrum analysis is better than that of the FFT of the general oscilloscope. Therefore, using the frequency domain signal of the spectrum analysis, the frequency domain peaks and the components of each composition can be correctly captured, which is impossible for the general FFT. Conventional DSO's FFT always calculates the entire signal bandwidth up to half the sampling rate ( $F_s$ ). However, the insufficient calculation capability can't conduct FFT calculation with more points. Users can't have the signal's detailed frequency information due to the insufficient frequency resolution from the calculation result. Whereas MDO-2000A analyzes signal spectrum of interest. The start frequency and stop frequency of the spectrum analyzer can be selected according to the characteristics of the test signal, so that the frequency domain signal can be displayed on the screen. Compared with oscilloscope' FFT, the MDO-2000A series allows engineers to effectively conduct signal measurements on frequency domain. Right illustration shown the conventional DSO's FFT (above figure) VS. MDO-2000A's Spectrum analyzer (below figure).

MDO-2000A's spectrum analyzer's frequency measurement range is from DC to 1GHz, which can meet the requirements of the low frequency test of audio and vibration. The general spectrum analyzer cannot measure the signals below 9kHz. The highest frequency of 1GHz is shown on the right. MDO-2000A uses a BNC Cable to connect to the RF Signal Generator to obtain the maximum 1GHz signal frequency. Although the 1GHz signal has attenuated in the time domain, the input signal can still be obtained in the frequency domain.



The spectrum analyzer of MDO-2000A can automatically adjust to the most appropriate sample rate according to users' input frequency range. The required data for calculation is also from the same sampling. By the tremendous calculation efficiency of Zynq SoC, a large amount of calculation can be done in a very short period of time. Therefore, MDO-2000A can complete a spectrum faster than a conventional spectrum analyzer. The screen display on the right shows the spectrum results of MDO-2000A's spectrum analyzer of FSK signal. The parameters of FSK signal: 500mVpp sine wave, fmax: 10.2MHz, fmin: 10.0MHz, bit rate: 10.0kHz. Users can directly input Center and Span Frequency by an intuitive and swift setting. Fmax and fmin can be clearly identified from the screen display.



When the same signal is tested by FFT (the right display was the result tested by Keysight DSOX2000A), most users do not know the correlation between the sampling rate of the time domain signal and the frequency of the DUT signal, so the FFT waveform display is not easy to adjust correctly. The slow update, time domain waveform overlapping with the frequency domain waveform, and most DSOs do not provide the search function together make it impossible to clearly analyze the frequency domain waveform and simultaneously measure the components of more than two modulated signals. FFT without RBW setting does not allow users to adjust the output waveform with the best resolution according to the characteristics of the actual waveform.



MDO-2000A's Spectrum Analyzer also includes Spectrum Trace Type settings (Normal, Max-hold, Min-hold, and Average). Users can freely select various Spectrum Traces for simultaneous display. Detection method (Sample, +Peak, -Peak, and Average) can be individually set for each Trace. Additionally, users, via Cursor, can manually mark the corresponding positions to reflect Frequency and Amplitude. The Search function can also be applied to log spectrum's Peak Table. Amplitude is displayed with dB and Marker can obtain measurement data. Display on the right is a FM signal's spectrum.



Users can use the Search function to search and mark several amplitudes and frequencies. Search methods include Max. peak and threshold. Measurement results can be displayed and saved.

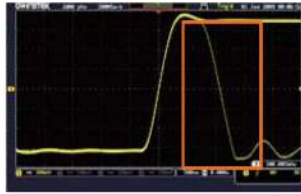


The display on the right shows the frequency domain display of the AM signal. Via the Search function, users can easily capture more than two spectral components



# 300/200/100MHz Mixed-domain Oscilloscope

## A. 120,000wfm/s WAVEFORM UPDATE RATE AND VPO WAVEFORM DISPLAY TECHNOLOGY



The MDO-2000A series oscilloscope allows users to easily and completely observe inrush signals and rare transient waveforms to increase waveform debugging efficiency by using features, including advanced VPO (Visual Persistence Oscilloscope) signal processing technology, waveform update rate as high as 120,000 wfm/s, and multi-layered afterglow display to enhance waveform display efficiency. Oscilloscope with VPO technology

displays signals with three dimensional waveforms constructed by amplitude, time and signal strength to show each waveform point. 256 color gradients yield clear waveform changes. Comparing with the conventional digital storage oscilloscope, the MDO-2000A series provides more natural and more genuine signal display effect which is very close to the original analog signal.

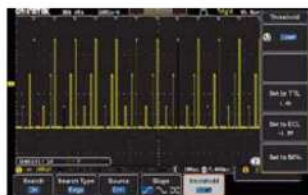
## B. SUPPORT I<sup>2</sup>C, UART, CAN, LIN BUS TRIGGER AND DECODING FUNCTIONS



The serial bus technology has been widely applied in the present embedded application design. The IoT devices connecting sensors and the peripheral components are using serial bus such as UART, I<sup>2</sup>C. To rapidly and correctly trigger and analyze serial bus data has posed a difficult challenge to engineers. The MDO-2000A series

provides serial bus analysis function with 20M long memory depth. Users can trigger, decode, and analyze frequently used I<sup>2</sup>C and UART serial bus and CAN/LIN bus, which is often used by automotive communications.

## C. WAVEFORM SEARCH FUNCTION



Users can rapidly search desired waveforms according to the trigger condition. After activating the search function, hollow inverted triangles will show the location met the trigger condition. The upper left hand corner Overall will show the total number of waveforms met the trigger condition. Users can set waveform search by the trigger condition such as Edge, pulse width, Runt, Rise/Fall, and Bus. When the trigger condition is met, hollow inverted triangles will appear. Users can save all marks to compare with the next input signal. The front panel of the MDO-2000A series controls waveform zoom-out and play/pause function to swiftly identify each desired event. The function allows users to conveniently complete waveform search and save marks for rapid comparison and analysis.

## D. DATA LOG FUNCTION



Users, via the data log function, can observe waveform changes in long periods of time to ensure product reliability or measure sporadically appeared signals. The data log function, based on the requirements, can set record time and interval. Record time can be selected from 5 minutes to 1000 hours, and record interval is 2 seconds, the minimum. Waveform type for record data and CSV file format for each channel can also be selected. Data can be stored in USB drive, the MDO-2000A series or the remote computer via LAN.

## E. SEGMENTED MEMORY FUNCTION



Users Can Select "Analyze Segments" to Conveniently Obtain The Analysis Results.

To achieve the most ideal application for memory depth, the MDO-2000A series has the built-in segmented memory function. The segmented memory function allows users to select the desired important signals for observation. Hence, insignificant signals can be neglected and serial bus decoding; pulse or inrush signals can be identified when retrieving signals.

The segmented memory function of the MDO-2000A series allows users to select the number of sections. The maximum sections can be selected are 29,000. After activating the function, users can select and observe waveform for each segment by turning the Variable knob. The ultimate application of memory depth, therefore, is completely realized.

## F. MASK FUNCTION



The MDO-2000A series provides the Mask function, which allows users to apply Auto Mask and user-defined Mask to determine whether the quality of the product meets the regulation. Via user-defined mask, users can set up to 8 areas and each area is up to

10 points to meet test requirements. Users can also refer to the examples from user manual to edit Mask by the PC to satisfy all test needs. By setting Save On, users can log and monitor signals, which violate test conditions.

## G. 25MHz DUAL CHANNEL ARBITRARY WAVEFORM GENERATOR

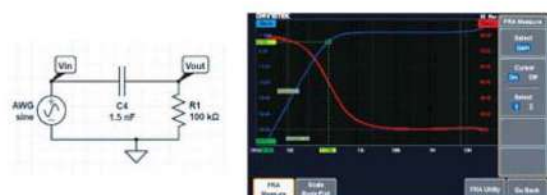


\* MDO-2000AG only



With respect to signal source, MDO-2000AG features a built-in dual channel 25MHz arbitrary waveform generator with modulation capability and also provides 14 bits vertical resolution; sample rate of 200MSa/s; 13 output waveforms (Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac); and AM/FM/FSK modulation and sweep function. The friendly user interface is the ideal choice for education and applications such as circuit simulation tests. Arbitrary waveform generator provides users with 16k memory length. The arbitrary waveform can be edited through the PC software, and the edited arbitrary waveform(CSV file) can be recalled by the AWG function.

## H. PROVIDE FREQUENCY RESPONSE ANALYSIS (FRA) FUNCTION



\* MDO-2000AG only

FRA (bode plot) has a very wide application range ,including product circuit and component performance verification and analysis, such as negative feedback networks of switch mode power supplies design (loop response), feedback of circuit design, filter design, amplifier design, resonant Circuit design, cable frequency response and signal transformer performance etc. The diagram above is a RC high pass filter. The -3dB cut-off frequency= $1.06\text{kHz}(F=1/2*\pi*R*C)$  and the measurement result is 1.1kHz which is quite close to the theoretical value. The frequency test range of FRA and the max. 90 points per decade of test point are higher than that of Keysight InfiniVision 3000T's option. More points per decade allow users to get higher accurate test results.



# 200/100/70MHz Mixed-domain Oscilloscope



## MDO-2000E Series (200/100/70 MHz)



### FEATURES

- \* 200/100/70MHz Bandwidth Selections:  
2 or 4 Channels
- \* Real Time Sample Rate Per Channel:  
1GSa/s (2 Channel Models); Maximum Real  
Time Sample Rate: 1 GSa/s (4 Channel Models)
- \* MDO-2000EG Equips with a Spectrum  
Analyzer and a Dual Channel 25MHz AWG
- \* MDO-2000EX Equips with a Spectrum  
Analyzer ; a Dual Channel 25MHz AWG;  
DMM and Power Supply
- \* Per Channel 10M Memory Depth and VPO  
Waveform Display Technology
- \* Waveform Update Rate up to 120,000 wfm/s
- \* 8 " WVGA TFT LCD
- \* Free Frequency Response Analyzer Software
- \* Maximum 1M FFT Provides Higher Frequency  
Domain Resolution Measurements
- \* High Pass, Low Pass and Band Pass Filter  
Functions
- \* 29,000 Segmented Memory Sections and  
Waveform Search Functions
- \* I<sup>2</sup>C/SPI/UART/CAN/LIN Serial Bus Trigger  
and Decoding Functions
- \* Data Log Function is Able to Track Signal  
Changes up to 1000 Hours
- \* Mask Test Function
- \* Network Storage Function

### SPECIFICATIONS

	MDO-2072E(G/X)	MDO-2074E(G/X)	MDO-2102E(G/X)	MDO-2104E(G/X)	MDO-2202E(G/X)	MDO-2204E(G/X)
VERTICAL SENSITIVITY						
Channels	2Ch+EXT		4Ch		2Ch+EXT	
Bandwidth	DC~70MHz(-3dB)		DC~100MHz(-3dB)		DC~200MHz(-3dB)	
Rise Time	5ns		3.5ns		1.75ns	
Bandwidth Limit	20MHz		20MHz		20M/100MHz	
Vertical Resolution	8 bits : 1mV ~ 10V/div					
Input Coupling	AC, DC, GND					
Input Impedance	1MΩ // 16pF approx.					
DC Gain Accuracy	±(3% when 2mV/div or greater is selected ; ±(5%) when 1mV/div is selected					
Polarity	Normal & Invert					
Maximum Input Voltage	300Vrms , CAT I					
Offset Position Range	1mV/div ~ 20mV/div: ±0.5V ; 50mV/div ~ 200mV/div: ±5V ; 500mV/div ~ 2V/div: ±25V; 5V/div~10V/div: ±250V					
Waveform Signal Process	+ , - , × , ÷ , FFT , User Defined Expression FFT : 1Mpts ; FFT : Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS and FFT Window to Rectangular, Hamming, Hanning, or Blackman					
TRIGGER						
Source	CH1 ,CH2, CH3, CH4, Line, EXT* ; *dual channel models only					
Trigger Mode	Auto (Supports Roll Mode for 100 ms/div and slower), Normal, Single Sequence					
Trigger Type	Edge, Pulse Width(Glitch), Video, Pulse Runt, Rise & Fall(Slope), Alternate, Time out, Event-Delay (1~65,535 events),Time-Delay(Duration:4ns~10s), Bus					
Trigger Holdoff Range	4ns ~ 10s					
Coupling	AC, DC, LF rej. , Hf rej. , Noise rej.					
Sensitivity	1div					
EXT TRIGGER						
Range	±15V					
Sensitivity	DC ~ 100MHz Approx. 100mV; 100MHz ~ 200MHz Approx. 150mV					
Input Impedance	1MΩ ±3%, ~16pF					
HORIZONTAL						
Time Base Range	1ns/div ~ 100s/div (1-2-5 increments); ROLL : 100ms/div ~ 100s/div					
Pre-trigger	10 div maximum					
Post-trigger	2,000,000 div maximum					
Time Base Accuracy	±50 ppm over any ≥ 1 ms time interval					
Real Time Sample Rate	Max. : 1GSa/s (4ch model); Per channel 1GSa/s (2ch model)					
Record Length	10Mpts/CH					
Acquisition Mode	Normal, Average, Peak Detect, Single					
Peak Detection	2ns (typical)					
Average	Selectable from 2 to 256					
X-Y MODE						
X-Axis Input	Channel 1 ; Channel 3* ( * : four channel models only )					
Y-Axis Input	Channel 2 ; Channel 4* ( * : four channel models only )					
Phase Shift	±3° at 100kHz					
CURSORS AND MEASUREMENT						
Cursors	Amplitude, Time, Gating Available; Unit : Seconds(S), Hz(1/S), Phase (Degrees), Ratio(%)					
Automatic Measurement	38 sets : Pk-Pk, Max, Min, Amplitude, High, Low, Mean, Cycle Mean, RMS, Cycle RMS, Area, Cycle Area, ROVShoot, FOVShoot, RPRESHoot, FPREShoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, Duty Cycle, +Pulses, -Pulses, +Edges, -Edges, %Flicker, Flicker Idx., FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase					
CONTROL PANEL FUNCTION						
Auto Counter	6 digits, range from 2Hz minimum to the rated bandwidth					
Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo Autoset					
Save Setup	20 sets					
Save Waveform	24 sets					
DISPLAY SYSTEM						
TFT LCD Type	8" TFT LCD WVGA color display					
Display Resolution	800 horizontal x 480 vertical pixels (WVGA)					
Interpolation	Sin(x)/x					
Waveform Display	Dots, Vectors, Variable persistence(16ms~4s), Infinite persistence					
Waveform Update Rate	120,000 waveforms per second, maximum					
Display mode	YT ; XY					
Display Graticule	8 x 10 divisions					
INTERFACE						
USB Port	USB 2.0 High-speed host port x 1, USB 2.0 High-speed device port x 1					
Ethernet Port (LAN)	RJ-45 connector, 10/100Mbps with HP Auto-MDIX					
Go/NoGo BNC	5V Max/10mA TTL open collector output					
Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock					
SPECTRUM ANALYZER SPECIFICATIONS						
Frequency Range	DC~500MHz(Max.) (Max. bandwidth ~500MHz uncelebrated)					
Span	1kHz ~ 500MHz(Max.)					
Resolution Bandwidth	1Hz ~ 500kHz(Max.)					
Reference Level	-50 dBm to +40dBm in steps of 5dBm					
Vertical Units	dBV RMS; Linear RMS; dBm					
Vertical Position	-12divs to +12divs					
Vertical Scale	1dB/div to 20dB/div in a 1-2-5 Sequence					
Display Average Noise Level	1V/div < -50dBm, Avg : 16 ; 100mV/div < -70dBm, Avg : 16 ; 10mV/div < -90dBm, Avg : 16					
Spurious Response	2nd harmonic distortion< 40dBc; 3rd harmonic distortion< 45dBc					
Frequency Domain Trace Types	Normal ; Max Hold ; Min Hold ; Average (2 ~ 256)					
Detection Methods	Sample ; +Peak ; -Peak ; Average					
FFT Windows	FFT Factor : Hanning 1.44 ; Rectangular 0.89 ; Hamming 1.30 ; Blackman 1.68					
AWG SPECIFICATIONS						
Channels	2					
Sample Rate	200 Msa/s					
Vertical Resolution	14 bits					
Max. Frequency	25 MHz					
Waveforms	Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaston, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac					
Output Range	20 mVpp to 5 Vpp, HighZ; 10 mVpp to 2.5 Vpp, 50 Ω					
Output Resolution	1mV					
Output Accuracy	2% (1 kHz)					
Offset Range	±2.5 V, HighZ; ±1.25 V, 50 Ω					
Offset Resolution	1mV					
Sine	Frequency Range: 100mHz~25MHz ; Flatness: ±0.5 dB ( relative to 1kHz ) ; Harmonic Distortion: <40 dBc ; Stray (Non-harmonic): <40 dBc ; Total Harmonic Distortion: 1% ; S/N Ratio: 40 dB					
Square/Pulse	Frequency Range: 100mHz~15MHz ; Rise/Fall time: <15ns ; Overshoot: <3% ; Duty cycle Square: 50% & Pulse: 0.4%~99.6% ; Min. Pulse Width: 30 ns ; Jitter: 500 ps					
Ramp	Frequency Range: 100mHz~1MHz ; Linearity: 1% ; Symmetry: 0~100%					



## MDO-2000E Series

Rear Panel



### SPECIFICATIONS

	MDO-2072E(G/X)	MDO-2074E(G/X)	MDO-2102E(G/X)	MDO-2104E(G/X)	MDO-2202E(G/X)	MDO-2204E(G/X)
FREQUENCY RESPONSE ANALYSIS						
Dynamic Range	> 80 dB (typical)					
Input and Output Sources	Channel 1 or 2 ( 3 or 4 for four channel model)					
Frequency Range	20 Hz to 25 MHz					
Number of Test Points	10 to 90 points per decade					
Test Amplitude	20 mVpp to 5 Vpp into High-Z Fixed amplitude across entire sweep					
Test Results	Logarithmic overlaid gain and phase plot					
Manual Measurements	Two pairs of tracking gain and phase markers					
Plot Scaling	Auto-scaled during test					
DMM SPECIFICATIONS (MDO-2000EX only)						
Digit Level	5,000 counts ; CAT II 600Vrms, CAT III 300Vrms					
DC Voltage	50mV, 500mV, 5V, 50V, 500V, 1000V 6 ranges					
Accuracy	50mV, 500mV, 5V, 50V, 500V, 1000V $\pm(0.1\%$ reading + 5 digits)					
Input Impedance	10M $\Omega$					
DC Current	50mA, 500mA, 10A 3 ranges					
Accuracy	50mA~500mA (0.5% reading+0.05mA), 10A $\pm(0.5\%$ reading + 50mA)					
AC Voltage	50mV, 500mV, 5V, 50V, 700V 5 ranges					
Accuracy	50mV, 500mV, 5V, 50V, 700V $\pm(1.5\%$ reading + 15 digits) at 50Hz~1kHz * Amplitude greater than 0.2% of the full scale reading.					
AC Current	50mA, 500mA, 10A 3 ranges					
Accuracy	50mA, 500mA, $\pm(1.5\%$ reading + 0.05mA) at 50Hz~1kHz ; 10A $\pm(3\%$ reading + 50mA) at 50Hz~1kHz * Measure range: >10mA					
Resistance	500 $\Omega$ , 5k $\Omega$ , 50k $\Omega$ , 500k $\Omega$ , 5M $\Omega$ , 5 ranges					
Accuracy	500 $\Omega$ , 5k $\Omega$ , 50k $\Omega$ , 500k $\Omega$ $\pm(0.3\%$ reading + 3 digits); 5M $\Omega$ $\pm(0.5\%$ reading + 5 digits)					
POWER SUPPLY SOECIFICATIONS (MDO-2000EX only)						
Output Channel	CH1 & CH2					
Output Voltage Range	1.0V~5.0V					
Output Current(Max.)	1A					
Voltage Step	0.1V Continuously Adjustable					
Output Voltage Accuracy	$\pm 3\%$					
Ripple and Noise	50mVrms					
POWER SOURCE MISCELLANEOUS						
Line Voltage Range	AC 100V ~ 240V, 50Hz ~ 60Hz, auto selection					
Multi-Language Menu	Available					
On-Line Help	Available					
Time Clock	Time and date, provide the date/time for saved data					
Operation Environment	Temperature: 0°C to 50°C. Relative Humidity: $\leq 80\%$ at 40°C or below; $\leq 45\%$ , 41°C ~ 50°C					
DIMENSIONS & WEIGHT						
	384(W) X 208(H) X 127.3(D)mm, Approx. 3 kg					

Note : Three-year warranty, excluding probes & LCD display panel.

### ORDERING INFORMATION

<b>MDO-2204E(G/X)</b>	200MHz,4Channel,Digital Storage Oscilloscope,Spectrum analyzer,dual channel 25MHz AWG
<b>MDO-2202E(G/X)</b>	200MHz,2Channel,Digital Storage Oscilloscope,Spectrum analyzer,dual channel 25MHz AWG
<b>MDO-2104E(G/X)</b>	100MHz,4Channel,Digital Storage Oscilloscope,Spectrum analyzer,dual channel 25MHz AWG
<b>MDO-2102E(G/X)</b>	100MHz,2Channel,Digital Storage Oscilloscope,Spectrum analyzer,dual channel 25MHz AWG
<b>MDO-2074E(G/X)</b>	70MHz,4Channel,Digital Storage Oscilloscope,Spectrum analyzer,dual channel 25MHz AWG
<b>MDO-2072E(G/X)</b>	70MHz,2Channel,Digital Storage Oscilloscope,Spectrum analyzer,dual channel 25MHz AWG

"(X)" built in 5,000 counts DMM and power supply

Accessories :

User manual CD x 1, Power cord x 1, **GTL-110** BNC-BNC cable x 2, **GTL-105A** Alligator Clip test lead (only on MDO-2000EX), **GTL-207A** Banana plug test lead (only on MDO-2000EX)

**GTP-070B-4** : 70MHz(10:1/1:1) Switchable passive probe for MDO-2072E(X)/2074E(X) (one per channel)

**GTP-100B-4** : 100MHz(10:1/1:1) Switchable passive probe for MDO-2102E(X)/2104E(X) (one per channel)

**GTP-200B-4** : 200MHz(10:1/1:1) Switchable passive probe for MDO-2202E(X)/2204E(X) (one per channel)

### OPTIONAL ACCESSORIES

<b>GRA-426</b>	Rack Adapter Panel	<b>GCP-100</b>	Current Probe, DC~100KHz, 100A, Current Probe
<b>GAK-003</b>	50 $\Omega$ Impedance Adapter	<b>GCP-300</b>	300kHz/200A Current probe
<b>GTL-246</b>	USB Cable, USB 2.0, A-B Type, 1200mm	<b>GCP-530</b>	50MHz/30A Current probe
<b>GTL-205A</b>	Temperature probe adaptor with thermocouple (K type)	<b>GCP-500</b>	500kHz/150A Current probe
<b>GDP-025</b>	25MHz High voltage differential probe	<b>GCP-1030</b>	100MHz/30A Current probe
<b>GDP-050</b>	50MHz High voltage differential probe	<b>GCP-1000</b>	1MHz/7A Current probe
<b>GDP-100</b>	100MHz High voltage differential probe	<b>GCP-206P</b>	Power supply for current probe (2 input channel)
<b>GSC-008</b>	Soft Carrying Case	<b>GCP-425P</b>	Current Probe - Power Supply, 4 Channel Power Supply for GCP-530/1030
<b>GCP-020</b>	Current Probe, 40Hz~40kHz, 240A	<b>GTP-033A</b>	Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M)

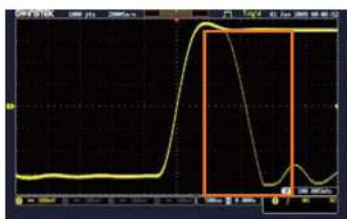
### FREE DOWNLOAD

<b>PC Software</b>	OpenWave software	<b>Driver</b>	USB driver ; LabView driver
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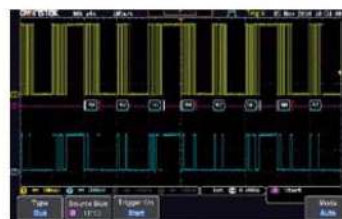
# 200/100/70MHz Mixed-domain Oscilloscope

## A. 120,000wfm/s WAVEFORM UPDATE RATE AND VPO WAVEFORM DISPLAY TECHNOLOGY



The MDO-2000E series oscilloscope allows users to easily and completely observe inrush signals and rare transient waveforms to increase waveform debugging efficiency by using features, including advanced VPO (Visual Persistence Oscilloscope) signal processing technology, waveform update rate as high as 120,000 wfm/s, and multi-layered afterglow display to enhance waveform display efficiency. Oscilloscope with VPO technology displays signals with three dimensional waveforms constructed by amplitude, time and signal strength to show each waveform point. 256 color gradients yield clear waveform changes. Comparing with the conventional digital storage oscilloscope, the MDO-2000E series provides more natural and more genuine signal display effect which is very close to the original analog signal.

## B. SUPPORT I<sup>2</sup>C,SPI,UART,CAN,LIN BUS TRIGGER AND DECODING FUNCTIONS



The serial bus technology has been widely applied in the present embedded application design. The IoT devices connecting sensors and the peripheral components are using serial bus such as UART, I<sup>2</sup>C, and SPI. To rapidly and correctly trigger and analyze serial bus data has posed a difficult challenge to engineers. The MDO-2000E series provides serial bus analysis function with 10M long memory depth. Users can trigger, decode, and analyze frequently used I<sup>2</sup>C, SPI and UART serial bus and CAN/LIN bus, which is often used by automotive communications.

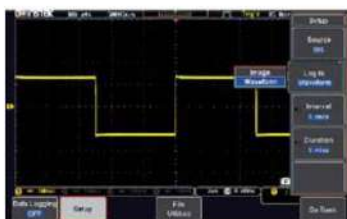
## C. WAVEFORM SEARCH FUNCTION



Users can rapidly search desired waveforms according to the trigger condition. After activating the search function, hollow inverted triangles will show the location met the trigger condition. The upper left hand corner Overall will show the total number of waveforms met the trigger condition. Users can set waveform search by the trigger condition such as Edge, pulse width, Runt, Rise/Fall, and

Bus. When the trigger condition is met, hollow inverted triangles will appear. Users can save all marks to compare with the next input signal. The front panel of the MDO-2000E series controls waveform zoom-out and play/pause function to swiftly identify each desired event. The function allows users to conveniently complete waveform search and save marks for rapid comparison and analysis.

## D. DATA LOG FUNCTION



Users, via the data log function, can observe waveform changes in long periods of time to ensure product reliability or measure sporadically appeared signals. The data log function, based on the requirements, can set record time and interval. Record time can be selected from 5 minutes to 1000 hours, and record interval is 5 seconds, the minimum. Waveform type for record data and CSV file format for each channel can also be selected. Data can be stored in USB drive, the MDO-2000E series or the remote computer via LAN.

## E. MASK FUNCTION



The MDO-2000E series provides the Mask function, which allows users to apply Auto Mask and user-defined Mask to determine whether the quality of the product meets the regulation. Via user-defined mask, users can set up to 8 areas and each area is up to 10 points to meet test requirements. Users can also refer to the examples from user manual to edit Mask by the PC to satisfy all test needs. By setting Save On, users can log and monitor signals, which violate test conditions.

## F. SEGMENTED MEMORY FUNCTION



Users Can Select “Analyze Segments” to Conveniently Obtain The Analysis Results.

To achieve the most ideal application for memory depth, the MDO-2000E series has the built-in segmented memory function. The segmented memory function allows users to select the desired important signals for observation. Hence, insignificant signals can be neglected and serial bus decoding; pulse or inrush signals can be identified when retrieving signals. The segmented memory function

of the MDO-2000E series allows users to select the number of sections. The maximum sections can be selected are 29,000. After activating the function, users can select and observe waveform for each segment by turning the Variable knob. The ultimate application of memory depth, therefore, is completely realized.

## G. 25MHz DUAL CHANNEL ARBITRARY WAVEFORM GENERATOR



With respect to signal source, MDO-2000E features a built-in dual channel 25MHz arbitrary waveform generator with modulation capability and also provides 14 bits vertical resolution; sample rate of 200MSa/s; 13 output waveforms (Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaussian, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac); and AM/FM/FSK modulation and sweep function. The friendly user interface is the ideal choice for education

and applications such as circuit simulation tests. Arbitrary waveform generator provides users with 16k memory length. Users can upload basic waveforms, including Sine, Square, Pulse, Ramp, and Noise to edit arbitrary waveforms. Normal and Function Edit can edit waveforms. The edited waveforms can be saved as UAW file for data access.

## H. POWER SUPPLY AND DMM FUNCTIONS (MDO-2000EX only)



MDO-2000EX has expanded its capabilities by incorporating a 5,000 count DMM and a 5V/1A power supply. DMM provides tests for ACV, DCV, ACA, DCA resistance, diode and temperature. The highly accurate DMM can strengthen DSO's capabilities of voltage and current measurement accuracy. Power supply provides 5V/1A; 0.1V incremental adjustment which can supply power for the development

board and IoT (Internet of Things) module of the often used 8051/Arduino/ESP8266/MSP430 in Microprocessors and Micro controllers experiment courses. For education and digital circuit tests, it can satisfy the voltage input requirements of 5V or 3.3V. Each increment is 0.1V and over load protection is available.



# 200MHz/100MHz/70MHz Digital Storage Oscilloscope



## GDS-2000E Series (200/100/70 MHz)



### FEATURES

- \* 200/100/70MHz Bandwidth
- \* Sampling Rate : Max. 1GSa/s (4ch Model) ; Per Channel 1GSa/s (2ch Model)
- \* 10M/CH Memory Depth and VPO Waveform Display Technology
- \* Waveform Update Rate of 120,000 wfm/s
- \* 8" 800 x 480 TFT LCD Display
- \* Max. 1M pts of FFT to Get Higher Resolution in Frequency Domain
- \* Digital Filter Function
- \* Segmented Memory and Waveform Search Functions
- \* I<sup>2</sup>C/SPI/UART/CAN/LIN Serial Bus Trigger and Decoding Function
- \* Data Log Function for Waveform Observation in Long Periods of Time
- \* Network Storage Function

### SPECIFICATIONS

#### VERTICAL SENSITIVITY

	GDS-2072E	GDS-2074E	GDS-2102E	GDS-2104E	GDS-2202E	GDS-2204E
Channels	2Ch+EXT	4Ch	2Ch+EXT	4Ch	2Ch+EXT	4Ch
Bandwidth	DC~70MHz (-3dB)		DC~100MHz (-3dB)		DC~200MHz (-3dB)	
Rise Time	5ns		3.5ns		1.75ns	
Bandwidth Limit	20MHz		20MHz		20M/100MHz	
Vertical Resolution	8 bits : 1mV ~ 10V/div					
Input Coupling	AC, DC, GND					
Input Impedance	1M $\Omega$ // 16pF approx.					
DC Gain Accuracy	$\pm$ (3% when 2mV/div or greater is selected ; $\pm$ (5%) when 1mV/div is selected					
Polarity	Normal & Invert					
Maximum Input Voltage	300Vrms , CAT I (300Vrms CAT II with GTP-070B-4/100B-4/200B-4, 10 : 1 probe)					
Offset Position Range	1mV/div ~ 20mV/div : $\pm$ 0.5V ; 50mV/div ~ 200mV/div : $\pm$ 5V ; 500mV/div ~ 2V/div : $\pm$ 25V ; 5V/div~10V/div : $\pm$ 250V					
Waveform Signal Process	+, -, $\times$ , $\div$ , FFT, FFTrms, Uesr defined expression. FFT : 1Mpts ; FFT : Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS ; FFT Window Displays : Rectangular, Hamming , Hanning, Blackman-Harris					

#### TRIGGER

Source	CH1, CH2, CH3, CH4, Line, EXT* ; *dual channel models only.
Trigger Mode	Auto (Supports Roll Mode for 100 ms/div and slower), Normal, Single Sequence
Trigger Type	Edge, Pulse Width (Glitch), Video, Pulse Runt, Rise & Fall (Slope), Alternate, Time out, Event-Delay (1~65,535 events), Time-Delay (Duration; 4ns~10s), Bus
Trigger Holdoff Range	4ns ~ 10s
Coupling	AC, DC, LF rej., HF rej., Noise rej.
Sensitivity	1div

#### EXT TRIGGER

Range	$\pm$ 15V
Sensitivity	DC ~ 100MHz Approx. 100mV 100MHz ~ 200MHz Approx. 150mV
Input Impedance	1M $\Omega$ $\pm$ 3%, ~16pF

#### HORIZONTAL

Time Base Range	1ns/div ~ 100s/div (1-2-5 increments); ROLL : 100ms/div ~ 100s/div
Pre-trigger	10 div maximum
Post-trigger	2,000,000 div maximum
Time Base Accuracy	$\pm$ 50 ppm over any $\geq$ 1 ms time interval
Real Time Sample Rate	Max. : 1GSa/s (4ch model); Per channel 1GSa/s (2ch model)
Record Length	Max. : 10Mpts
Acquisition Mode	Normal, Average, Peak Detect, Single
Peak Detection	2ns (typical)
Average	Selectable from 2 to 256

#### X-Y MODE

X-Axis Input	Channel 1 ; Channel 3* (* : four channel models only)
Y-Axis Input	Channel 2 ; Channel 4* (* : four channel models only)
Phase Shift	$\pm$ 3° at 100kHz

#### CURSORS AND MEASUREMENT

Cursors	Amplitude, Time, Gating Available; Unit : Seconds(S), Hz(1/S), Phase (Degrees), Ratio(%)
Automatic Measurement	36 sets: Pk-Pk, Max, Min, Amplitude, High, Low, Mean, Cycle Mean, RMS, Cycle RMS, Area, Cycle Area, ROVShoot, FOVShoot, RPRESShoot, FPRESShoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, Duty Cycle, +Pulses, -Pulses, +Edges, -Edges, FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase
Control Panel Function	Cursors measurement
Auto Counter	6 digits, range from 2Hz minimum to the rated bandwidth
Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo Autoset
Save Setup	20set
Save Waveform	24set

#### DISPLAY SYSTEM

TFT LCD Type	8" TFT LCD WVGA color display
Display Resolution	800 horizontal x 480 vertical pixels (WVGA)
Interpolation	Sin(x)/x
Waveform Display	Dots, Vectors, Variable persistence (16ms~10s), Infinite persistence
Waveform Update Rate	120,000 waveforms per second, maximum
Display mode	YT ; XY
Display Graticule	8 x 10 divisions

#### INTERFACE

USB Port	USB 2.0 Full-speed host port x 1, USB High-speed 2.0 device port x 1
Ethernet Port (LAN)	RJ-45 connector, 10/100Mbps with HP Auto-MDIX
Go/NoGo BNC	5V Max/10mA TTL open collector output
Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock

#### POWER SOURCE MISCELLANEOUS

Line Voltage Range	AC 100V ~ 240V, 50Hz ~ 60Hz, auto selection
Multi-Language Menu	Available
On-Line Help	Available
Time clock	Time and date, provide the date/time for saved data
Operation Environment	Temperature: 0°C to 50°C. Relative Humidity: $\leq$ 80%, 40°C or below; $\leq$ 45%, 41°C ~ 50°C

#### DIMENSIONS & WEIGHT

	384(W) X 208(H) X 127.3(D)mm, Approx. 2.8 kg
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## GDS-2000E Series

### ORDERING INFORMATION

<b>GDS-2204E</b>	200MHz, 4-Channel, Digital Storage Oscilloscope
<b>GDS-2202E</b>	200MHz, 2-Channel, Digital Storage Oscilloscope
<b>GDS-2104E</b>	100MHz, 4-Channel, Digital Storage Oscilloscope
<b>GDS-2102E</b>	100MHz, 2-Channel, Digital Storage Oscilloscope
<b>GDS-2074E</b>	70MHz, 4-Channel, Digital Storage Oscilloscope
<b>GDS-2072E</b>	70MHz, 2-Channel, Digital Storage Oscilloscope

#### Accessories :

User manual CD x 1, Power cord x 1

GTP-070B-4 : 70MHz(10:1/1:1) Switchable passive probe for GDS-2072E/2074E(one per channel)

GTP-100B-4 : 100MHz(10:1/1:1) Switchable passive probe for GDS-2102E/2104E(one per channel)

GTP-200B-4 : 200MHz(10:1/1:1) Switchable passive probe for GDS-2202E/2204E(one per channel)

#### OPTIONAL ACCESSORIES

<b>GRA-426</b>	Rack Adapter Panel
<b>GAk-003</b>	50 $\Omega$ Impedance Adapter
<b>GSC-008</b>	Soft Carrying Case
<b>GTL-246</b>	USB Cable, USB 2.0, A-B Type, 1200mm
<b>GCP-020</b>	40kHz/240A Current probe
<b>GCP-100</b>	100kHz/100A Current probe
<b>GCP-300</b>	300kHz/200A Current probe
<b>GCP-530</b>	50MHz/30A Current probe
<b>GCP-500</b>	500kHz/150A Current probe
<b>GCP-1030</b>	100MHz/30A Current probe
<b>GCP-1000</b>	1MHz/7A Current probe
<b>GCP-206P</b>	Power supply for current probe (2 input channel)
<b>GCP-425P</b>	Power supply for current probe (4 input channel)
<b>GTP-033A</b>	Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M)
<b>GDP-025</b>	25MHz High voltage differential probe
<b>GDP-050</b>	50MHz High voltage differential probe
<b>GDP-100</b>	100MHz High voltage differential probe

#### FREE DOWNLOAD

<b>PC Software</b>	OpenWave software
<b>Driver</b>	USB driver ; LabView driver

### Rear Panel



### GDB-03 Oscilloscope Education and Training Kit

For : GDS-3000/2000A/2000E/1000B Series  
MSO-2000E Series/MDO-2000A/2000E Series





# 200/100/70 MHz Digital Storage Oscilloscope

Patent No. :  
13/671702  
ZL201420272063.8  
ZL201430150303.2



## GDS-200 Series (200/100/70 MHz)



## GDS-300 Series (200/100/70 MHz)



### FEATURES

- \* 200/100/70MHz Bandwidth Selections, Two Input Channels
- \* 1GSa/s Maximum Sample Rate
- \* Maximum 5M/1M Memory Depth Per Channel
- \* 7" 800 x 480 Full Touch Panel Capacitive LCD Multi-Point Control, Landscape and Portrait Display
- \* Built-In 50,000/5,000 Counts DMM
- \* 30,000 Consecutive Waveform Records Logging Function, Replay Measurement Results Any Time
- \* Temperature Measurement and Logging Function
- \* Built-In Engineering Calculator, SMD Resistance Coding, Color Coding Info, and Attenuator Calculation Application Software
- \* Optional Differential Probe to Achieve Isolation Effect

### GWS-001 Wrist Strap



The portable 7" full touch panel capacitive LCD, featuring multi-point touch panel method which allows engineers to move waveform position, adjust waveform size, and set trigger conditions easily, subverts the traditional handheld instrument. With this unique feature, engineers can retrieve DUT's signals easily under the complex working environment. Landscape or portrait measurement display not only clearly shows waveforms under full screen status but also combines multi-functional measurement environment to achieve unimaginable measurement results.

Built-in, the second to none, the longest 5M sample memory depth helps engineers diagnose waveforms in great details. The long memory depth can record detailed waveform data and help engineers reproduce the original waveforms while engineers are conducting long observation or retrieving detailed transient signals. Any delicate changes of analog waveforms can be clearly presented in front of engineers when they adjust time scale from long to short that leaves no measurement problems unanswered.

Built-in 50,000 counts (GDS-300) or 5,000 counts (GDS-200) DMM helps engineers accurately measure DUT's electric parameters including not only measurements of D.C. voltage, A.C. voltage, D.C. current, A.C. current, resistance and diode polarity, but also temperature measurement and monitoring. The analysis of trend diagrams further completes test and measurement. DMM can simultaneously work with oscilloscope to conduct multi-measurement tasks.

Normally, engineers wish to effectively record intermittent signals while retrieving a series of signals during a long period of time. GDS-300/GDS-200's built-in 30,000 consecutive waveform records logging function not only records 30,000 waveform records in a long period of time but also replays the recorded data that allows engineers to identify intermittent problems occurred during the recorded time. Leave no problems unidentified.

Engineers need to isolate power and solve corresponding grounding issue while conducting circuit debugging. One of the criteria engineers must overcome is to maintain system grounding and isolation safety in the strict test and measurement environment such as no grounding system or no isolation. GDS-300/200 provide optional differential probe to effectively assist engineers in solving isolation and grounding problems that elevates the efficiency and safety of test and measurement.

Engineers often need some calculation tool software to conduct circuit design and debugging analysis during the R&D process. GDS-300/200 oscilloscopes, with the built-in standard engineering calculator, allow engineers to verify parameters during the test and measurement process. While using unknown resistance, engineers can obtain resistance value via color coding calculation software. If any attenuator was designed in the circuit, GDS-300/200 can also provide corresponding attenuator model and attenuation value calculation.

### SPECIFICATIONS

SPEECH FEATURES		GDS-307	GDS-310	GDS-320	GDS-207	GDS-210	GDS-220
VERTICAL							
Channels	2 (BNC-Shield)						
Input Impedance	1M $\Omega$ ±2%, 16.5pf approx.						
Maximum Input	CAT II 300VRMS						
Input Coupling	AC, DC, GND						
Bandwidth	DC~70MHz (-3dB)	DC~100MHz (-3dB)	DC~200MHz (-3dB)	DC~70MHz (-3dB)	DC~100MHz (-3dB)	DC~200MHz (-3dB)	
Rise Time	<5ns	<3.5ns	<1.75ns	<5ns	<3.5ns	<1.75ns	
Sensitivity	2mV/div~10V/div (1-2-5 increments)						
Accuracy	±(3% x Readout + 0.1 div + 1mV)						
Bandwidth Limit	20MHz(-3dB)						
Polarity	Normal, Invert						
Offset Position Range	2mV/div~50mV/div:±0.4V;100mV/div~500mV/div:±4V;1V/div~5V/div:±40V;10V/div:±300V						
SIGNAL ACQUISITION							
Realtime Sample Rate	1GSa/s						
Memory Depth	5Mpoints per ch			1Mpoints per ch			
Acquisition Mode	Average : 2~256 waveforms; Peak detect : 10ns; sin(x)/x or ET						
Replay Wfms.	30,000 wfms.						
TRIGGER							
Source	Ch1 or Ch2						
Trigger mode	Auto, Normal, Single, Force						
Trigger type	Edge, Pulse Width, Video, Alternate						
Trigger Holdoff	10ns ~ 10s						
Coupling	AC, DC, LFR, HFR, NR						
Sensitivity	DC~25MHz : approx. 0.5div or 5mV; 25MHz~ 70/100/200MHz : approx. 1.5div or 15mV						
HORIZONTAL							
Range	5ns~100s/Div (1-2-5 increments)						
Roll	100ms/div ~ 100s/div						
Pre-trigger	10 div max.						
Post-trigger	1,000 div max(depend on time base)						
Accuracy	±20ppm over any > 1ms time interval						
XY MODE							
Phase Shift	±3° at 100KHz						
CURSOR AND MEASUREMENT							
Cursors	Voltage difference between cursors( $\Delta V$ ), Time difference between cursors( $\Delta T$ ), frequency measure( $1/\Delta T$ )						
Auto-measurement	36 sets.						
Auto-counter Autoset	6 digits. Range: 2Hz to rated bandwidth						
TEMPERATURE MEASUREMENT							
	Available			Non-Available			



SPECIFICATIONS						
	GDS-307	GDS-310	GDS-320	GDS-207	GDS-210	GDS-220
MISCELLANEOUS						
Multi-Language Menu	Available					
On-line Help	Available					
Time and Clock	Available					
BATTERY						
Battery power	Li-polymer 6100mA/hr, 7.4V (Built-in)					
Charge time	2.0 hour (75%)					
Operation time	4.1 hour, depending on operating condition					
PROBE COMPENSATION						
	2V, 1kHz, 50% Duty cycle					
INTERFACE						
USB	USB Device (Isolation)					
Internal Flash Disk	120MB					
DISPLAY						
Type	7 inch					
Display Resolution	480 x 800 pixels					
Display Direction	Landscape & Portrait					
Backlight Control	Manual adjustable, ECO mode					
Touch Panel	Capacitive					
DMM						
Digit Level	50,000 counts			5,000 counts		
DC Voltage	Range	CAT II 600VRMS, CAT III 300VRMS				
	Accuracy	50mV, 500mV, 5V, 50V, 500V, 1000V 6 ranges				
Input Impedance	Range	GDS-320/310/307: 50mV, 500mV, 5V, 50V, 500V: $\pm(0.05\%+5\text{digits})$				
	Accuracy	GDS-220/210/207: 50mV, 500mV, 5V, 500V, 1000V: $\pm(0.1\%+5\text{digits})$				
DC Current	Range	10M $\Omega$ *Measure range>50 $\mu$ A				
	Accuracy	50mA, 500mA, 10A 3 ranges				
AC Voltage	Range	GDS-320/310/307: 50mA, 500mA: $\pm(0.1\%+0.05\text{mA})$ , 10A: $\pm(0.5\%+50\text{mA})$				
	Accuracy	GDS-220/210/207: 50mA, 500mA: $\pm(0.5\%+0.05\text{mA})$ , 10A: $\pm(0.5\%+50\text{mA})$				
AC Current	Range	50mV, 500mV, 5V, 50V, 700V 5 ranges				
	Accuracy	50mV, 500mV, 5V, 50V, 700V: $\pm(1.5\%+15\text{ digits})$ at 50Hz~1kHz *Amplitude greater than 0.2% of the full scale reading				
RESISTANCE	Range	50mA, 500mA, 10A 3 ranges				
	Accuracy	50mA, 500mA, $\pm(1.5\%+15\text{ digits})$ at 50Hz~1kHz; 10A: $\pm(3\%+15\text{ digits})$ at 50Hz~1kHz				
Diode Test	Range	*Measure range>10mA				
	Accuracy	500 $\Omega$ , 5K $\Omega$ , 50K $\Omega$ , 500K $\Omega$ $\pm(0.3\%+3\text{ digits})$ ; 5M $\Omega$ $\pm(0.5\%+5\text{ digits})$ *Measure range:50 $\Omega$ ~5M $\Omega$				
Temperature (thermocouple)	Range	Maximum forward voltage 1.5V, Open voltage 2.8V				
	Resolution	-50°C ~ +1000°C				
Continuity Beep	Range	0.1°C				
	Thermocouple	B, E, J, K, N, R, S, T				
Functions	Range	*Specifications do not include probe accuracy. Temperature specifications only apply to the GDS-320/310/307				
	Thermocouple	< 15 $\Omega$				
POWER ADAPTOR						
Line Voltage	AC 100V~240V, 50~60Hz, Power Consumption 40W; DC Output : 12V/3A, Double Shield					
OPTION						
Differential Probe	Dual-channel, 40MHz, CAT II 600V					
DIMENSIONS & WEIGHT						
	240.2(W) x 136.0(H) x 59.7(D) mm; Approx. 1.5 Kg					

## ORDERING INFORMATION

GDS-320	200MHz, 2 Channels, Digital Storage Oscilloscope
GDS-310	100MHz, 2 Channels, Digital Storage Oscilloscope
GDS-307	70MHz, 2 Channels, Digital Storage Oscilloscope
GDS-220	200MHz, 2 Channels, Digital Storage Oscilloscope
GDS-210	100MHz, 2 Channels, Digital Storage Oscilloscope
GDS-207	70MHz, 2 Channels, Digital Storage Oscilloscope

### Accessories

User manual CD x 1

GTP-150B-2 150MHz Probe, Suitable for GDS-307/207, GDS-310/210

GTP-250B-2 250MHz Probe, Suitable for GDS-320/220

GTL-207A Multimeter Test Lead x 1

GSC-010 Soft Carrying Case

GSC-011 Soft Carrying Bag

GAP-001 AC-DC Adaptor

GWS-001 Wrist Strap

### Optional Accessories

GDP-040D 40MHz Dual-Channel Differential Probe

GCL-001 Vertical Calibration Cable

GTL-253 USB Cable, USB 2.0, A-mini B Type, 1400mm

GPF-700 Protective Films for 7" Touch Screen

GTL-131 Test Clip, Suitable for GDP-040D

GTL-205 Temperature probe adaptor with thermocouple (K type)

### Free Download

OpenWave 200 Software

## SELECTION GUIDE

MODEL	GDS-307	GDS-310	GDS-320	GDS-207	GDS-210	GDS-220
Bandwidth	70MHz	100MHz	200MHz	70MHz	100MHz	200MHz
Sample Rate	1GSa/s	1GSa/s	1GSa/s	1GSa/s	1GSa/s	1GSa/s
Memory Length	5M pts	5M pts	5M pts	1M pts	1M pts	1M pts
DMM Count	50,000	50,000	50,000	5,000	5,000	5,000
Temperature Measurement	✓	✓	✓	-	-	-

## GDS-300 Series Rear Panel



## GDS-200 Series Rear Panel



## GSC-010 Soft Carrying Case



## GSC-011 Soft Carrying Bag



## GPF-700 Protective Films



## GAP-001 AC-DC Adaptor





# 200MHz/100MHz/70MHz/50MHz Digital Storage Oscilloscope



## GDS-1000B Series



### FEATURES

- \* 200/100/70/50MHz Bandwidth Selections, 2ch or 4ch Input
- \* 1GSa/s Maximum Sampling Rate
- \* 10M Maximum Memory Depth For Each Channel
- \* 7" 800 x 480 WVGA LCD Display
- \* 256 Color Gradient Display Function to Strengthen Waveform Performance
- \* 1Mpts FFT Frequency Domain Signal Display
- \* I<sup>2</sup>C/SPI/UART/CAN/LIN Serial Bus Trigger and Decoding Functions
- \* 1Mpts FFT Frequency Domain Signal Display
- \* Zero Key Function For Horizontal Time, Vertical Voltage and Triggering
- \* Compact And Innovative Exterior Design

The GDS-1000B Series features four bandwidth selections - 200MHz, 100 MHz, 70 MHz, 50MHz and equips with analog signal input terminals by four or two channels. The maximum sampling rate for each single channel is 1GSa/s, and the memory depth is 10Mpts per channel independently. The GDS-1000B Series has a waveform update rate of 50,000wfms/s, which helps users to precisely observe the detailed waveform variation. Additionally, 7" WVGA color LCD display and the 256 color gradient display function together allow waveforms to be observed with the senses of transparency and gradation. With respect to the horizontal time scale adjustment knob and trigger level adjustment knob, GW Instek provides a very thoughtful design -the zero key function, which allows engineers to work more effectively. For mathematical analysis mode, 1Mpts FFT signal display makes the dull frequency domain signal analysis more delicate.

Moreover, the innovative exterior design and compact design also bring much convenience to users. Other diversified and charming multi-functional operation demonstrates the concept of complete technology integration.

### SPECIFICATIONS

	GDS-1054B	GDS-1072B	GDS-1074B	GDS-1102B	GDS-1104B	GDS-1202B
VERTICAL						
Channels	4	2 + Ext	4	2 + Ext	4	2 + Ext
Bandwidth	DC~50MHz (-3dB)	DC~70MHz (-3dB)	DC~70MHz (-3dB)	DC~100MHz (-3dB)	DC~100MHz (-3dB)	DC~200MHz (-3dB)
Rise Time	7ns	5ns	5ns	3.5ns	3.5ns	1.75ns
Bandwidth Limit	20MHz	20MHz	20MHz	20MHz	20MHz	20MHz
Vertical Sensitivity Resolution	8 bit : 1mV~10V/div					
Input Coupling	AC, DC, GND					
Input Impedance	1MΩ // 16pF approx. ; GDS-1202B : 1MΩ // 14pF approx.					
DC Gain Accuracy*	±3%					
Polarity	Normal & Invert					
Maximum Input Voltage	300Vrms, CAT I (300Vrms CAT II with GTP-070B- 4/100B-4, 200B-4 10:1 probe)					
Offset Position Range	1mV/div : ±1.25V ; 2mV/div ~ 100mV/div : ±2.5V ; 200mV/div ~ 10V/div : ±125V					
Waveform Signal Process	+, -, ×, ÷, FFT, FFTrms, User Defined Expression ; FFT: 1Mpts; FFT: Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS ; FFT Window Display : Rectangular, Hamming, Hanning , or Blackman-Harris					
TRIGGER						
Source	CH1, CH2, CH3*, CH4*, Line, EXT** ; *four channel models only ; **two channel models only					
Trigger Mode	Auto (supports Roll Mode for 100 ms/div and slower), Normal, Single Sequence					
Trigger Type	Edge, Pulse Width, Video, Pulse Runt, Rise & Fall, Timeout, Alternate, Event-Delay (1~65535 events), Time-Delay (Duration, 4ns~10S)					
Holdoff range	4ns to 10s					
Coupling	AC, DC, LF rej., Hf rej., Noise rej.					
Sensitivity	1div					
EXTERNAL TRIGGER						
Range	±15V					
Sensitivity	DC ~ 100MHz Approx. 100mV ; 100MHz ~ 200MHz Approx. 150mV					
Input Impedance	1MΩ ±3% ~ 16pF ; GDS-1202B : 1MΩ ±3% ~ 14pF					
HORIZONTAL						
Time base Range	5ns/div ~ 100s/div (1-2-5 increments)					
ROLL	100ms/div ~ 100s/div					
Pre-trigger	10 div maximum					
Post-trigger	2,000,000 div maximum					
Timebase Accuracy	±50 ppm over any ≥1 ms time interval					
Real Time Sample Rate	1GSa/s max.					
Record Length	Max. 10Mpts					
Acquisition Mode	Normal, Average, Peak Detect, Single					
Peak Detection	2nS (typical)					
Average	selectable from 2 to 256					
X-Y MODE						
X-Axis Input	Channel 1; Channel 3*(*four channel models only)					
Y-Axis Input	Channel 2; Channel 4*(*four channel models only)					
Phase Shift	±3° at 100kHz					
CURSORS AND MEASUREMENT						
Cursors	Amplitude, Time, Gating available; Unit : Seconds(s), Hz(1/s), Phase(degree), Ration(%)					
Automatic Measurement	36 sets: Pk-Pk, Max, Min, Amplitude, High, Low, Mean, Cycle Mean, RMS, Cycle RMS, Area, Cycle Area, ROVShoot, FOVShoot, RPRESshoot, FPRESshoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, Duty Cycle, +Pulses, -Pulses, +Edges, -Edges, FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase					
Cursors Measurement	Voltage difference between cursors (ΔV) Time ; difference between cursors (ΔT)					
Auto Counter	6 digits, range from 2Hz minimum to the rated bandwidth					
CONTROL PANEL FUNCTION						
Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo Autoset					
Save Setup	20set					
Save Waveform	24set					



## GDS-1000B Series

### SPECIFICATIONS

SPECIFICATIONS		GDS-1054B	GDS-1072B	GDS-1074B	GDS-1102B	GDS-1104B	GDS-1202B
DISPLAY							
TFT LCD Type	7" TFT WVGA color display						
Display Resolution	800 horizontal × 480 vertical pixels (WVGA)						
Interpolation	Sin(x)/x						
Waveform Display	Dots, vectors, variable persistence (16ms~4s), infinite persistence						
Waveform Update Rate	50,000 waveforms per second, maximum						
Display Graticule	8 x 10 divisions						
Display Mode	YT, XY						
INTERFACE							
USB Port	USB 2.0 High-speed host port x1, USB High-speed 2.0 device port x1						
Ethernet Port(LAN)	RJ-45 connector, 10/100Mbps with HP Auto-MDIX (only for 4 channel models)						
Go-NoGo BNC	5V Max/10mA TTL open collector output						
Kensington Style Lock	Rear-panel security slot connects to standard kensington-style lock						
POWER SOURCE							
	AC 100V ~ 240V , 50Hz ~ 60Hz , Auto selection , Power consumption: 30 Watts						
MISCELLANEOUS							
Multi-Language Menu	Available						
Operation	Temperature : 0°C ~ 50°C. Relative Humidity ≤80% at 40°C or below;						
Environment	≤ 45% at 41°C ~ 50°C						
Online Help	Available						
DIMENSIONS & WEIGHT							
380(W) × 208 (H) × 127.3(D)mm, Approx. 2.8kg							

Note : The specifications apply when the GDS-1000B is powered on for at least 30 minutes under +20°C~+30°C.

### ORDERING INFORMATION

<b>GDS-1202B</b>	200MHz, 2 channels, Digital Storage Oscilloscope
<b>GDS-1104B</b>	100MHz, 4 channels, Digital Storage Oscilloscope
<b>GDS-1102B</b>	100MHz, 2 channels, Digital Storage Oscilloscope
<b>GDS-1074B</b>	70MHz, 4 channels, Digital Storage Oscilloscope
<b>GDS-1072B</b>	70MHz, 2 channels, Digital Storage Oscilloscope
<b>GDS-1054B</b>	50MHz, 4 channels, Digital Storage Oscilloscope

#### ACCESSORIES :

	User manual x1, Power cord x1
GTP-200B-4	200MHz Passive Probe. Suitable for GDS-1202B
GTP-100B-4	100MHz Passive Probe. Suitable for GDS-1104B, GDS-1102B
GTP-070B-4	70MHz Passive Probe. Suitable for GDS-1074B, GDS-1072B, GDS-1054B

#### OPTIONAL ASSESSORIES

<b>GDB-03</b>	Demo Board
<b>GTL-110</b>	Test lead, BNC to BNC heads
<b>GTL-246</b>	USB cable, USB 2.0 A-B type cable 4P, 1200mm
<b>GRA-426</b>	Rack Mount Kit
<b>GSC-008</b>	Soft carrying case
<b>GDP-025</b>	25MHz High voltage differential probe
<b>GDP-050</b>	50MHz High voltage differential probe
<b>GDP-100</b>	100MHz High voltage differential probe

#### FREE DOWNLOAD

<b>Software</b>	OpenWave Software
<b>Driver</b>	USB Driver ; LabView Driver

### Rear Panel



### GDB-03 Oscilloscope Education and Training Kit

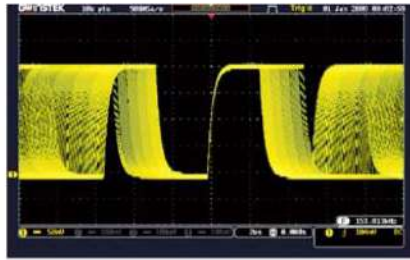
For : GDS-3000/2000A/2000E/1000B Series  
MSO-2000E Series





# 200MHz/100MHz/70MHz/50MHz Digital Storage Oscilloscope

## A. WAVEFORM UPDATE RATE UP TO 50,000wfms/s AND VPO DISPLAY TECHNOLOGY



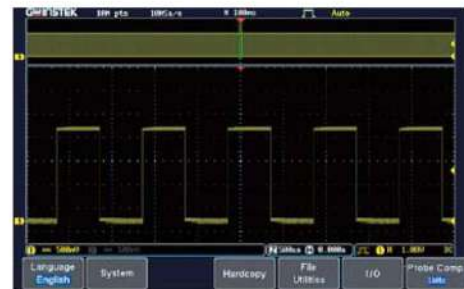
The GDS-1000B Series oscilloscope is under the category of general and fundamental oscilloscope by the market segmentation. Nevertheless, the series arms itself with the waveform update rate up to 50,000wfms/s and VPO waveform display technology. Users can input a rapid frequency modulation carrier signal as shown on the diagram. An unsmooth temporarily holding phenomenon will occur while using conventional digital oscilloscopes to measure this signal. As a result, the conventional digital oscilloscopes could not

clearly yield the modulation variation process of frequency modulation signals. With the GDS-1000B Series oscilloscope, the measurement result will produce not only a smooth waveform modulation variation, but also detailed changes by distinct layers. Engineers could easily grasp the root cause of electric circuits while measuring the unexpected and fast changing signals. The GDS-1000B Series is indeed an excellent debugging weapon for the test and measurement industry.

## B. 256 COLOR GRADIENT DISPLAY & 10M MEMORY DEPTH PER CHANNEL INDEPENDENTLY

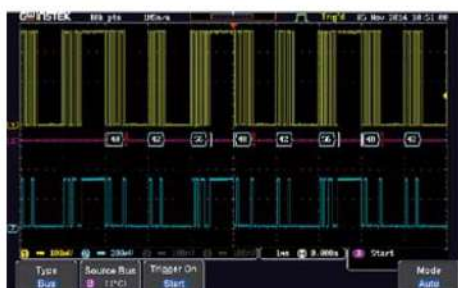


With respect to the waveform display technology, the GDS-1000B Series oscilloscope is capable of displaying 256 color gradients which can delineate the profound gradational fluctuations; as if it can recreate the analog oscilloscope display capability. When a multi-layer video signal is input, the GDS-1000B Series, with 256 color gradient display, has the ability to precisely reveal the colored burst signal and to show details of layers with the brightness. Hence, the dull monochrome waveform is imbued with vitality, which is precisely the unlimited measurement fascination the GDS-1000B Series intends to bring to the general purpose oscilloscope arena.

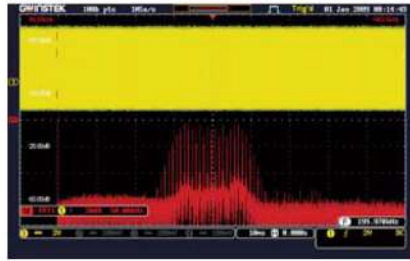


The GDS-1000B Series oscilloscope has a powerful and incomparable memory depth for the data retrieving. 10M memory depth per channel independently surpasses the specification of the industry's 1000 Series boundary. 10M memory depth allows users to easily seize the waveform detail while conducting fundamental measurement applications. If a long serial sequent sine waveform is input and the time scale is adjusted to 1mv/div, other GDS-1000 Series oscilloscopes for lack of sufficient memory depth will appear a distorted waveform while enlarging the waveform for its details. The GDS-1000B Series while enlarging the waveform to 20ns/div reveals a very clear sine waveform detail which is precisely the true value of the GDS-1000B Series oscilloscope.

## C. SUPPORT I<sup>2</sup>C, SPI, UART, CAN, LIN BUS TRIGGER AND DECODING FUNCTIONS

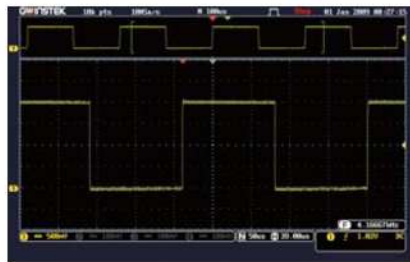


The serial bus technology has been widely applied in the present embedded application design. The IoT devices connecting sensors and the peripheral components are using serial bus such as UART, I<sup>2</sup>C, and SPI. To rapidly and correctly trigger and analyze serial bus data has posed a difficult challenge to engineers. The GDS-1000B series provides serial bus analysis function with 10M long memory depth. Users can trigger, decode, and analyze frequently used I<sup>2</sup>C, SPI and UART serial bus and CAN/LIN bus, which is often used by automotive communications.

**D. 1M FFT MATHEMATICAL SAMPLING ANALYSIS MODE**

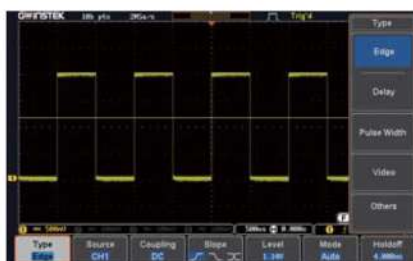
The GDS-1000B Series oscilloscope, under the Fast Fourier Transform mathematical analysis mode, is equipped with the 1M memory depth retrieving mode. For the conventional digital oscilloscopes, the FFT mode often has only 1000 point retrieving length; therefore, they can not show the strength distribution of each spectrum quantity under the frequency domain mode. The GDS-1000B Series oscilloscope leads the industry to provide the display mode of 1M retrieving points, which can clearly show the detail of each spectrum quantity. On top of that, the 50,000 wfms/s waveform update rate augments the FFT

analysis mode to be fast and precise as if a real time spectrum analyzer is used. These features substantially elevate oscilloscope's signal processing capability for the frequency domain analysis. The diagram illustrates a 200 kHz carrier waveform to be modulated as a standard FM signal with 40 kHz and 5 kHz frequency deviation. Since the GDS-1000B Series is equipped with 1M memory depth, a 5 kHz frequency deviation interval can be clearly revealed that allows engineers to fully grasp the measurement details.

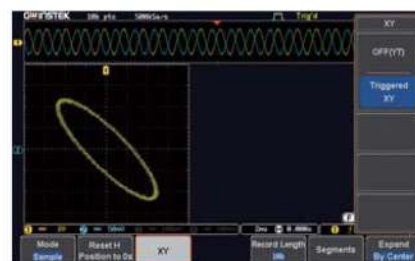
**E. ZOOM IN/PLAY AND PAUSE FUNCTION**

The GDS-1000B series provides engineers with partial waveform zoom in function to observe waveform in great details. The display screen can be split into two windows: the upper window shows waveform data log in a long period of time and the marked vicinity of the waveform needed to be zoomed in; the lower window shows the enlarged partial waveform. The function not only allows engineers to

make a comparison but also grasp waveform details in the different time frame. Additionally, the GDS-1000B series also features the play/pause function. For the long waveform observation, the play/pause function facilitates engineers to rapidly skim through the whole section of DUT's waveforms as well as to swiftly identify waveform's problems.

**F. DIVERSIFIED TRIGGER FUNCTIONS**

The GDS-1000B series oscilloscope is equipped with diversified trigger functions, including Edge Trigger, Delay Trigger, Pulse Width Trigger, and Video Trigger. Engineers, based upon different waveform measurements, can select different trigger functions to lock waveforms in order to identify the root cause of the complicated circuit designs to save development time and to accomplish tasks.

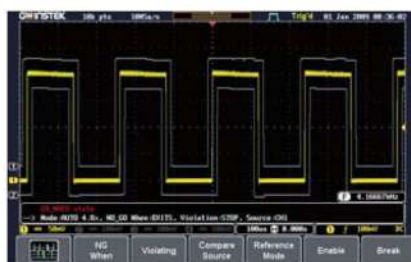
**G. X-Y MODE DISPLAY**

The GDS-1000B series oscilloscope provides the educational market with some powerful measurement functions. Among them, the X-Y mode display is an excellent example. Teachers and students can use X-Y mode display to conduct Lissajous diagram teaching, which allows users to easily understand the relation between waveforms and frequency while measuring sine waveforms with different frequency by dual channels. For engineers working for the industries, the X-Y mode display can be used to conduct yield rate tests for basic components' electric conduction and non conduction. Therefore, the X-Y mode display plays an important role in basic oscilloscopes.



# 200MHz/100MHz/70MHz/50MHz Digital Storage Oscilloscope

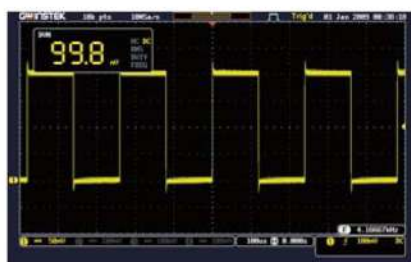
## H. GO/NOGO FUNCTION



For the industries, the yield rate determination is very important to mass production. The GDS-1000B series oscilloscope provides the Go/NoGo analysis function to accelerate the yield rate analysis. From the right diagram, the Go/NoGo function provides a standard waveform template for examining DUT's waveforms. The function

can freely adjust the size of template. A defect message will be shown if the DUT's waveform is abnormal and touches the template. The function is not only very useful measurement tool for production lines but also a very convenient tool for engineers to observe waveforms in a long period of time.

## I. DIGITAL VOLTAGE METER FUNCTION

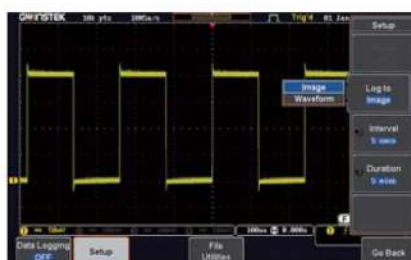


For electric circuit measurement and debugging, R&D engineers require oscilloscopes as well as basic voltage meters. The GDS-1000B series oscilloscope equips with a digital voltage meter with three-digit voltage value and five-digit frequency value. Engineers, by pressing the option key, can select the digital voltage meter function from the

menu to measure DC/AC voltage, duty cycle, and frequency. Engineers can not only measure waveforms but also monitor the electric parameters of each component on the circuit board. The function is a very convenient tool.

\* Users need to download this application from GW Instek website

## J. DATA LOG FUNCTION

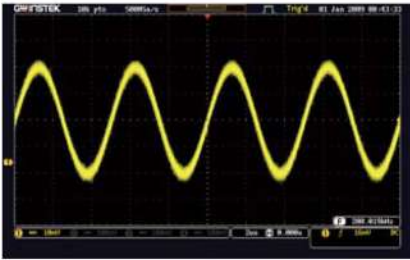


The GDS-1000B Series oscilloscope has the data log function option, which allows users to observe and record waveform changes in a long period of time to ensure product's reliability and stability. The data log function can set data storage time and interval based on the test requirements. Record time can be set from 5 minutes to 100 hours and the interval can be set as 5 seconds the shortest. Data log formats

include waveform and point data in CSV file. Data can be saved to USB, GDS-1000B or remote computer via LAN. It is very user-friendly and also an advanced measurement management tool.

\* Users need to download this application from GW Instek website

## K. DIGITAL FILTER FUNCTION



In electric circuit tests, engineers are often troubled by noise interference while measuring signals. The GDS-1000B series oscilloscope provides the digital filter function option, which can be set as high pass or low pass filter. The filter frequency can be



adjusted according to the requirements. The filter parameters of each channel can also be set. The tracking on function can be used to set same filter frequency for all channels.

\* Users need to download this application from GW Instek website

## L. 36 MEASUREMENT PARAMETER SELECTIONS

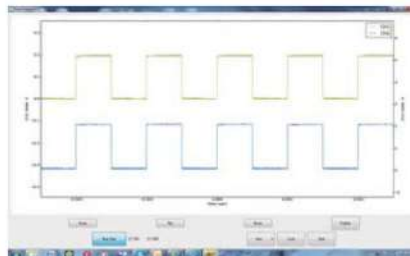


The GDS-1000B series oscilloscope is equipped with 36 different automatic measurement parameter functions. Users, after obtaining measured waveforms, can select different measurement parameters from Measure key according to different measurement requirements. The GDS-1000B Series shows simultaneously eight sets of different measurement parameters on the bottom of the



display screen. Users can also select to show all parameters if the preset eight sets are insufficient. Once the selection is made, all 36 measurement parameters will be shown on the center of the display screen. This is a very convenient measurement tool for students writing dissertations or engineers writing reports.

## M. OPENWAVE CONNECTION SOFTWARE



The GDS-1000B Series oscilloscope, via the OpenWave connection software developed by GW Instek, can connect with the PC. Users, after installing USB driver under Windows interface, can connect GDS-1000B with the PC through USB cable and OpenWave software. Waveform interpretation and retrieval can be done from

the PC end. Data retrieval and storage can better facilitate users in processing analysis. OpenWave connection software is indeed a very powerful tool for engineers to compile reports or to integrate systems.



# 150MHz/100MHz/70MHz Digital Storage Oscilloscope



## GDS-1000A-U Series



**MemoryPrime** 2MEGA MEMORY BUILT-IN

### FEATURES

- \* 150/100/70 MHz Bandwidth, 2 Input Channels
- \* 1GSa/s Real-Time and 25GSa/s Equivalent-Time Sampling Rate
- \* 2Mega Point Memory Depth
- \* 2mV~10V Vertical Scale & 1ns~50s Horizontal Range
- \* Up to 27 Auto Measurements
- \* Versatile Math Function: +, -, x, FFT, FFTrms, Zoom FFT
- \* 5.7" Color TFT LCD Display
- \* USB Host & Device Ports
- \* Go/NoGo Function
- \* Data Logger
- \* Limited Lifetime Warranty

The GDS-1000A-U Series is a general purpose 2-channel oscilloscope and originally designed to meet educational and industrial requirements without specializing in DSO features. This series provides three selective bandwidths of 70MHz, 100MHz and 150MHz together with innovative human machine interface design plus an TFT color LCD display, users will enjoy better measurement experience!

The GDS-1000A-U Series offers dual sampling mode, giving users two options for 1GSa/s Real-Time sampling or 25GSa/s high-speed Equivalent sampling rate. What's more, with high-speed waveform handling capability, more advanced triggering functions, and 2.5 kg light-weight design, it is a powerful functional oscilloscope with the best price than ever. Ultimately, The GDS-1000A-U Series is considered for the replacement of analog oscilloscope and further promoted as a personal DSO affordable to any situation such as educational labs, service technicians, or industrial fields with high quantity requirements.

Besides, the requirement of measuring data exchange and analysis is integrated into the GDS-1000A-U Series. The convenient PC standard interface is also available, such as USB device port and host port. This two built-in standard interface capability enable the performance of remote control or data transferring to a desktop/laptop for documenting purpose and enhancing your work efficiency.

### SPECIFICATIONS

		GDS-1072A-U	GDS-1102A-U	GDS-1152A-U
VERTICAL				
Channels		2 + EXT	2 + EXT	2 + EXT
Bandwidth		DC~70MHz(-3dB)	DC~100MHz(-3dB)	DC~150MHz(-3dB)
Rise Time		<5ns Approx.	<3.5ns Approx.	<2.3ns Approx.
Sensitivity		2mV/div ~ 10V/div (1-2.5 increments)		
Accuracy		± (3% x  Readout  + 0.1 div + 1mV)		
Input Coupling		AC, DC & Ground		
Input Impedance		1MΩ±2%, ~15pF		
Polarity		Normal & Invert		
Maximum Input		300V (DC+AC peak), CATII		
Waveform Signal Process		+, -, x, FFT, FFTrms, Zoom FFT		
Offset Range		2mV/div ~ 50mV/div : ±0.4V ; 100mV/div ~ 500mV/div : ±4V ; 1V/div ~ 5V/div : ±40V ; 10V/div : ±300V		
Bandwidth Limit		20MHz (-3dB)		
TRIGGER				
Source Mode		CH1, CH2, Line, EXT		
Coupling		AUTO, NORMAL, SINGLE, TV, Edge, Pulse width		
Sensitivity		AC, DC, LF rej., HF rej., Noise rej.		
		DC ~ 25MHz: Approx. 0.5div or 5mV; 25MHz ~ 70/100/150MHz: Approx. 1.5div or 15mV		
EXT TRIGGER				
Range		±15V		
Sensitivity		DC ~ 25MHz : ~ 50mV ; 25MHz ~ 70/100/150MHz : ~15mV		
Input Impedance		1MΩ ±2%, ~ 15pF		
Maximum Input		300V (DC + AC peak) , CATII		
HORIZONTAL				
Range		1ns/div ~ 50s/div (1-2.5-5 increments); ROLL : 50ms/div ~ 50s/div		
Modes		MAIN, WINDOW, WINDOW ZOOM, ROLL, X-Y		
Accuracy		±0.01%		
Pre-Trigger		10 div maximum		
Post-Trigger		1000 div		
X-Y MODE				
X-Axis Input		Channel 1		
Y-Axis Input		Channel 2		
Phase Shift		±3° at 100kHz		
SIGNAL ACQUISITION				
Real-Time Sample Rate		1GSa/s maximum		
Equivalent Sample Rate		25GSa/s maximum		
Vertical Resolution		8 Bits		
Memory Depth		2Mega Points maximum		
Acquisition Mode		Normal, Peak Detect, Average		
Peak Detection		10ns(500ns/div ~ 50s/div)		
Average		2, 4, 8, 16, 32, 64, 128, 256		
CURSORS AND MEASUREMENT				
Voltage Measurement		V <sub>pp</sub> , V <sub>amp</sub> , V <sub>avg</sub> , V <sub>rms</sub> , V <sub>hi</sub> , V <sub>lo</sub> , V <sub>max</sub> , V <sub>min</sub> , Rise Preshoot/Overshoot, Fall Preshoot/Overshoot		
Time Measurement		Freq, Period, Rise Time, Fall Time, Positive Width, Negative Width, Duty Cycle		
Delay Measurement		Eight different delay measurement		
Cursors Measurement		Voltage difference between cursors(ΔV)Time difference between cursors(ΔT),frequency measurement(1/ΔT)		
Auto Counter		Resolution : 6 digits Accuracy : ±2% Signal Source: All available trigger source except the Video trigger mode		
ADJUSTABLE PROBE COMPENSATION SIGNAL				
Frequency Range		1kHz ~ 100kHz, 1kHz/STEP		
Duty Cycle Range		5% ~ 95%, 5%/STEP		
CONTROL PANEL FUNCTION				
Autoset		Adjust Vertical VOLT/DIV, Horizontal TIME/DIV, and Trigger level automatically		
Save Setup		Up to15 sets of measurement conditions		
Save Waveform		15 sets of waveform		



## GDS-1000A-U Series

### SPECIFICATIONS

#### DISPLAY

TFT LCD Type	5.7 inch
Display Resolution	234 (Vertically) x 320 (Horizontally) Dots
Display Graticule	8 x 10 divisions
Display Brightness	Adjustable

#### INTERFACE

Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock
USB Device	USB1.1 & 2.0 full speed compatible
USB Host	Image (BMP) waveform data (CSV) and setup (SET)

#### POWER SOURCE

Line Voltage Range	AC 100V ~ 240V, 50Hz ~ 60Hz, Auto selection
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#### MISCELLANEOUS

Go/NoGo Function	Available
Data Logger	Available
Multi-Language Menu	Available
Online Help	Available

#### DIMENSIONS & WEIGHT

310(W) x 142 (H) x 140(D)mm, Approx. 2.5kg
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The specifications apply when the oscilloscope is powered on for at least 30 minutes under +20°C~+30°C.

### ORDERING INFORMATION

GDS-1072A-U	70MHz, 2 channel, 1GSa/s & 2Mega Memory DSO
GDS-1102A-U	100MHz, 2 channel, 1GSa/s & 2Mega Memory DSO
GDS-1152A-U	150MHz, 2 channel, 1GSa/s & 2Mega Memory DSO

#### ACCESSORIES:

Power cord x1, CD x1

Probe GTP-070B-4 or equivalent: 70MHz(10:1/1:1)Switchable passive probe for GDS-1072A-U(one per channel)

Probe GTP-100B-4 or equivalent: 100MHz(10:1/1:1)Switchable passive probe for GDS-1102A-U(one per channel)

Probe GTP-150B-4 or equivalent: 150MHz(10:1/1:1)Switchable passive probe for GDS-1152A-U(one per channel)

#### OPTIONAL ASSESSORIES

GTL-246	USB Cable, USB 2.0 Type A - Type B, 4P	GSC-006	Soft Carrying Case
GTL-110	Test Lead, BNC-BNC Heads	GTP-033A	Oscilloscope Probe, 35MHz 1:1 Passive Probe

#### FREE DOWNLOAD

PC Software	FreeWave software	Driver	USB driver, LabView Driver
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### Rear Panel



### GSC-006 Soft Carrying Case



### PRIME FEATURES

#### Auto Measurement Gating

A built-in Autoset function on a digital oscilloscope gives engineers remarkable convenience. With the complexities of product features, traditional auto measurement information is inadequate for modern measurement needs. The new Cursor Gating feature allows you to mark an area with cursors for auto measurement.

0.1x  
to  
2000x

#### Flexible Probe Factor Setting

There is a diverse range of test probes currently on the market such as passive, differential, and electrical probes. The attenuation ratio of each probe type also differs greatly. To ensure compatibility, probe attenuation ratios of 0.1X to 2000X as well as voltage and current probes as supported with the GDS-1000A-U.

#### Fast Horizontal Position Mark and Search

MemoryPrime technology allows a maximum of 2M points of waveform data. For engineers, analyzing a considerable amount of data can be an extremely challenging task. To assist engineers in analyzing waveforms quicker, we provide Horizontal Page Skip and Set Time Mark functionalities. This lets engineers take full advantage of the 2M memory depth.



# 100MHz/70MHz/50MHz Digital Storage Oscilloscope



## GDS-1000-U Series



USB

PC Software

LabVIEW Driver



### FEATURES

- \* 100/70/50 MHz Bandwidth, 2 Input Channels
- \* 250MSa/s Real-Time & 25GSa/s Equivalent-Time Sampling Rate
- \* 4k Memory Depth per Channel
- \* Save/Recall of 15 Front Panel Settings & Waveforms
- \* 5.7" Color TFT LCD Display
- \* 19 Auto Measurements
- \* Math Function: Add, Subtract, FFT
- \* USB Host & Device Ports
- \* Go/NoGo Function
- \* Data Logger
- \* Limited Lifetime Warranty

### SPECIFICATIONS

		GDS-1052-U	GDS-1072-U	GDS-1102-U
VERTICAL				
Channels		2 + EXT	2 + EXT	2 + EXT
Bandwidth		DC~50MHz(−3dB)	DC~70MHz(−3dB)	DC~100MHz(−3dB)
Rise Time		<7ns Approx.	<5ns Approx.	<3.5ns Approx.
Sensitivity		2mV/div ~ 10V/div (1-2.5 increments)		
Accuracy		±(3% x  Readout  + 0.1 div + 1mV)		
Input Coupling		AC, DC & Ground		
Input Impedance		1MΩ±2%, ~15pF		
Polarity		Normal & Invert		
Maximum Input		300V (DC+AC peak), CATII		
Waveform Signal Process		+, −, FFT		
Offset Range		2mV/div ~ 50mV/div : ±0.4V ; 100mV/div ~ 500mV/div : ±4V ; 1V/div ~ 5V/div : ±40V ; 10V/div: ±300V		
Bandwidth Limit		20MHz (−3dB )		
TRIGGER				
Sources		CH1, CH2, Line, EXT		
Modes		AUTO, NORMAL, SINGLE, TV, Edge, Pulse width		
Coupling		AC, DC, LF rej., HF rej., Noise rej.		
Sensitivity		DC ~ 25MHz: Approx. 0.5div or 5mV; 25MHz ~ 50/70/100MHz: Approx. 1.5div or 15mV		
EXT TRIGGER				
Range		±15V		
Sensitivity		DC ~ 25MHz : ~ 50mV ; 25M ~ 50/70/100MHz : ~15mV		
Input Impedance		1MΩ ±2% , ~ 16pF		
Maximum Input		300V (DC + AC peak) , CATII		
HORIZONTAL				
Range		1ns/div ~ 50s/div (1-2.5-5 increments); ROLL : 50ms/div ~ 50s/div		
Modes		MAIN, WINDOW, WINDOW ZOOM, ROLL, X-Y		
Accuracy		±0.01%		
Pre-Trigger		10 div maximum		
Post-Trigger		1000 div		
X-Y MODE				
X-Axis Input		Channel 1		
Y-Axis Input		Channel 2		
Phase Shift		±3° at 100kHz		
SIGNAL ACQUISITION				
Real-Time Sample Rate		250MSa/s maximum		
Equivalent Sample Rate		25GSa/s maximum		
Vertical Resolution		8 Bits		
Memory Depth		4K Points maximum		
Acquisition Mode		Normal, Peak Detect, Average		
Peak Detection		10ns(500ns/div ~ 50s/div)		
Average		2, 4, 8, 16, 32, 64, 128, 256		
Voltage Measurement		V <sub>pp</sub> , V <sub>amp</sub> , V <sub>avg</sub> , V <sub>rms</sub> , V <sub>hi</sub> , V <sub>lo</sub> , V <sub>max</sub> , V <sub>min</sub> , Rise Preshoot/ Overshoot, Fall Preshoot/ Overshoot		
Time Measurement		Freq, Period, Rise Time, Fall Time, Positive Width, Negative Width, Duty Cycle		
Cursors Measurement		Voltage difference between cursors (ΔV) Time difference between cursors (ΔT)		
Auto Counter		Resolution : 6 digits ; Accuracy : ±2% Signal Source: All available trigger source except the Video trigger mode		
ADJUSTABLE PROBE COMPENSATION SIGNAL				
Frequency Range		1kHz ~ 100kHz, 1kHz/STEP		
Duty Cycle Range		5% ~ 95%, 5%/STEP		
CONTROL PANEL FUNCTION				
Autoset		Adjust Vertical VOLT/DIV, Horizontal TIME/DIV, and Trigger level automatically		
Save Setup		Up to 15 sets of measurement conditions		
Save Waveform		15 sets of waveform		



## GDS-1000-U Series

### Rear Panel



### GSC-006 Soft Carrying Case



### SPECIFICATIONS

DISPLAY	
TFT LCD Type	5.7 inch
Display Resolution	234 (Vertically) x 320 (Horizontally) Dots
Display Craticule	8 x 10 divisions
Display Brightness	Adjustable
INTERFACE	
USB Device	USB1.1 & 2.0 full speed compatible(Not support via USB3.0 or above)
USB Host	Image (BMP) waveform data (CSV) and setup (SET)
POWER SOURCE	
Line Voltage Range	AC 100V ~ 240V , 50Hz ~ 60Hz , Auto selection
MISCELLANEOUS	
Go/NoGo Function	Available
Data Logger	Available
Multi-Language Menu	Available
Online Help	Available
DIMENSIONS & WEIGHT	
310(W) x 142 (H) x 140(D)mm, Approx. 2.5kg	

The specifications apply when the oscilloscope is powered on for at least 30 minutes under +20 °C~+30 °C .

### ORDERING INFORMATION

GDS-1052-U 50MHz, 2-channel, Color LCD Display DSO  
 GDS-1072-U 70MHz, 2-channel, Color LCD Display DSO  
 GDS-1102-U 100MHz, 2-channel, Color LCD Display DSO

#### ACCESSORIES :

Power Cord x 1 , CD x 1  
 Probe-GTP-070B-4 : 70MHz(10:1/1:1) Switchable Passive Probe for GDS-1052-U(one per channel)  
 Probe-GTP-070B-4 : 70MHz(10:1/1:1) Switchable Passive Probe for GDS-1072-U(one per channel)  
 Probe-GTP-100B-4 : 100MHz(10:1/1:1) Switchable Passive Probe for GDS-1102-U(one per channel)

#### OPTIONAL ASSESSORIES

GTL-246 USB Cable, USB 2.0 A-B TYPE CABLE, 4P  
 GTL-110 Test Lead, BNC-BNC Heads  
 GSC-006 Soft Carrying Case  
 GTP-033A Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M)

#### FREE DOWNLOAD

PC Software FreeWave software  
 Driver USB driver  
 LabView Driver



# Oscilloscope Education And Training Kit



## GDB-03



The GDB-03 training kit allows you to learn both the basic and the advanced functions of the GDS-3000 Series, GDS-2000A Series/GDS-2000E Series/MSO-2000 Series and GDS-1000B Series Digital Storage Oscilloscope (DSO). Following the training procedures of this training kit, you will quickly understand the basic operations of a DSO, and the unique features, which represents a typical hi-tech DSO today.

The training kit is a signal generator board capable of producing waveforms, which contain various real-life scenarios you might encounter. With the GDB-03 training kit and the included curriculums, you are able to acquire adequate knowledge in using a DSO with advanced features.

### SPECIFICATIONS

#### SIGNAL OUTPUT

The GDB-03 provides  
9 basic and 19 advanced oscilloscope training signals

#### BASIC OSCILLOSCOPE TRAINING

- Lab 1 Connect and view a waveform
- Lab 2 Compensate the probe (1kHz square wave)
- Lab 3 Adjust waveform scale and position (square wave)
- Lab 4 Measure the waveform by manual (square wave ; frequency counter, cursor measure)
- Lab 5 Automatic measurement (GDB-03 including noise function ; auto measure, cursor getting measure)
- Lab 6 VPO (VPO signal, color, gray mode)
- Lab 7 Autoset function (Fit screen, AC priority)
- Lab 8 Automatic range
- Lab 9 Save data using hardcopy function

#### ADVANCE OSCILLOSCOPE TRAINING

- Lab 1 Automatic measurement (gating measurement)
- Lab 2 Using peak detect mode
- Lab 3 Low speed signal measurement
- Lab 4 Noisy signal measurement
- Lab 5 Using zoom timebase function
- Lab 6 Transient signal measurement
- Lab 7 Lissajous waveform & phase measurement
- Lab 8 Runt trigger
- Lab 9 Video trigger
- Lab 10 Rise & Fall trigger
- Lab 11 Pulse width trigger
- Lab 12 Hold off function
- Lab 13 Split window 1
- Lab 14 Split window 2
- Lab 15 UART signal
- Lab 16 I<sup>2</sup>C signal
- Lab 17 SPI signal
- Lab 18 CAN signal
- Lab 19 LIN signal

#### POWER SUPPLY

5V DC, USB or auxiliary power input

### ORDERING INFORMATION

**GDB-03** Oscilloscope Education And Training Kit

#### ACCESSORIES :

CD x 1  
Signal demo board with instructions  
GTL-246 USB 2.0 A-B Type cable

# ACCESSORIES

MODEL	DESCRIPTION	APPLICABLE DEVICE
AFG-125	USB Arbitrary Function Generator, 1CH/25MHz	GDS-2000A Series
AFG-225	USB Arbitrary Function Generator, 2CH/25MHz	GDS-2000A Series
DS2-08LA	8-Channel Logic Analyzer, Includes 8-channel Logic analyzer card (GLA-08) and 8 channel Logic analyser probe (GTL-08LA)	GDS-2000A Series
DS2-16LA	16-Channel Logic Analyzer, Includes 16-channel Logic analyzer card (GLA-16) and 16 channel Logic analyser probe (GTL-16LA)	GDS-2000A Series
DS2-FGN	DDS Function Generator, 5MHz, sine/square/triangle/pulse function	GDS-2000A Series
DS2-FH1	Module extension bay & USB Type A to Type A/B cable	GDS-2000A Series, AFG-100/200 Series
DS2-GPIB	GPIB Interface	GDS-2000A Series
DS2-LAN	Ethernet & SVGA Output	GDS-2000A Series
DS3-PWR	Power Analysis Software: Power quality/Harmonic/Ripple/In-rush current measurement	GDS-3000 Series
DS3-SBD	Serial Bus Analysis software I2C / SPI/ UART (for 4 channel model only)	GDS-3000 Series
GAK-003	Adaptor, 50Ω Termination, BNC(P/M)	GDS-2000A Series, MDO-2000A Series, MDO-2000E Series, MSO-2000E Series, GDS-2000E Series, GDS-1000B Series, GDS-1000A-U Series, GDS-1000-U Series, GSP-Series
GAP-001	AC-DC Adaptor	GDS-300/200 Series
GCL-001	Vertical Calibration Cable	GDS-300/200 Series
GCP-020	Current Probe, 40Hz ~ 40kHz, 240A	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series GDS-1000A-U Series
GCP-100	Current Probe, DC ~ 100kHz, 100A	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series GDS-1000A-U Series
GCP-1030	Current Probe, DC ~ 100MHz, 30Arms	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series GDS-1000A-U Series
GCP-206P	Current Probe - Power Supply, 2 Channel Power Supply for GCP-530/1030	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series GDS-1000A-U Series
GCP-300	300kHz/400A Current probe	GDS-3000 Series, GDS-2000A Series, MDO-2000A Series, MDO-2000E Series, MSO-2000E Series, GDS-2000E Series
GCP-425P	Current Probe - Power Supply, 4 Channel Power Supply for GCP-530/1030	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series GDS-1000A-U Series
GCP-500	500kHz/200A Current probe	GDS-3000 Series, GDS-2000A Series, MDO-2000A Series, MDO-2000E Series, MSO-2000E Series, GDS-2000E Series
GCP-530	Current Probe, DC ~ 50MHz, 30Arms	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series GDS-1000A-U Series
GCP-1000	1MHz/700A Current probe	GDS-3000 Series, GDS-2000A Series, MDO-2000A Series, MDO-2000E Series, MSO-2000E Series, GDS-2000E Series
GDB-03	Digital Storage Oscilloscope Demo Kit	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series
GDP-025	25MHz High Voltage Differential Probe	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series
GDP-040D	40MHz High Voltage Differential Probe	GDS-300/200 Series
GDP-050	50MHz High Voltage Differential Probe	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series
GDP-100	100MHz High Voltage Differential Probe	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series
GKT-100	Deskew Fixture	GDS-3000 Series
GLA-08	Logic Analyzer Card, 8-Channel Logic Analyzer Card for DS2-8LA	GDS-2000A Series
GLA-16	Logic Analyzer Card, 16-Channel Logic Analyzer Card for DS2-16LA	GDS-2000A Series
GPF-700	Protective Films	GDS-300/200 Series
GRA-411	Rack Mount Kit	GDS-3000 Series
GRA-420	Rack Mount Kit	GDS-2000A Series
GRA-426	Rack Mount Kit	MDO-2000A Series, MDO-2000E Series, MSO-2000E Series, GDS-2000E Series, GDS-1000B Series
GSC-006	Soft carrying case	GDS-1000A-U Series, GDS-1000-U Series
GSC-008	Soft carrying case	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series
GSC-010	Soft Carrying Case	GDS-300/200 Series
GSC-011	Soft Carrying Bag	GDS-300/200 Series
GTL-08LA	Logic Analyzer Probe, 8-Channel Logic Analyzer Probe for DS2-8LA	GDS-2000A Series
GTL-16E	16-Channel Logic Analyzer Probe	MSO-2000E Series
GTL-105A	Test Lead, Alligator to Banana Test Lead, Max. Current 3A, 1000mm	MDO-2000A Series, MDO-2000E Series
GTL-110	BNC Cable, BNC(P/M)-BNC(P/M), 1000mm	GDS-3000 Series, GDS-2000A Series, GDS-2000E Series, GDS-1000A-U Series, GDS-1000-U Series, GDS-1000B Series
GTL-131	Test Clip, Suitable for GDP-040D	GDS-300/200 Series
GTL-16LA	Logic Analyzer Probe, 16-Channel Logic Analyzer Probe for DS2-16LA	GDS-2000A Series
GTL-205A	Temperature probe adaptor with thermocouple (K type)	MDO-2000E Series
GTL-207A	Test Lead, Banana to Probe Test Lead, 800mm	GDS-300/200 Series, MDO-2000E Series.
GTL-232	RS-232C Cable, 9-pin, F-F Type, null modem, 2000mm	GDS-3000 Series, GDS-2000A Series,
GTL-246	USB 2.0 cable, A-B type 4P, 1800mm	All DSO Series
GTL-248	GPIB Cable, Double Shielded, 2000mm	GDS-3000 Series, GDS-2000A Series
GTL-250	GPIB Cable, Double Shielded, 600mm	GDS-3000 Series, GDS-2000A Series
GTP-033A	Oscilloscope Probe, 35MHz 1:1 Passive Probe	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series, GDS-1000A-U Series, GDS-1000-U Series
GTP-070B-4	Oscilloscope Probe, 70MHz (10:1/1:1) Switching Passive Probe, BNC(P/M)	MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000A-U Series, 1000-U Series, GDS-1000B Series
GTP-100B-4	Oscilloscope Probe, 100MHz (10:1/1:1) Switching Passive Probe, BNC(P/M)	MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000A-U Series, GDS-1000-U Series, GDS-1000B Series
GTP-150B-4	Oscilloscope Probe, 150MHz (10:1/1:1) Switching Passive Probe, BNC(P/M)	GDS-2000E Series
GTP-150B-2	Oscilloscope Probe, 150MHz (10:1/1:1) Switching Passive Probe, BNC(P/M)	GDS-300/200 Series, GDS-2000A Series
GTP-151R	Oscilloscope Probe, 150MHz 10:1 Passive Probe, BNC(P/M)	GDS-3000 Series
GTP-200B-4	Oscilloscope Probe, 200MHz (10:1/1:1) Switching Passive Probe, BNC(P/M)	GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series
GTP-250A-2	Oscilloscope Probe, 250MHz (10:1/1:1) Switching Passive Probe, BNC(P/M)	GDS-2000A Series, GDS-2000E Series
GTP-250B-2	Oscilloscope Probe, 250MHz (10:1/1:1) Switching Passive Probe, BNC(P/M)	GDS-300/200 Series
GTP-251R	Oscilloscope Probe, 250MHz 10:1 Passive Probe, BNC(P/M)	GDS-3000 Series
GTP-300B-4	Oscilloscope Probe, 300MHz (10:1/1:1) Switching Passive Probe, BNC(P/M)	GDS-2000A Series, MDO-2000A Series
GTP-350A-2	Oscilloscope Probe, 350MHz (10:1/1:1) Switching Passive Probe, BNC(P/M)	GDS-2000A Series
GTP-351R	Oscilloscope Probe, 350MHz 10:1 Passive Probe, BNC(P/M)	GDS-3000 Series
GTP-352R	Oscilloscope Probe, 350MHz 20:1 Passive Probe, BNC(P/M)	GDS-3000 Series
GTP-501R	Oscilloscope Probe, 500MHz 10:1 Passive Probe, BNC(P/M)	GDS-3000 Series
GLU-001	GPIB-USB Adaptor, GPIB to USB adaptor	GDS-3000 Series
GWS-001	Wrist Strap	GDS-300/200 Series



## GTP-070B-4

For: GDS-1052-U/1072-U/1072A-U,  
GDS-2072A/2074A,  
GDS-2072E/2074E



GTP-070B-4 is a x1, x10 attenuator modular probe. Designed for use with DC to 70MHz oscilloscope with input impedance of 1MΩ. The probe consists of following separate units;  
1. BNC male connector and compensation box.  
2. Probe body probe tip and R.C. assemblies.  
3. Approx. 1.2M cable

Item	10:1	1:1
Bandwidth	DC~70MHz(±3dB)	DC~6MHz(±3dB)
Input R	~10MΩ	1MΩ (Oscilloscope)
Input C	14.5~17.5pF	85~115pF
Att. Ratio	1/10	1/1
Max. Input Voltage	≤600V DC+AC peak	≤200V DC+AC peak
Accessories	1.Pincher tip 2.Ground lead 3.Cable marker 4.Screw driver 5.IC tip 6.Adjusting tool 7.Earth tip	

## GTP-100B-4

For: GDS-2102A/2104A,  
GDS-2102E/2104E,  
GOS-6103/6103C/6112



The GTP-100B-4 is a passive high impedance oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1MΩ shunted by 20pF. However, it may be compensated for use with instruments having an input capacitance of 5~30pF(10:1).The probe incorporates a two position slide switch in the head which selects attenuation of x1, x10 position.

Item	10:1	1:1
Bandwidth	DC~100MHz(±3dB)	DC~10MHz(±3dB)
Input R	~10MΩ	1MΩ (Oscilloscope)
Input C	14.5~17.5pF	85~115pF
Att. Ratio	1/10	1/1
Max. Input Voltage	≤600Vpk	≤200Vpk
Accessories	1.Channel identifier clip 2.Hook 3.Ground lead 4. Insulating tip 5.IC tip 6.Adjusting tool 7.Earth tip	

## GTP-150B-4

For: GDS-1152A-U,  
GDS-2102A/2104A



The GTP-150B-4 is a passive high impedance oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1MΩ shunted by 20pF. However, it may be compensated for use with instruments having an input capacitance of 5~30pF. The probe incorporates a two position slide switch in the head which selects attenuation of x1, x10 position.

Item	10:1	1:1
Bandwidth	DC~150MHz(±3dB)	DC~6MHz(±3dB)
Input R	~10MΩ	1MΩ (Oscilloscope)
Input C	8.5~18.5pF	45~65pF
Att. Ratio	1/10	1/1
Max. Input Voltage	600V DC+AC peak	200V DC+AC peak
Accessories	1.Channel identifier clip 2.hook 3.Ground lead 4. Insulating tip 5.IC tip 6.Adjusting tool 7.Earth tip	

## GTP-150B-2

For: GDS-300/200 Series



The GTP-150B-2 is a passive high impedance oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1MΩ shunted by 20pF. However, it may be compensated for use with instruments having an input capacitance of 10~30pF. The probe incorporates a two position slide switch in the head which selects attenuation of x1, x10 position.

Item	10:1	1:1
Bandwidth	DC~150MHz(±3dB)	DC~6MHz(±3dB)
Input R	~10MΩ	1MΩ (Oscilloscope)
Input C	13pF	65pF
Att. Ratio	1/10	1/1
Max. Input Voltage	500V CAT I, 400CAT II	150V CAT I, 150V CAT II
Accessories	1.Channel identifier clip 2.Hook 3.Ground lead 4. Insulating tip 5.IC tip 6.Adjusting tool 7.Earth tip	
Compensatim Range	—	10~30pF

## GTP-200B-4

For: GDS-Series



The GTP-200B-4 is a passive high impedance oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1MΩ shunted by 20pF. However, it may be compensated for use with instruments having an input capacitance of 5~30pF. The probe incorporates a two position slide switch in the head which selects attenuation of x1, x10 position.

Item	10:1	1:1
Bandwidth	DC~200MHz(±3dB)	DC~10MHz(±3dB)
Input R	~10MΩ	1MΩ (Oscilloscope)
Input C	10.5~17.5pF	65~105pF
Att. Ratio	1/10	1/1
Max. Input Voltage	600V peak	200V peak
Accessories	1.Channel identifier clip 2.hook 3.Ground lead 4. Insulating tip 5.IC tip 6.Adjusting tool 7.Earth tip	
Compensation Range	5~30pF	—

## GTP-250A-2

For: GDS-2202A/2204A



The GTP-250A-2 is a passive high impedance oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1MW shunted by 20pF. However, it may be compensated for use with instruments having an input capacitance of 10~35pF. Connect this sentence to the end of the previous sentence.

Item	10:1	1:1
Bandwidth	DC~250MHz(±3dB)	DC~6MHz(±3dB)
Input R	~10MΩ	1MΩ (Oscilloscope)
Input C	~17pF	~47pF
Att. Ratio	1/10	1/1
Max. Input Voltage	500V CAT I, 300CAT II	300V CAT I, 150V CAT II
Accessories	1.Channel identifier clip 2.Hook 3.Ground lead 4. Insulating tip 5.IC tip 6.Adjusting tool 7.Earth tip	

## Ordering Guide

If an accessory is ordered separately from the main product, please indicate the nomenclature of the accessory when placing order.

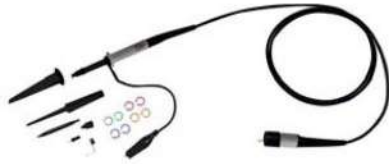
Example : GSC-006 Soft Carrying Case for GDS-1000A-U Series

If an accessory is ordered along with the main product, please indicate the option number of the accessory when placing order.

Example : GDS-3352 350MHz, 2-Channel, Visual Persistance DSO , GSC-008 Soft Carrying Case

## GTP-151R

For : GDS-3000 Series

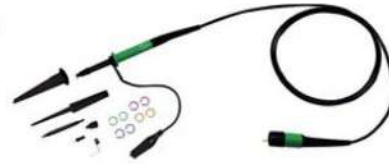


The GTP-151R is compatible with readout function oscilloscopes that automatically detect and display the attenuation factor of the probe.

Item	10:1
Bandwidth	DC~150MHz(±3dB)
Input R	~10MΩ
Input C	~12pF
Att. Ratio	1/10
Max. Input Voltage	< 500 Vpk
Accessories	1.Channel identifier clip 2.Sprung hook 3.Ground lead 4.Insulating tip 5.IC tip 6.Adjusting tool 7.Measuring tip 8. Sprung earth tip

## GTP-251R

For: GDS-3000 Series



The GTP-251R is compatible with readout function oscilloscopes that automatically detect and display the attenuation factor of the probe.

Item	10:1
Bandwidth	DC~250MHz(±3dB)
Input R	~10MΩ
Input C	~12pF
Att. Ratio	1/10
Max. Input Voltage	DC 500V CAT I, 300V CAT II
Accessories	1.Channel identifier clip 2.Sprung hook 3.Ground lead 4.Insulating tip 5.IC tip 6.Adjusting tool 7.Measuring tip 8. Sprung earth tip

## GTP-250B-2

For: GDS-300/200 Seri



The GTP-250B-2 is a passive high impedance oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1MΩ shunted by 20pF. However, it may be compensated for use with instruments having an input capacitance of 10~35pF. Connect this sentence to the end of the previous sentence.

Item	10:1	1:1
Bandwidth	DC~250MHz(±3dB)	DC~6MHz(±3dB)
Input R	~10MΩ	1MΩ (Oscilloscope)
Input C	~13pF	~65pF
Att. Ratio	1/10	1/1
Max. Input Voltage	500V CAT I, 400V CAT II	150V CAT I, 150V CAT II
Accessories	1.Channel identifier clip 2.Hook 3.Ground lead 4.Insulating tip 5.IC tip 6.Adjusting tool 7.Earth tip	

## GTP-300B-4

For: GDS-2202E/2204E Series



The GTP-300A-4 is a passive high impedance oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1MΩ shunted by 20pF. However, it may be compensated for use with instruments having an input capacitance of 10~35pF. The probe incorporates a two position slide switch in the head which selects attenuation of x1, x10 position.

Item	10:1	1:1
Bandwidth	DC~300MHz(±3dB)	DC~10MHz(±3dB)
Input R	~10MΩ	1MΩ (Oscilloscope)
Input C	10.5~17.5pF	65~105pF
Att. Ratio	1/10	1/1
Max. Input Voltage	600V DC+AC pk	200V DC+AC pk
Accessories	1.Channel identifier clip 2.Hook 3.Ground lead 4.Insulating tip 5.IC tip 6.Adjusting tool 7.Earth tip	

## GTP-351R/352R

For: GDS-3000 Series



Both GTP-351R and GTP-352R are passive high impedance oscilloscope probes designed and calibrated for use on instrument. GTP-351R has an input impedance of 1 MΩ shunted by 20pF while GTP-352R has an input impedance of 1 MΩ shunted by 15pF. However, GTP-351R may be compensated for use with instruments having an input capacitance of 10~35pF while GTP-352R has an input impedance of 10~30pF.

	GTP-351R	GTP-352R
Item	10:1	20:1
Bandwidth	DC~350MHz	DC~350MHz
Input R	~10MΩ	~10MΩ
Input C	~12pF	~7pF
Att. Ratio	1/10	1/20
Max. Input Voltage	500V CAT I, 300V CAT II	1kV CAT II
Accessories	1.Channel identifier clip 2.Sprung hook 3.Ground lead 4.Insulating tip 5.IC tip 6.Adjusting tool 7.Measuring tip 8. Sprung earth tip	

## GTP-350A-2

For: GDS-3000 Series  
GDS-2302A/2304A



The GTP-352A-2 is a passive high impedance oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1MΩ shunted by 15pF. However, it may be compensated for use with instruments having an input capacitance of 10~30pF. Connect this sentence to the end of the previous sentence.

Item	10:1	1:1
Bandwidth	DC~350MHz	DC~6MHz
Input R	~10MΩ	~1MΩ
Input C	~13pF	~46pF
Att. Ratio	1/10	1/1
Max. Input Voltage	500V CAT I, 300V CAT II	300V CAT I, 150V CAT II
Accessories	1.Channel identifier clip 2.Sprung hook 3.Ground lead 4.Insulating tip 5.IC tip 6.Adjusting tool 7.Measuring tip 8. Sprung earth tip	

## GKT-100 Deskew Fixture

The GKT-100 deskew fixture is used to compensate for the propagation delay between a passive voltage probe and current probe. It is used with the GDS-3000 Series, Required tools.

- 1.GDS-3000 x 1
- 2.GKT-100 x 1
- 3.USB type A-B cable x1 -used for deskew fixture
- 4.Standard passive probe x1
- 5.Current probe x1 (GCP-530 or GCP-1030)





## ACCESSORIES

### GTP-501R

For: GDS-3000 Series  
GDS-2000A Series



The GTP-501R is a passive high impedance oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1M $\Omega$  shunted by 13pF. However, it may be compensated for use with instruments having an input capacitance of 8~20pF. Connect this sentence to the end of the previous sentence.

Item	10:1
Bandwidth	DC~500MHz
Input R	~10M $\Omega$
Input C	~11.5pF
Att. Ratio	1/10
Max. Input Voltage	500V CAT I, 300V CAT II
Accessories	1.Channel identifier clip 2.Sprung hook 3.Ground lead 4.Insulating tip 5.IC tip 6.Adjusting tool 7.Measuring tip 8. Sprung earth tip

### GTP-033A

For: GDS-3000 Series



GTP-033A is a x1, attenuator modular probe. Designed for use with DC to 35MHz oscilloscope with input impedance of 1M $\Omega$  The probe consists of following separate units;  
1. BNC male connector and compensation box.  
2. Approx. 1.2M cable

Item	1:1
Bandwidth	DC~35MHz ( $\pm 3dB$ )
Input R	1M $\Omega$ (Oscilloscope)
Input C	~83pF
Att. Ratio	1/1
Max. Input Voltage	<300 CAT I
Accessories	1.Channel Identifier Clip 2.Sprung Hook 3.Ground Lead 4.Insulating Tip 5. IC Tip

### GTL-101



### GTL-110



### GTL-207A



### GTL-232



### GTL-246



### GTL-248



### GTL-250



### GTL-253

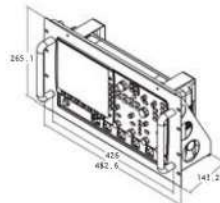


### GTL-205A



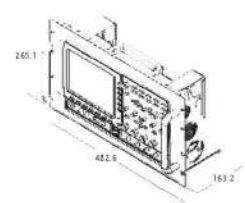
### GRA-411 Rack Mount Kit

For : GDS-3000 Series



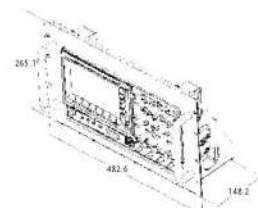
### GRA-420 Rack Mount Kit

For : GDM-2000A Series



### GRA-426 Rack Mount Kit

For : MDO-2000A Series, MDO-2000E Series,  
MSO-2000E Series, GDS-2000E Series, GDS-1000B Series



# ACCESSORIES

## Current Probe and Differential Probe Selections

## Dual-channel Differential Probe



GCP-100/020



GCP-300/500/1000



GCP-530/1030, GCP-206P/425P



GDP-025



GDP-050/100



GDP-040D (for GDS-300/200 only)

In addition to the standard passive probes, the optional current or differential probes can be used to perform additional tests or power analysis.

The differential probes come in three bandwidths: 25MHz, 50MHz and 100MHz. The current probes come in a broad variety of bandwidth and current ranges (ranging from 50MHz/30A, 100MHz/30A, 40kHz/240A, 300kHz/200A, 500kHz/150A, 1MHz/70A, 100kHz/100A), to cover any number of power supply testing applications.

\* The GCP-530/1030 must be used in conjunction with the GCP-206P/425P current probe power supply.

\* The GCP-206P is capable of powering 2 units of GCP-530 or GCP-1030 and the GCP-425P is capable of powering 4 units.

\* The GCP-100 requires a standard 9V battery; The GCP-020 do not require batteries or a power supply source.

## CURRENT PROBE

	GCP-100	GCP-020	GCP-300	GCP-500	GCP-530	GCP-1000	GCP-1030
Probe Bandwidth	DC~100kHz	40Hz~40kHz	DC~300kHz	DC~500kHz	DC~50MHz	DC~1MHz	DC~100MHz
Rise Time	—	—	1.17μs(Typ.)	0.7μs(Typ.)	7ns or less	0.35μs (Typ.)	3.5ns or less
Maximum Continuous Input Range	0.05~10A(100mV/A) 1~100A(10mV/A)	0.1~24A(100mV/A) 0.5~240A(10mV/A)	200A(10mV/A) 20A(100mV/A)	150A(20mV/A) 15A(200mV/A)	30Apeak	7A(50mV/A) 70A(500mV/A)	30Apeak
Maximum Peak Current Value	100A	60A(100mV/A) 600A(10mV/A)	DC : 200A AC : 140Arms	DC : 150A AC : 100Arms	50A	DC : 70A AC : 50Arms	50A
Output Voltage Rate	100mV/A;10mV/A	10mV/A;100mV/A	100mV/A;10mV/A	200mV/A;20mV/A	0.1V/A	500mV/A;50mV/A	0.1V/A
DC Amplitude Accuracy	≤3%±5mV (50mA~10A peak) ≤4%±500μV (0.5A~40A peak) ≤15%(40~100A peak)	≤2%±50mV (100mA~20A peak) ≤3.5%±5mV (0.5~10A peak) ≤3%±5mV (10~40A peak) ≤1.5%±5mV (100A~240A peak)	±3%±50 mA at 100 mV/A (50 mA ~ 20A peak range) ±4%±50 mA at 10 mV/A (500 mA ~ 80A peak range) ±15% max at 10 mV/A (80A peak ~ 200A peak range)	±3%±30 mA at 200 mV/A (30 mA ~ 15 A peak range) ±4%±300 mA at 20 mV/A (300 mA ~ 80 A peak range) ±15% max at 20 mV/A (80A peak ~ 150A peak range)	±1.0%rdg±1mV (0~30Arms/DC, 45~66Hz);±2.0%rdg (30Arms~50A peak /DC, 45~66Hz)	±3%±20 mA at 500 mV/A (20 mA ~ 7A peak range) ±4%±200 mA at 50 mV/A (200 mA ~ 50 A peak range) ±15% max at 50 mV/A (50A peak ~ 70A peak range)	±1.0%rdg±1mV (0~30Arms/DC, 45~66Hz);±2.0%rdg (30Arms~50A peak /DC, 45~66Hz)
Noise	—	—	—	—	2.5mArms or less	—	2.5mArms or less
Rate Supply Voltage	—	—	—	—	±12V±0.5V	—	±12V±0.5V
Maximum Rated Power	—	—	—	—	5.6VA	—	5.3VA
Maximum Rated Voltage	600V, CAT III	600V, CAT III	CAT III 300V/CAT II 600V	CAT III 600V	300V, CAT I	CAT III 600V	300V, CAT I

## CURRENT PROBE POWER SUPPLY

	GCP-206P	GCP-425P
Compatible Current Probe	GCP-530/GCP-1030	GCP-530/GCP-1030
Number of Power Supply Connectors	2	4
Output Voltage	±12V±0.5V	±12V±0.5V
Rated Output Current	±600mA	±2.5A
Rated Supply Voltage(50/60Hz)	110V/120V, 220V/240V AC±10%	100V~240V AC±10%
Maximum Rated Power	20VA	170VA
Dimensions & Weight	73(W)x110(H)x186(D)mm; Approx.1.1kg	80(W)x119(H)x200(D) mm; Approx.1.1kg
Accessories	Power cord, fuse	Power cord, fuse

## HIGH-VOLTAGE DIFFERENTIAL PROBE

	GDP-025	GDP-050	GDP-100
Probe Bandwidth	DC ~ 25MHz (attenuation x50, x200); DC ~ 15MHz(attenutation x20)	DC ~ 50MHz(attenutation x200, x500, x1000); DC ~ 25MHz(attenutation x100)	DC ~ 100MHz(attenutation x200, x500, x1000); DC ~ 50MHz(attenutation x100)
Attenuation	x20, x50, x200	x100, x200, x500, x1000	x100, x200, x500, x1000
Accuracy	±2%	±2%	±2%
Voltage Input Range (DC+AC peak to peak)	≤140Vp-p for x 20, ≤350Vp-p for x 50, ≤1400Vp-p for x 200	≤700Vp-p for x 100 ≤1400Vp-p for x 200 ≤3500Vp-p for x 500 ≤7000Vp-p for x 1000	≤700Vp-p for x 100 ≤1400Vp-p for x 200 ≤3500Vp-p for x 500 ≤7000Vp-p for x 1000
Permitted Max Input Voltage	Maximum differential voltage: Max voltage between input terminal and ground: 600Vrms	Maximum differential voltage: Max voltage between input terminal and ground: 6500Vrms	Maximum differential voltage: Max voltage between input terminal and ground: 6500Vrms
Input Impedance	Differential:4MΩ/1.2pF; Between terminals and ground: 2MΩ/2.3pF	Differential:54MΩ/1.2pF; Between terminals and ground:27MΩ/2.3pF	Differential: 54MΩ/1.2pF; Between terminals and ground: 27MΩ/2.3pF
Output	≤7.0V	≤7.0V	≤7.0V
Output impedance	50Ω	50Ω	50Ω
Rise Time	14ns (x50, x200 attenuation); 23.4ns (x20 attenuation)	7ns (x200, x500, x1000 attenuation); 14ns (x100 attenuation)	3.5ns (x200, x500, x1000 attenuation); 7ns (x100 attenuation)
Rejection Rate on Common Mode(CMRR)	60Hz>80dB, 100Hz>60dB, 1MHz>50dB	60Hz>80dB, 100Hz>60dB, 1MHz>50dB	60Hz>80dB, 100Hz>60dB, 1MHz>50dB
Power Supply	External DC adapter	External DC adapter	External DC adapter
Consumption	Maximum 35mA (0.4Watt)	Maximum 35mA (0.4Watt)	Maximum 35mA (0.4Watt)

## DUAL-CHANNEL DIFFERENTIAL PROBE

	GDP-040D
Channel	2
Bandwidth (-3dB)	DC ~ 40MHz (x200)
Attenuation	200 X
Voltage Input Range	600Vpp Max. CAT III
Output	≤±3V
Maximum Input Voltage to Earth	600Vpp for x200
Typical CMRR	80dB@60Hz; 60dB@100Hz; 50dB@1MHz
Input Impedance	Differential : 2MΩ//1.2pF, Ground 1MΩ//2.4pF
Output Impedance	50Ω
Rise Time	8.75ns for x200
Power Supply	5V DC from GDS-300/200 Series
Accuracy	±2%
Dimension	81.7(H) x 123.0(W) x 28.0(D) mm





## SPECTRUM ANALYZERS & COMMUNICATIONS TESTERS

GW Instek's spectrum analyzer product line consists of two series, which are spectrum analyzer and dedicated tester. Both series are ideal for a wide range of test applications, including R&D, service, maintenance, manufacturing, education and other RF application fields.

### Spectrum Analyzer Series

There are four spectrum analyzer products featuring frequency ranges from 9 kHz to 1.8 GHz / 3 GHz / 3.25 GHz and providing various measurement application functions such as ASK/FSK/AM/FM demodulation analysis, SEM, ACPR/OCBW/CHPW, TOI, harmonic, CNR/CTB/CSO, frequency counter; and communications interfaces such as USB, RS-232, LAN, MicroSD, GPIB, etc.

GSP-9330 and GSP-9300B are applied spectrum analyzers. GSP-9330's built-in EMI-dedicated feature is one of a kind and it collocates with dedicated test accessories to allow engineers to quickly and accurately identify EMI issues. In order to provide more stable measurement and better signal analysis, GSP-9330 has built-in Spectrogram and Topographic display modes to display signal persistence and energy changes via color images. The built-in Sequence function allows users to create and execute the required test procedures directly on spectrum analyzer without using a PC.

GSP-818, a basic spectrum analyzer, features a measurement range up to 1.8 GHz, a 10.4" large display, and an easy-to-upgrade software option ideal for general RF measurement applications. GSP-730 is developed for the educational market and it can collocate with the dedicated RF communications modules GRF-1300/GRF-1300A/USG to conduct courses.

### Communication Testers Series

There are two communications testers, including ASK/FSK/TPMS Tester and IoT LoRa Tester.

C-1100 ASK/FSK/TPMS Tester provides analyses on ASK/FSK digital signal applications. For example, products using ASK/FSK technology such as tire pressure monitoring system (TPMS) and remote controller.

C-1200 IoT LoRa Tester is specifically designed to test product applications based on LoRa technology.

Both communication testers provide multi-channel design and dedicated PC control software to increase test efficiency and reduce equipment costs. Customized services are available.

## PRODUCTS

- 3.25 GHz Spectrum Analyzer
- 3 GHz Spectrum Analyzer
- 1.8 GHz Spectrum Analyzer
- ASK/FSK/TPMS Tester
- IoT LoRa Tester
- RF Training System

## SPECTRUM ANALYZER OVERVIEW

Spectrum analyzer is the most widely applied measuring instrument for wireless communications devices, components or systems. It measures and displays the frequency spectrum distribution of an RF signal. Spectrum analyzer can measure and read both frequency and amplitude information. Nowadays, digital communications dominate wireless communications systems. Despite the dominance of digital communications, measuring a frequency spectrum by a spectrum analyzer is still considered an important process.

To choose the right spectrum analyzer, several key specifications should be considered, which are explained below.

## FREQUENCY RANGE

Selecting a spectrum analyzer for a measurement requires selecting its frequency range, like 1GHz, 2.4GHz, and so on. Therefore the frequency range is the first consideration for most applications.

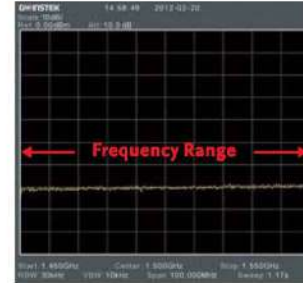


Figure 1, Frequency Range

## NOISE FLOOR

Noise floor is the bottom noise level when no signal is fed into spectrum analyzer. It represents the lowest signal level that spectrum analyzer can measure. The noise floor usually depends on Resolution Bandwidth (RBW).

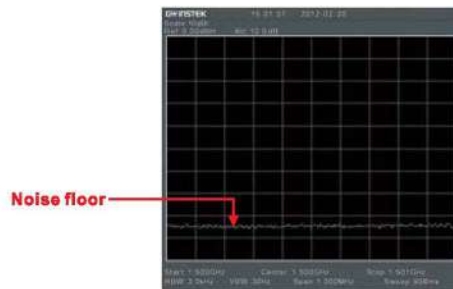


Figure 2, Noise Floor

## SPURIOUS NOISE

Circuit noise or interference that looks like a signal occurs even without an input signal due to spurious noise of spectrum analyzer. Unlike noise floor, spurious noise presents itself like a signal with a specific frequency.

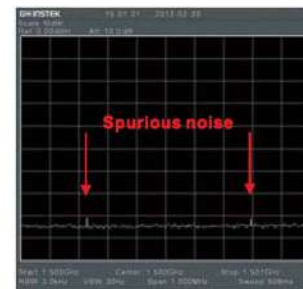


Figure 3, Spurious Noise

## HARMONICS

Spectrum analyzer itself also generates harmonics from an input signal. Therefore if the harmonics generated by a spectrum analyzer are greater than the harmonics from an input signal, the harmonic measurement will result in an error as Figure 4 presents.

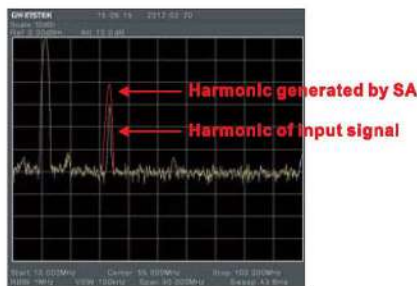


Figure 4, Harmonic Error Because of Greater Harmonic of Spectrum Analyzer

## PHASE NOISE

Phase noise shows the purity of a signal. In Figure 5a, there are two signals with different levels of phase noise. The lower one is purer than the upper one, and therefore it has better phase noise performance.

a. Signals with different phase noises b. Definition of phase noise

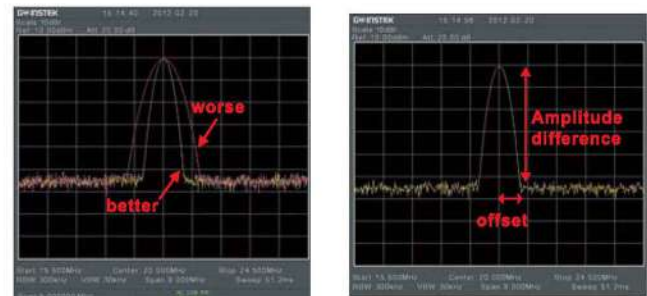


Figure 5 : Phase Noise

Figure 5b shows the definition of phase noise. It is usually defined as dBc with a frequency offset. For example, "-50dBc at 200kHz offset with 30kHz RBW".



## THIRD ORDER INTER-MODULATION

Third order inter-modulation occurs with a two-tone input signal, a signal with two frequencies or two signals with different frequencies that are fed into a spectrum analyzer at the same time. When the input signal frequencies are  $f_1$  and  $f_2$ , the harmonics are as follows.

Input	output	
$f_1, f_2$	fundamentals	$f_1, f_2$
	2nd order harmonics	$2f_1, 2f_2, f_1 \pm f_2,$
	3rd order harmonics	$3f_1, 3f_2, 2f_1 \pm f_2, 2f_2 \pm f_1$
	----	----

The third order harmonics are the primary concerns in a system. If the frequencies of  $f_1$  and  $f_2$  are very close, then  $2f_1 - f_2$  and  $f_1 - 2f_2$  will also be very close to the original signal. It will be difficult for the subsequent filters to filter out the harmonics accordingly. The concepts are illustrated in Figure 6.

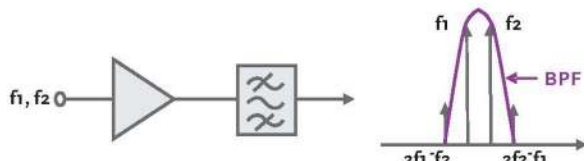


Figure 6: Third Order Harmonics of  $2f_1 - f_2$  and  $2f_2 - f_1$

An example is expressed in Table 1.

Input Frequency	Harmonics	1	2	3
100, 110		100, 110	...	300, 330, 310, 320, 90, 120
100, 101		100, 101	...	300, 303, 301, 302, 99, 102
100, 100.1		100, 100.1	...	300, 300.3, 300.1, 300.2, 99.9, 100.2

Table 1 : Two-Tone Signal Harmonics

In case the input signal frequencies are 100 and 100.1, their 3rd order harmonics will be 99.9 ( $2f_1 - f_2$ ) and 100.2 ( $2f_2 - f_1$ ). Using that example it is easy to see that the third order harmonics are close to the original signals, which will pose challenges for designing the subsequent filters. Therefore the inter-modulation distortion of spectrum analyzer itself might limit the ability of two-toned signal measurements.

## DYNAMIC RANGE

Different companies use different definitions for dynamic range, but actually they all point to the same thing: the ability to accurately measure amplitude. Considering the specifications introduced above, the dynamic range might actually include more than one term. For example, if a two-tone signal is under measurement, the inter-modulation distortion needs to be considered. If the input signal frequency falls onto the spurious noise, it will limit the dynamic range. But generally speaking, dynamic range is defined as the level between noise floor and the maximum measurable level. Alternatively, sometimes the display range (80 or 100dB) is called dynamic range. It describes the range within the display without shifting the reference level. The entire concept is illustrated in Figure 7.

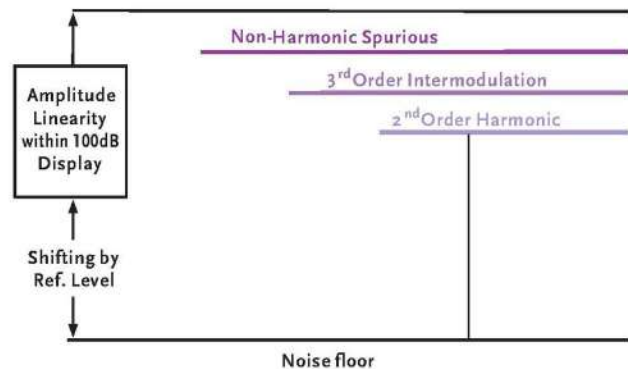
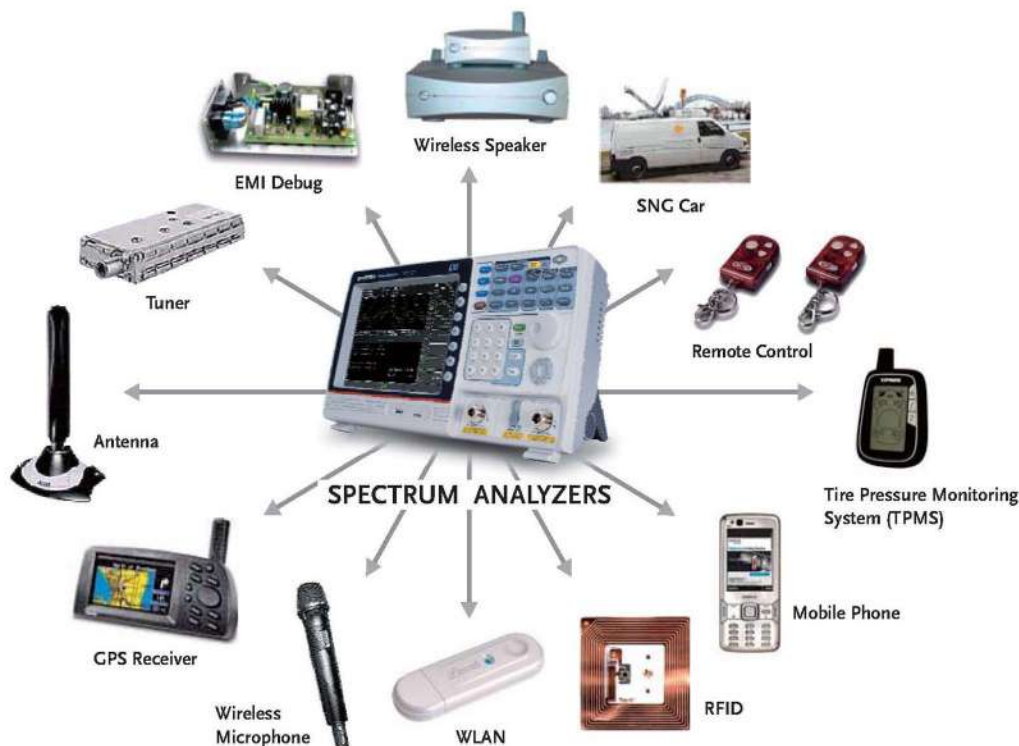


Figure 7 : Dynamic Range

## APPLICATION



# SPECTRUM ANALYZERS

MODEL	GSP-9330	GSP-9300B	GSP-818	GSP-730
Frequency Range	9kHz ~ 3.25GHz	9kHz ~ 3GHz	9kHz ~ 1.8GHz	150kHz ~ 3GHz
Frequency Stability	±1ppm max. (per year)	±1ppm max. (per year)	1ppm max. (per year)	-
Over Temperature Frequency Stability	±0.025 ppm (0 ~ 50 °C)	±0.025 ppm (0 ~ 50 °C)	<2.5ppm (15°C to 35°C)	-
RBW Range	1Hz~1MHz in 1-3-10 sequence 200Hz, 9kHz, 120kHz, 1MHz for EMI Filter	1Hz~1MHz in 1-3-10 sequence 200Hz, 9kHz, 120kHz, 1MHz for EMI Filter	10Hz to 500kHz (1-10 steps by sequence), 1MHz, 3MHz EMI Filter(6dB): 200Hz, 9kHz, 120kHz, 1MHz (Optional)	30kHz, 100kHz, 300kHz, 1MHz (30kHz Range is not adjustable)
VBW Range	1Hz~1MHz in 1-3-10 sequence	1Hz~1MHz in 1-3-10 sequence	10Hz~3MHz in 1-3-10 sequence	-
Phase Noise	-88dBc/Hz @1GHz, 10kHz offset	-88dBc/Hz @1GHz, 10kHz offset	-82dBc/Hz @1GHz, 10kHz offset	-85dBc/Hz @1GHz, 500kHz offset
Noise Floor	-139dBm @1GHz, 10Hz RBW, per-amp on	-139dBm @1GHz, 10Hz RBW, per-amp on	-140dBm @1GHz, 10Hz RBW, per-amp on	-100dBm @1GHz, 30kHz RBW
Overload Protection	+30dBm, ±50VDC	+30dBm, ±50VDC	+30dBm, ±50VDC	+30dBm, ±25VDC
Reference Level Range	-110dBm ~ +30dBm	-110dBm ~ +30dBm	-80 dBm to +30 dBm	-40dBm ~ +20dBm
Input Attenuator	0 ~ 50dB, in 1 dB steps	0 ~ 50dB, in 1 dB steps	0 ~ 40dB, in 1 dB steps	-
Pre-amplifier	Built-in 18dB nominal	Built-in 18dB nominal	Built-in 20dB internal	-
Measurement Function	SEM, ACPR, OCBW, CHPW, N-dB BW, Phase Jitter, Harmonic, TOI, CNR, CSO, CTB, P1dB, TDP	SEM, ACPR, OCBW, CHPW, N-dB BW, Phase Jitter, Harmonic, TOI, CNR, CSO, CTB, P1dB, TDP	ACPR, OCBW, CHPW, N-dB BW	ACPR, OCBW, CHPW
Demodulator	Yes, with AM/FM/ASK/FSK analysis	Yes, with AM/FM analysis	Yes, with AM/FM analysis	-
Gated Sweep	Yes	Yes	-	-
Frequency Counter	Support , Min. resolution 1Hz	Support , Min. resolution 1Hz	Support , Min. resolution 1Hz	-
Sequence	Yes	Yes	-	-
Limit Line	Yes	Yes	Yes	Yes
Correction Table	Yes	Yes	-	-
Trace Number	4 Traces	4 Traces	5 Traces	3 Traces
Trace Detect Mode	Positive-peak, negative-peak, sample, normal, RMS(not Video), Quesi-Peak, Average	Positive-peak, negative-peak, sample, normal, RMS(not Video), Quesi-Peak, Average	Positive-peak, negative-peak, sample, normal, RMS(not Video), (Optional) Quesi-Peak/Average	-
Marker Number	6	6	5	5
Internal Memory	16MB	16MB	256MB	5 memories
Display Modes	Spectrogram, Topographic, Spectrum	Spectrogram, Topographic, Spectrum	Time Spec, Bandwidth Zoom, Spectrum	Spectrum
Split-Window	Yes	Yes	-	Yes
Tracking Generator	100kHz ~ 3.25GHz (optional)	100kHz ~ 3GHz (optional)	100kHz ~ 1.8GHz (optional)	-
IF Output	V, 886MHz, -25dBm	V, 886MHz, -25dBm	-	-
Interface	USB Host/Device, RS-232, LAN(LXI standard), MicroSD, GPIB(Optional)	USB Host/Device, RS-232, LAN(LXI standard), MicroSD, GPIB(Optional)	USB Host/Device, LAN	USB Host/Device, RS-232
Screen Size	8.4 inchs Color TFT LCD with SVGA (800 x 600)	8.4 inchs Color TFT LCD with SVGA (800 x 600)	10.4 inchs Color TFT LCD with SVGA (800 x 600)	5.6 inchs Color TFT LCD with VGA (640 x 480)
Rack Adapter Panel	V, GRA-415	V, GRA-415	-	-
Power Operation	AC	AC	AC	AC
Power Source	AC100 ~ 240V, 50 ~ 60Hz	AC100 ~ 240V, 50 ~ 60Hz	AC100 ~ 240V, 50 ~ 60Hz	AC100 ~ 240V, 50 ~ 60Hz
Page	B5-12	B13-15	B16-18	B19-24

## RF & SPECTRUM ANALYZER TRAINING SYSTEM

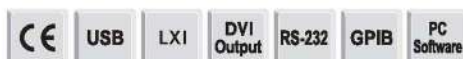
MODEL	GRF-1300	GRF-1300A
Collocation Instrument	GSP-730	GSP-730
Necessary Option	USG-LF44	-
RF Cable	SMA Cable	SMA Cable
RF Connector	SMA Female	SMA Female
Interface	USB Device	USB Device
Power Source	AC100 ~ 240V, 50 ~ 60Hz	AC100 ~ 240V, 50 ~ 60Hz
Page	B20	B20



## 3.25GHz Spectrum Analyzer



GSP-9330



### FEATURES

- \* Frequency Range : 9kHz ~ 3.25GHz
- \* 0.025ppm Frequency Stability and 1ppm Aging Rate
- \* RBW : 1Hz ~ 1MHz (3dB), 6dB EMI Filter : 200Hz, 9kHz, 120kHz, 1MHz
- \* Fastest Sweep Time : 204μs
- \* Sensitivity : -149dBm/Hz (@PreAmp on)
- \* Built-in Preamplifier, 50dB Attenuator, and Sequence Function
- \* Built-in EMC Pretest Function
- \* Built-in 2FSK Analysis, AM/FM/ASK/FSK Demodulation & Analysis
- \* Built-in P1dB Point, Harmonic, Channel Power, N-dB Bandwidth, OCBW, ACPR, SEM, TOI, CNR, CTB, CSO, Noise Marker, Frequency Counter, Time Domain Power, Gated Sweep
- \* Built-in Spectrogram, Topographic and Split-window Display Modes
- \* Remote Control EMI Measurement Software : SpectrumShot
- \* Remote Control Interface : LAN, USB, RS-232
- \* Options : Tracking Generator, GPIB Interface

### GSC-009 Soft Carrying Case

For: GSP-9330/9300B



GSP-9330, a high test speed spectrum analyzer with 3.25 GHz, provides the fastest 204 μs sweep speed. Users, via high speed sweep time, can easily handle and analyze modulation signals. The keys to handling modulated signals are fast sweep time and signal demodulation functions. In addition to the analog AM/FM demodulation and analysis function, GSP-9330 also provides digital signal ASK/FSK, and 2FSK demodulation and analysis capabilities. Nowadays, EMC issues are very crucial to product's design processes. Therefore, GSP-9330 has incorporated the EMC pretest solution to facilitate EMC tests. The simple and easy EMC pretest procedures from GSP-9330 can tremendously shorten users' product launch timeline.

### SPECIFICATIONS

#### FREQUENCY

##### FREQUENCY

Range	9 kHz ~ 3.25 GHz
Resolution	1 Hz

##### FREQUENCY REFERENCE

Accuracy	±(period since last adjustment x aging rate) + stability over temperature + supply voltage stability	
Aging Rate	± 1 ppm max.	1 year after last adjustment
Frequency Stability Over Temperature	± 0.025 ppm	0 ~ 50 °C
Supply Voltage Stability	± 0.02 ppm	

##### FREQUENCY READOUT ACCURACY

Start, Stop, Center, Marker	±(marker frequency indication x frequency reference accuracy + 10% x RBW + frequency resolution)	
Trace Points	Max. 601 points, Min. 6 points	

##### MARKER FREQUENCY COUNTER

Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz	
Accuracy	±(marker frequency indication X frequency reference accuracy + counter resolution)	RBW/Span >= 0.02 ; Mkr level to DANL > 30 dB

##### FREQUENCY SPAN

Range	0 Hz (zero span), 100 Hz ~ 3.25 GHz	
Resolution	1 Hz	
Accuracy	± frequency resolution <sup>1</sup>	RBW : Auto

##### PHASE NOISE

Offset from Carrier		Fc=1GHz;RBW=1kHz;VBW=10Hz;Average≥40
10 kHz	< -88 dBc/Hz	Typical <sup>2</sup>
100 kHz	< -95 dBc/Hz	Typical
1 MHz	< -113 dBc/Hz	Typical

##### RESOLUTION BANDWIDTH (RBW) FILTER

Filter Bandwidth	1 Hz ~ 1 MHz in 1-3-10 sequence 200 Hz, 9 kHz, 120 kHz, 1 MHz	-3dB bandwidth -6dB bandwidth Nominal <sup>3</sup>
Accuracy	± 8%, RBW = 1MHz ; ± 5%, RBW < 1MHz	Normal Bandwidth ratio: -60dB:-3dB
Shape Factor	< 4.5 : 1	

##### VIDEO BANDWIDTH (VBW) FILTER

Filter Bandwidth	1 Hz ~ 1 MHz in 1-3-10 sequence	-3dB bandwidth
------------------	---------------------------------	----------------

[1] Frequency Resolution = Span/(Trace points - 1)

[2] Typical specifications in this datasheet mean that the performance can be exhibited in 80% of the units with a 95% confidence level over the temperature range 20 to 30 °C. They are not covered by the product warranty.

[3] Nominal values indicate expected performance. They are not covered by the product warranty.

### AMPLITUDE

#### AMPLITUDE RANGE

Measurement Range	100 kHz ~ 1 MHz 1 MHz ~ 10 MHz 10 MHz ~ 3.25 GHz	DANL ~ 18 dBm DANL ~ 21 dBm DANL ~ 30 dBm
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#### ATTENUATOR

Input Attenuator Range	0 ~ 50 dB, in 1 dB steps	Auto or manual setup
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#### MAXIMUM SAFE INPUT LEVEL

Average Total Power	≤ +33 dBm	Input attenuator ≥ 10 dB
DC Voltage	± 50 V	

#### 1 dB GAIN COMPRESSION

Total Power at 1st Mixer	> 0 dBm	Typical ; Fc ≥ 50 MHz; preamp. off
Total Power at the Preamp	> -22 dBm	Typical ; Fc ≥ 50 MHz; preamp. on Mixer power level (dBm) = input power (dBm) - attenuation (dB)



**GSP-9330**

## SPECIFICATIONS

### DISPLAYED AVERAGE NOISE LEVEL (DANL)<sup>4</sup>

Preamp off	0 dB attenuation; RF Input is terminated with a 50Ω load. RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60 dBm; trace average ≥ 40	
9 kHz ~ 100 kHz	< -93 dBm	Nominal
100 kHz ~ 1 MHz	< -90 dBm - 3 x (f/100 kHz) dB	Nominal
1 MHz ~ 10 MHz	< -122 dBm	Nominal
2.7 ~ 3.25 GHz	< -116 dBm	Nominal
Preamp on	0 dB attenuation; RF Input is terminated with a 50Ω load. RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60 dBm; trace average ≥ 40	
100 kHz ~ 1 MHz	< -108 dBm - 3 x (f/100 kHz) dB	Nominal
1 MHz ~ 10 MHz	< -142 dBm	Nominal
10 MHz ~ 3.25 GHz	< -142 dBm + 3 x (f/1 GHz) dB	Nominal

[4] DANL spec excludes spurious response.

### LEVEL DISPLAY RANGE

Scales	Log, Linear	
Units	dBm, dBmV, dBuV, V, W	
Marker Level Readout	0.01 dB	Log scale
	0.01 % of reference level	Linear scale
Level Display Modes	Trace, Topographic, Spectrogram	Single/Split Windows
Number of Traces	4	
Detector	Positive-peak, negative-peak, sample, normal, RMS(not Video), Quasi-Peak, Average	
Trace Functions	Clear & Write, Max/Min Hold, View, Blank, Average	Can be setup for each trace separately

### ABSOLUTE AMPLITUDE ACCURACY

Absolute Point	Center=160 MHz; RBW 10 kHz; VBW 1 kHz; span 100 kHz; log scale; 1 dB/div; peak detector; 23°C±1°C; Signal at Reference Level	
Preamp Off	± 0.3 dB	Ref level 0 dBm; 10 dB RF attenuation
Preamp On	± 0.4 dB	Ref level -30dBm; 0dB RF attenuation

### FREQUENCY RESPONSE

Preamp Off	Attenuation : 10 dB; Reference: 160 MHz; 20 ~ 30°C
100 kHz ~ 2.0 GHz	± 0.5 dB
2GHz ~ 3.25 GHz	± 0.7 dB
Preamp On	Attenuation: 0 dB; Reference: 160 MHz; 20 ~ 30°C
1 MHz ~ 2 GHz	± 0.6 dB
2 GHz ~ 3.25 GHz	± 0.8 dB

### ATTENUATION SWITCHING UNCERTAINTY

Attenuator Setting	0 ~ 50 dB in 1 dB step	Reference : 160 MHz, 10dB attenuation
Uncertainty	± 0.25 dB	

### RBW FILTER SWITCHING UNCERTAINTY

1 Hz ~ 1 MHz	± 0.25 dB	Reference : 10 kHz RBW
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### LEVEL MEASUREMENT UNCERTAINTY

Overall Amplitude Accuracy	± 1.5 dB	20 ~ 30°C; frequency > 1 MHz; Signal input 0 ~ -50 dBm; Reference level 0 ~ -50 dBm; Input attenuation 10 dB; RBW 1 kHz; VBW 1 kHz; after cal; Preamp Off
	± 0.5 dB	Typical

### SPURIOUS RESPONSE

Second Harmonic Intercept	+35 dBm +60 dBm	Preamp off; signal input -30dBm; 0 dB attenuation Typical; 10 MHz < f <sub>c</sub> < 775 MHz Typical; 775 MHz ≤ f <sub>c</sub> < 1.625 GHz Preamp off; signal input -30dBm; 0 dB attenuation 300 MHz ~ 3.25 GHz Input signal level -30 dBm, Att. Mode, Att=0dB; 20 ~ 30°C Input terminated; 0 dB attenuation; Preamp off
Third-order Intercept	> 1dBm < -60 dBc	
Input Related Spurious	< -60 dBc	
Residual Response (Inherent)	< -90 dBm	

## Rear Panel



## GRA-415 Rack Adapter Panel

For : GSP-9330/9300B, Rack Mounting (19", 6U)



## GKT-001 General Kit Set

Include :  
ADP-002  
ATN-100  
GTL-303  
GSC-002  
For: GSP-Series



## GKT-002 CATV Kit Set

Include :  
ADP-001  
ADP-101  
GTL-304  
GSC-003  
For: GSP-Series



## GKT-003 RLB Kit Set

Include :  
GAK-001  
GAK-002  
GTL-302  
GSC-004  
For: GSP-Series



## GKT-008 EMI Probe Kit Set

Include :  
ADP-002  
GTL-303  
PR-01  
PR-02  
ANT-04  
ANT-05  
For: GSP-Series





# 3.25GHz Spectrum Analyzer

## SPECIFICATIONS

### SWEEP

#### SWEEP TIME

Range	204 $\mu$ s ~ 1000 s 50 $\mu$ s ~ 1000 s	Span > 0 Hz Span = 0 Hz; Min resolution=10 $\mu$ s
Sweep Mode	Continuous; Single	
Trigger Source	Free run; Video; External	
Trigger Slope	Positive or negative edge	

### RF PREAMPLIFIER

Frequency Range	1 MHz ~ 3.25 GHz	
Gain	18 dB	Nominal (installed as standard)

### FRONT PANEL INPUT/OUTPUT

#### RF INPUT

Connector Type	N-type female	
Impedance	50 $\Omega$	Nominal
VSWR	<1.6 :1	300 kHz ~ 3.25 GHz ; Input attenuator $\geq$ 10 dB

#### POWER FOR OPTION

Connector Type	SMB male	
Voltage/Current	DC +7V/500 mA max	With short-circuit protection

#### USB HOST

Connector Type	A plug	
Protocol	Version 2.0	Support Full/High/Low speed

#### MICRO SD SOCKET

Protocol	SD 1.1	
Support Cards	Micro SD, Micro SDHC	Up to 32GB capacity

### REAR PANEL INPUT/OUTPUT

#### REFERENCE OUTPUT

Connector Type	BNC female	
Output Frequency	10 MHz	Nominal
Output Amplitude	3.3V CMOS	
Output Impedance	50 $\Omega$	

#### REFERENCE INPUT

Connector Type	BNC female	
Input Reference Frequency	10 MHz	
Input Amplitude	-5 dBm ~ +10 dBm	
Frequency Lock Range	Within $\pm$ 5 ppm of the input reference frequency	

#### ALARM OUTPUT

Connector Type	BNC female	Open-collector
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#### TRIGGER INPUT/GATED SWEEP INPUT

Connector Type	BNC female	
Input Amplitude	3.3V CMOS	
Switch	Auto selection by function	

#### LAN TCP/IP INTERFACE

Connector Type	RJ-45	
Base	10Base-T; 100Base-Tx; Auto-MDIX	

#### USB DEVICE

Connector Type	B plug	
Protocol	Version 2.0	For remote control only; supports USB TMC Supports Full/High/Low speed

#### IF OUTPUT

Connector Type	SMA female	
Impedance	50 $\Omega$	Nominal
IF Frequency	886 MHz	Nominal
Output Level	-25 dBm	10 dB attenuation; RF input : 0 dBm @ 1 GHz

#### EARPHONE OUTPUT

Connector Type	3.5mm stereo jack, wired for mono operation	
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#### VIDEO OUTPUT

Connector Type	DVI-I (integrated analog and digital), Single Link. Compatible with VGA or HDMI standard through adapter	
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#### RS-232C INTERFACE

Connector Type	D-sub 9-pin female	Tx, Rx, RTS, CTS
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#### GPIO INTERFACE (OPTIONAL)

Connector Type	IEEE-488 bus connector	
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#### AC POWER INPUT

Power Source	AC 100 V ~ 240 V, 50/60 Hz	Auto range selection
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### GENERAL

Internal Data Storage	16 MB nominal	
Power Consumption	< 65 W	
Warm-up Time	< 45 minutes	
Temperature Range	+5 °C ~ +45 °C -20 °C ~ +70 °C	Operating Storage
Dimensions & Weight	350(W) x 210(H) x 100(D) mm, Approx. 4.5kg 13.8(W) x 8.3(H) x 3.9(D) inch, Approx. 9.9lb	Inc. all options (Basic + TG + GPIB + Battery)

### TRACKING GENERATOR (OPTIONAL)<sup>5</sup>

Frequency Range	100 kHz ~ 3.25 GHz	
Output Power	-50 dBm ~ 0 dBm in 0.5 dB steps	
Absolute Accuracy	$\pm$ 0.5 dB	@160 MHz, -10 dBm, Source attenuation 10 dB, 20 ~ 30°C
Output Flatness	Referenced ~ 160 MHz, -10 dBm 100 kHz ~ 2 GHz 2 GHz ~ 3.25 GHz	$\pm$ 1.5 dB $\pm$ 2 dB Referenced to -10 dBm Typical, output level = -10 dBm
Output Level Switching Uncertainty	$\pm$ 0.8 dB	
Harmonics	< -30 dBc	
Reverse Power	+30 dBm max.	
Connector Type	N-type female	
Impedance	50 $\Omega$	Nominal
Output VSWR	< 1.6:1	300 kHz ~ 3.25 GHz, source attenuation $\geq$ 12 dB

[5] The minimum RBW filter is 10kHz when the TG output is ON.

Note : The specifications apply when the GSP-9330 is powered on for at least 45 minutes to warm-up to a temperature of 20 °C to 30 °C, unless specified otherwise.

## ORDERING INFORMATION

**GSP-9330** 3.25 GHz Spectrum Analyzer

**EMC Pretest Solution :** **GKT-008** EMI Near Field Probe Set  
**GLN-5040A** Line Impedance Stabilization Network  
**GIT-5060** Isolation Transformer  
**GPL-5010** Transient Limiter

### ACCESSORIES :

Power Cord, Certificate of Calibration, CD-ROM (with Quick Start Guide, User Manual, Programming Manual, SpectrumShot Software, SpectrumShot Guide & IVI Driver)

### OPTION

Opt.01 Tracking Generator

Opt.02 GPIB Interface

### OPTIONAL ACCESSORIES

**GSC-009** Soft Carrying Case

**GRA-415** Rack Adapter Panel

### FREE DOWNLOAD

SpectrumShot PC Software for Windows System (available on GW Instek website)  
 IVI Driver Supports LabVIEW/LabWindows/CVI Programming (available on NI website)

**GLN-5040A** Two Line V-Network

For: GSP-9330



**GPL-5010** Transient Limiter

For: GSP-9330



**GIT-5060** Isolation Transformer

For: GSP-9330

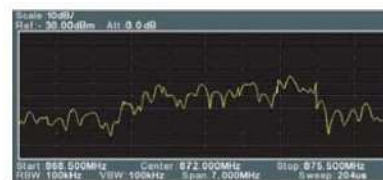


## A. FAST SIGNAL SWEEP

### FM Signal Monitoring



### Taiwan Telecom Signals



For spectrum analyzer, speed is the most important specification. GSP-9330 provides sweep speed up to 204  $\mu$ s. Users, via high speed sweep time, can identify and analyze various fast or transient signals

such as frequency/amplitude modulation signals, Bluetooth frequency hopping signals, tuned oscillator or other interfering signals under ISM Band.

## B. MODULATED SIGNAL ANALYSIS

### 2FSK Signal Analysis



2FSK

### ASK/FSK Signal Demodulation & Analysis



FSK



ASK

### AM/FM Signal Demodulation & Analysis



FM



AM

2FSK modulation, for its features of low design cost and low electricity consumption, is widely used by RF communications applications with low power and low data transmission speed characteristics. Nowadays, 2FSK modulation technology has been applied in various products and systems such as consumer electronics, automotive electronics, RFID, auto reading electricity meter, and industrial control devices, etc. 2FSK signal analysis measures parameters including carrier power, FSK frequency deviation, carrier frequency, and carrier frequency offset. Users can set the criterion in frequency deviation and carrier offset for fast test result determination.

RFID and optical communications systems often use Amplitude Shift Keying (ASK). Applications such as wireless telephone, paging systems, and RFID, etc. utilize Frequency Shift Keying (FSK). ASK/FSK demodulation and

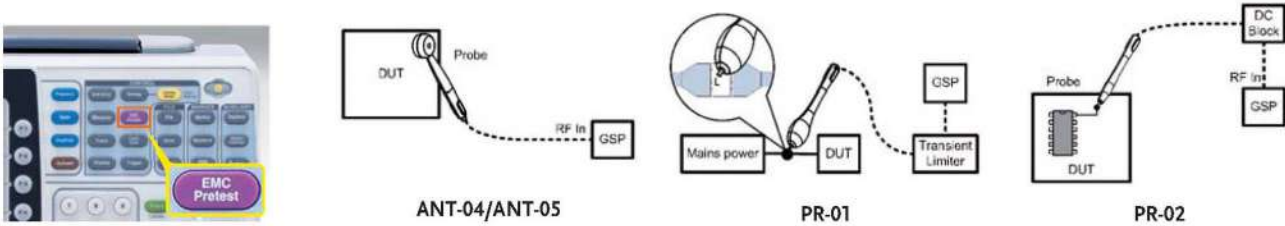
analysis measures parameters including ASK depth, frequency deviation, carrier power, carrier frequency offset, symbol, and waveform. Users can set ASK depth, frequency deviation, carrier power and carrier offset for Pass/Fail testing result. Data message is provided to determined preamble & sync function.

AM/FM Signal Analysis measures parameters including AM depth, frequency deviation, modulation rate, carrier power, carrier frequency offset and SINAD. Users can set the criterion in AM depth, frequency deviation, carrier power and carrier offset for fast test result determination. The GSP-9330 has a convenient AM/FM demodulation function to tune into AM or FM broadcast signals and listen to the demodulated signals.



3.25GHz Spectrum Analyzer

C. EMC PRETEST SOLUTION



GSP-9330 has the built-in EMI dedicated 200/9k/120k/1MHz filter, 20dB low noise amplifier and Quasi-Peak/Average detection mode to conduct radiation and conduction tests after collocating with the probe set.

GKT-008, the radiation test probe set, provides a complete near field test probe set to simplify the complex measurement procedures and to simulate 3m/10m far field tests from the labs. Using GKT-008 can greatly save engineers' debugging time and the money for going back and forth to the

labs. GKT-008 can collocate with the Tracking Generator function of GSP-9330 to conduct EMS tests.

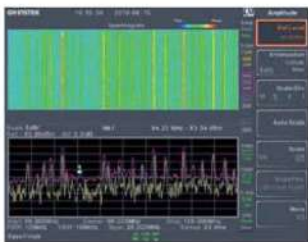
For conduction tests, GSP-9330 can collocate with LISN and Isolation Transformer to conduct electromagnetic conduction tests. If users concern EUT's large voltage variation or complexity, applying a Transient Limiter will make test equipment safer.

EMC Pretest Instruments Provided by GW Instek Are as Follows :		
GSP-9330	Spectrum Analyzer	Built-in complete EMC pretest solution
GKT-008	EMI Near Field Probe Set	Provide probe set for near field signals, including ANT-04/ANT-05 field sensor PR-01 AC high voltage probe PR-02 Source contact probe
GLN-5040A	LISN	LISN required by EMI conduction tests and it meets CISPR16-1-2:2006 regulations
GIT-5060	Isolation Transformer	Different mains have different current leakages that will cause systems to have short circuit Isolation transformer prevents short circuit by isolating current loop
GPL-5010	Transient Limiter	Transient Limiter will make test equipment safer if EUT has large voltage variation or complexity

For more detailed information about EMC Pretest Solution, please visit "DETAILED EMC PRETEST SOULTION" documents.

D. GRAPHIC PROCESSING OF SIGNAL MONITORING

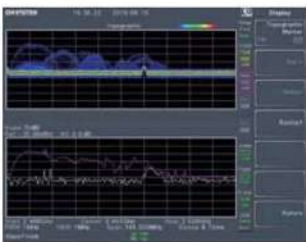
Observe FM Signals by Spectrogram



Spectrogram can simultaneously display power, frequency, and time. Frequency and power variation according to time changes can also be tracked. Especially, the intermittently appeared signals can be identified. Users, by using Spectrogram, can analyze the stability of signal versus time or identify the intermittently appeared interference signals in the communications system. Users can use two markers to find out the relation of power to frequency and time.

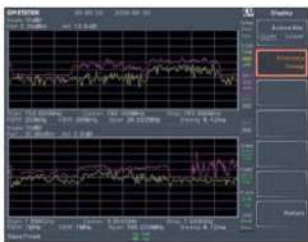
Topographic uses color shade to show the probability distribution of signal appearance. This function allows users to directly understand the

Observe WiFi Signals by Topographic



process of signal variation according to time changes that is beneficial to observe intermittent feeble signals or electromagnetic interference signals. Users can use two makers to find out the relation of power to frequency and percentage.

Observe 4G LTE Signals by Split-Window Display



Split-Window allows two independent observations that are very convenient for monitoring two different frequency bandwidths.

### Channel Power Measurement



#### ACPR

Telecommunications and broadcasting service carriers will encounter distorted signals caused by adjacent channels' inter-modulation while transmitting modulated signals using communications channels. If the distorted signals are too large the communications quality of adjacent channels will be affected. The ACPR measurement can examine the leakage status that is conducive to identifying interference source.

The OCBW measurement can simultaneously display OCBW, channel power and PSD. OCBW's unit is shown by percentage. A measurement area containing bandwidth will be shown when OCBW is in use.

#### OCBW

### Spectrum Emission Mask

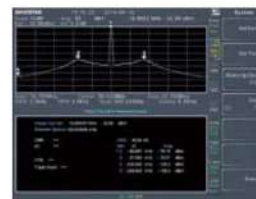


#### SEM

SEM measures out-of-channel emission which is defined by corresponding in-channel power. Users can set main channel's parameters, out-of-channel range, and limit line, etc.

GSP-9330 has the built-in SEM settings of 3 GPP, WLAN 802.11b/g/n, Wimax 802.16 and self-defined communications system. SEM supports the Pass/Fail test function and lists frequency range for surpassing each out-of-channel limit. An alarm signal will be triggered if any measurement results that are not matched with SEM.

### CATV System Parameter Tests



#### CNR/CSO/CTB

The built-in CNR/CSO/CTB functions of GSP-9330 are ideal for measuring performance of CATV amplifier and system.

Note: General CATV is 75Ω. For GSP-9330, a 50 – 75 ohm adapter is needed.

### TOI (Third Order Intercept)



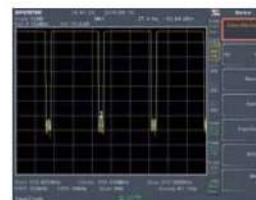
Users can measure the linearity of non-linear systems and components such as receiver, low-noise amplifier and mixer by TOI which automatically tests effective carrier and measures inter-modulation sidebands.

### Harmonic



Harmonic can easily measure the amplitude of fundamental frequency and as high as ten orders of harmonic frequency. This function can also measure amplitude(dBc) which is the ratio of harmonic and corresponding fundamental carrier. Total harmonic distortion (THD) can also be calculated by this function. The best harmonic information can be obtained by adjusting RBW.

### Time Domain Power



Users can go to zero span setting and open marker to observe burst signals when measuring burst signal in time domain is required.

### Phase Jitter

The Phase Jitter function can rapidly measure phase noise produced by RF signal source's and oscillator's carrier deviation. This function can directly convert signal jitter to phase (rad) and time (ns).

### Marker Noise

The marker noise function calculates the average noise level over a bandwidth of 1Hz, referenced from the marker position.

### Gated Sweep

Radar or TDMA communications systems, via intermittently turning On/Off output power, control transmission signals. In order to monitor the power spectrum during the transmission process, the Gated Sweep function can initiate measurement only when signals appear. This function is ideal for measuring burst signals such as GSM or WLAN.



# 3.25GHz Spectrum Analyzer

## F. PRODUCTION LINE APPLICATIONS

### Sequence Function



The sequence function allows users to edit a sequence formulated by a series of steps directly from the instrument. Pause and delay can be inserted in the sequence to observe the test results. There are five sets of sequence for selection. Each sequence allows editing of 20 steps. Different sequence can be interactive and support each other. This function provides automatic editing without using the PC that is very convenient for assembly lines in which execute routine test procedures.

### Shorten Warm-Up Time

GSP-9330 utilizes the patented design of high efficient heat dissipation and feedback temperature control. After the instrument is turned on, the internal instrument can rapidly maintain a stable temperature so as to provide accurate amplitude measurement and deliver the frequency measurement with 0.025 ppm frequency stability.

### Limit Line Function



The limit line function, based upon the preset criteria of passing the test, can be used to directly determine whether the DUT passes the test. Test result not only can be shown on the LCD screen, but also an alarm signal output indication from the rear panel which is done by connecting a speaker or light device to show the test result.

### Wake-Up Clock

Users can set up automatic wake-up time for each day of the week. By so doing, the purpose of GSP-9330 pre wake-up can be achieved. Pre wake-up is ideal for the lower temperature environment to conduct tests in the preset time.

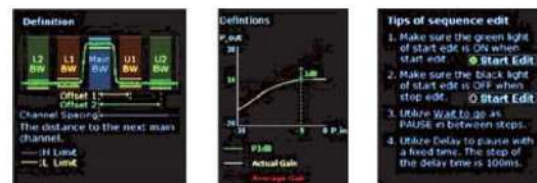
## G. USER FRIENDLY DESIGN

### Status Icons



Status Icons show the interface status, power status, alarm status and etc of GSP-9330. Users can easily understand the setting status and test results of the instrument.

### Definition Help



The built-in Definition Help function allows users to immediately understand the parameters of Channel Power, OCBW, ACPR, SEM, Phase Jitter, N-dB Bandwidth & P1dB items so as to save time on reading user manual.

## H. COMMUNICATIONS INTERFACE

### Various Interface



Provide USB Host, RS-232, LXI C(LAN), and GPIB(option) instrument control interface. Supported programs comply with IEEE488.2.

### File Storage and Video Output



DVI Interface

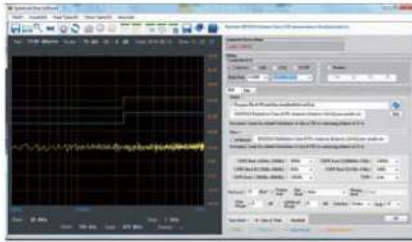


USB Device/MicroSD

Provide USB Device, MicroSD interface for file storage. Quick Save function is also available for users to quickly retrieve display. Support DVI with 800 x 600 resolutions.

## I. SOFTWARE SUPPORT

### PC Software - SpectrumShot



EMI Pretest Mode

Users can use the external software Spectrum Shot for EMI pretest report management and assessment, remote control and waveform data recording for long periods of time.

Under the EMI Pre-test Mode, users can select the required CISPR EMI regulation for conduction and radiation measurement.



Get Trace Mode

Under Get Trace mode, users can record the waveform data for long periods of time. It can be applied to spectrum monitoring for detecting any abnormal radio signals. The software will send out e-mail to inform users if any abnormal situation occurs.

Under the Remote Control mode, users can monitor wireless interference signals or observe signals for long periods of time.



Remote Control Mode

### IVI Driver & LabVIEW Support

IVI Driver Supports LabView & LabWindows/CVI Programming. It is available on NI website.

## J. VARIOUS AUGMENTING OPTIONS

### Tracking Generator



### 3dB Frequency Bandwidth

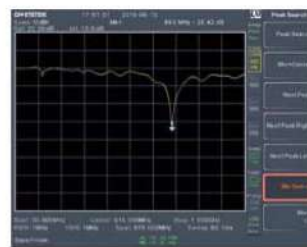
TG option provides 0 to -50 dBm synchronized sweep output, conducts scalar network analysis (S11, S21) function as well as P1dB.

The built-in tracking generator can swiftly and easily measure frequency response of cable loss, filter bandwidth, amplifier gain, mixer conversion loss, etc. The N-dB Bandwidth function measures 3dB bandwidth of Bandpass filter. SWR bridge should be connected with tracking generator to measure the return loss of antenna or filter.

### Scalar Network Analysis



### Reflection Loss



### P1dB Point Measurement



All active components have linear dynamic range for power output. Once output power reaches the maximum level, active component will enter the non-linear saturated area of P1dB point and cease amplifying signal intensity as well as produce harmonic distortion. It is very useful for P1dB point measurement in active components such as low noise amplifier, mixer and active filter.

### Soft Carrying Case



Optional soft carrying case(GSC-009) provides convenience and protection to the instrument. GSP-9330 is equipped with 8.4 inches 800 x 600 pixels LCD display which yields clearer display results for outdoor operations.



# 3GHz Spectrum Analyzer

Patent No. ZL201220347963.5



## GSP-9300B (9kHz~3GHz)



### FEATURES

- \* Frequency Range : 9kHz ~ 3 GHz
- \* 0.025ppm Frequency Stability and 1ppm Aging Rate
- \* Built-in Preamp, 50dB Attenuator, and Sequence Function
- \* RBW : 1Hz ~ 1MHz
- \* Sensitivity : -149dBm/Hz (@PreAmp on)
- \* Built-in AM/FM Demodulation & Analysis
- \* Built-in P1dB point, Harmonic, Channel Power, N-dB Bandwidth, OCBW, ACPR, SEM, TOI, CNR, CTB, CSO, Noise Marker, Frequency Counter, Time Domain Power, Gated Sweep
- \* Built-in Spectrogram, Topographic and Dual-View Display Modes
- \* Remote Control Software : SpectrumShot
- \* Remote Control Interface : LAN, USB, RS-232
- \* Options : Tracking Generator, GPIB Interface

### GSC-009 Soft Carrying Case

For: GSP-9330/9300B



GSP-9300B is a 3GHz spectrum analyzer, which meets general RF measurement requirements. It provides a frequency stability of 0.025ppm and collocates with a built-in preamplifier, which has a minimum noise floor of -149dBm / Hz. More than 20 measurement applications are also available, including AM/FM modulation analysis, ACPR /OCBW/CHPW, CATV parameters etc.

For signal monitoring and processing, GSP-9300B provides Topographic and Spectrogram display modes to analyze the signal through the change of color temperature. The split-window display mode can set parameters for both displays and measure two different frequency bands at the same time. Friendly user interface provides functions such as status icon display, online help, multi-language support, and sequence setting. The patented heat-conducting design can greatly shorten the time for the machine to power up. The preset power-on function can improve the efficiency when it is used in the production line. Communications interfaces include USB, RS-232, LXI, MicroSD, GPIB interface, and DVI output.

In summary, GSP-9300B is a stable, lightweight and suitable test equipment for various applications. It is very ideal for the education market, production line, general signal monitoring, and more importantly, its price is beyond your imagination. It is the preferred product for limited budgets.

### SPECIFICATIONS

#### FREQUENCY

##### FREQUENCY

Range	9 kHz ~ 3 GHz
Resolution	1 Hz

##### FREQUENCY REFERENCE

Accuracy	$\pm(\text{period since last adjustment} \times \text{aging rate}) + \text{stability over temperature} + \text{supply voltage stability}$	1 year after last adjustment 0 ~ 50 °C
Aging Rate	$\pm 1 \text{ ppm max.}$	
Frequency Stability Over Temperature	$\pm 0.025 \text{ ppm}$	
Supply Voltage Stability	$\pm 0.02 \text{ ppm}$	

##### FREQUENCY READOUT ACCURACY

Start, Stop, Center, Marker	$\pm(\text{marker frequency indication} \times \text{frequency reference accuracy} + 10\% \times \text{RBW} + \text{frequency resolution})$	
Trace Points	Max. 601 points, Min. 6 points	

##### MARKER FREQUENCY COUNTER

Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz	
Accuracy	$\pm(\text{marker frequency indication} \times \text{frequency reference accuracy} + \text{counter resolution})$	RBW/Span $\geq 0.02$ ; Mkr level to DANL $\geq 30 \text{ dB}$

##### FREQUENCY SPAN

Range	0 Hz (zero span), 100 Hz ~ 3 GHz	
Resolution	1 Hz	
Accuracy	$\pm \text{frequency resolution}^1$	RBW : Auto

##### PHASE NOISE

Offset from Carrier		$F_c=1\text{GHz}; \text{RBW}=1\text{kHz}, \text{VBW}=10\text{Hz}$ Average $\geq 40$
10 kHz	$< -88 \text{ dBc/Hz}$	Typical <sup>2</sup>
100 kHz	$< -95 \text{ dBc/Hz}$	Typical
1 MHz	$< -113 \text{ dBc/Hz}$	Typical

##### RESOLUTION BANDWIDTH (RBW) FILTER

Filter Bandwidth	1 Hz ~ 1 MHz in 1-3-10 sequence 200 Hz, 9 kHz, 120 kHz, 1 MHz	-3dB bandwidth -6dB bandwidth Nominal <sup>3</sup>
Accuracy	$\pm 8\%$ , RBW = 1MHz; $\pm 5\%$ , RBW < 1MHz	Normal Bandwidth ratio: -60dB:-3dB
Shape Factor	$< 4.5 : 1$	

##### VIDEO BANDWIDTH (VBW) FILTER

Filter Bandwidth	1 Hz ~ 1 MHz in 1-3-10 sequence	-3dB bandwidth
------------------	---------------------------------	----------------

[1] Frequency Resolution = Span / (Trace points - 1)

[2] Typical specifications in this datasheet mean that the performance can be exhibited in 80% of the units with a 95% confidence level over the temperature range 20 to 30 °C. They are not covered by the product warranty.

[3] Nominal values indicate expected performance. They are not covered by the product warranty.

### AMPLITUDE

#### AMPLITUDE RANGE

Measurement Range	100 kHz ~ 1 MHz	DANL 18 dBm
	1 MHz ~ 10 MHz	DANL to 21 dBm
	10 MHz ~ 3 GHz	DANL to 30 dBm

#### ATTENUATOR

Input Attenuator Range	0 ~ 50 dB, in 1 dB steps	Auto or manual setup
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#### MAXIMUM SAFE INPUT LEVEL

Average Total Power	$\leq +33 \text{ dBm}$	Input attenuator $\geq 10 \text{ dB}$
DC Voltage	$\pm 50 \text{ V}$	

#### 1 dB GAIN COMPRESSION

Total Power at 1st Mixer	$> 0 \text{ dBm}$	Typical ; $F_c \geq 50 \text{ MHz}$ ; preamp. off
Total Power at the Preamp	$> -22 \text{ dBm}$	Typical ; $F_c \geq 50 \text{ MHz}$ ; preamp. on Mixer power level (dBm) = input power (dBm) - attenuation (dB)



**GSP-9300B**

## SPECIFICATIONS

### DISPLAYED AVERAGE NOISE LEVEL (DANL)<sup>4</sup>

Preamp off	0 dB attenuation; RF Input is terminated with a 50Ω load. RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = - 60 dBm; trace average ≥ 40	
9 kHz~100 kHz	< -93 dBm	Nominal
100 kHz~1 MHz	< -90 dBm - 3 x (f/100 kHz) dB	Nominal
1 MHz~10 MHz	< -122 dBm	Nominal
2.7 ~ 3 GHz	< -116 dBm	Nominal
Preamp on	0 dB attenuation; RF Input is terminated with a 50Ω load. RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = - 60 dBm; trace average ≥ 40	
100 kHz~1 MHz	< -108 dBm - 3 x (f/100 kHz) dB	Nominal
1 MHz~10 MHz	< -142 dBm	Nominal
10 MHz~3 GHz	< -142 dBm + 3 x (f/1 GHz) dB	Nominal

[4] DANL spec excludes spurious response.

### LEVEL DISPLAY RANGE

Scales	Log, Linear	Log scale Linear scale Single/Split Windows
Units	dBm, dBmV, dBuV, V, W	
Marker Level Readout	0.01 dB	
Level Display Modes	Trace, Topographic, Spectrogram	Can be setup for each trace separately
Number of Traces	4	
Detector	Positive-peak, negative-peak, sample, normal, RMS(not Video), Quasi-Peak, Average	
Trace Functions	Clear & Write, Max/Min Hold, View, Blank, Average	

### ABSOLUTE AMPLITUDE ACCURACY

Absolute Point	Center=160 MHz ; RBW 10 kHz; VBW 1 kHz; span 100 kHz; log scale; 1 dB/div; peak detector; 23°C±1°C; Signal at Reference Level	
Preamp Off	± 0.3 dB	Ref level 0 dBm; 10 dB RF attenuation
Preamp On	± 0.4 dB	Ref level -30dBm; 0dB RF attenuation

### FREQUENCY RESPONSE

Preamp Off	Attenuation:10dB;Reference:160MHz;20~30°C	
100 kHz ~ 2.0 GHz	± 0.5 dB	
2GHz ~ 3 GHz	± 0.7 dB	
Preamp On	Attenuation:0dB;Reference:160MHz;20~30°C	
1 MHz ~ 2 GHz	± 0.6 dB	
2 GHz ~ 3 GHz	± 0.8 dB	

### ATTENUATION SWITCHING UNCERTAINTY

Attenuator Setting	0 ~ 50 dB in 1 dB step	Reference : 160 MHz, 10dB attenuation
Uncertainty	± 0.25 dB	

### RBW FILTER SWITCHING UNCERTAINTY

1 Hz ~ 1 MHz	± 0.25 dB	Reference : 10 kHz RBW
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### LEVEL MEASUREMENT UNCERTAINTY

Overall Amplitude Accuracy	± 1.5 dB	20~30°C; frequency >1MHz;Signal input 0~-50dBm;Reference level 0~-50dBm; Input attenuation 10dB;RBW 1kHz;VBW 1kHz; after cal; Preamp Off
	± 0.5 dB	Typical

### SPURIOUS RESPONSE

Second Harmonic Intercept	Preamp off; signal input -30dBm; 0dB attenuation	
	+35 dBm	Typical; 10MHz<fc<775MHz
	+60 dBm	Typical; 775MHz<fc<1.625GHz
Third-order Intercept	Preamp off; signal input -30dBm; 0 dB attenuation	
	> 1dBm	300 MHz ~ 3 GHz
Input Related Spurious	< -60 dBc	Input signal level -30 dBm, Att. Mode, Att = 0dB; 20 ~ 30°C
Residual Response(Inherent)	< -90 dBm	Input terminated;0dB attenuation;Preamp off

### SWEEP

SWEEP TIME		
Range	204 μs ~ 1000 s	Span > 0 Hz
	50 μs ~ 1000 s	Span = 0 Hz; Min resolution = 10μs
Sweep Mode	Continuous; Single	
Trigger Source	Free run; Video; External	
Trigger Slope	Positive or negative edge	

### RF PREAMPLIFIER

SWEEP TIME		
Frequency Range	1 MHz ~ 3 GHz	Nominal (installed as standard)
Gain	18 dB	

## Rear Panel



## GRA-415 Rack Adapter Panel

For : GSP-9330/9300B, Rack Mounting (19", 6U)



## GKT-001 General Kit Set

Include :  
ADP-002  
ATN-100  
GTL-303  
GSC-002  
For: GSP-Series



## GKT-002 CATV Kit Set

Include :  
ADP-001  
ADP-101  
GTL-304  
GSC-003  
For: GSP-Series



## GKT-003 RLB Kit Set

Include :  
GAK-001  
GAK-002  
GTL-302  
GSC-004  
For: GSP-Series



## GKT-008 EMI Probe Kit Set

Include :  
ADP-002  
GTL-303  
PR-01  
PR-02  
ANT-04  
ANT-05  
For: GSP-Series





# 3GHz Spectrum Analyzer

## SPECIFICATIONS

### FRONT PANEL INPUT/OUTPUT

#### RF INPUT

Connector Type	N-type female	Nominal
Impedance	50 $\Omega$	
VSWR	<1.6 :1	300 kHz ~ 3 GHz ; Input attenuator $\geq$ 10 dB

#### POWER FOR OPTION

Connector Type	SMB male	With short-circuit protection
Voltage/Current	DC +7V/500 mA max	

#### USB HOST

Connector Type	A plug	Support Full/High/Low speed
Protocol	Version 2.0	

#### MICRO SD SOCKET

Protocol	SD 1.1	Up to 32GB capacity
Support Cards	Micro SD, Micro SDHC	

### REAR PANEL INPUT/OUTPUT

#### REFERENCE OUTPUT

Connector Type	BNC female	Nominal
Output Frequency	10 MHz	
Output Amplitude	3.3V CMOS	
Output Impedance	50 $\Omega$	

#### REFERENCE INPUT

Connector Type	BNC female	
Input Reference Frequency	10 MHz	
Input Amplitude	-5 dBm ~ +10 dBm	
Frequency Lock Range	Within $\pm$ 5 ppm of the input reference frequency	

#### ALARM OUTPUT

Connector Type	BNC female	Open-collector
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#### TRIGGER INPUT/GATED SWEEP INPUT

Connector Type	BNC female	
Input Amplitude	3.3V CMOS	
Switch	Auto selection by function	

#### LAN TCP/IP INTERFACE

Connector Type	RJ-45	
Base	10Base-T; 100Base-Tx; Auto-MDIX	

#### USB DEVICE

Connector Type	B plug	For remote control only; supports USB TMC
Protocol	Version 2.0	Supports Full/High/Low speed

#### IF OUTPUT

Connector Type	SMA female	Nominal
Impedance	50 $\Omega$	Nominal
IF Frequency	886 MHz	10 dB attenuation; RF input : 0 dBm @ 1 GHz
Output Level	-25 dBm	

#### EARPHONE OUTPUT

Connector Type	3.5mm stereo jack, wired for mono operation	
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#### VIDEO OUTPUT

Connector Type	DVI-I (integrated analog and digital), Single Link. Compatible with VGA or HDMI standard through adapter	
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#### RS-232C INTERFACE

Connector Type	D-sub 9-pin female	Tx , Rx , RTS , CTS
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#### GPIO INTERFACE (OPTIONAL)

Connector Type	IEEE-488 bus connector	
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#### AC POWER INPUT

Power Source	AC 100 V ~ 240 V, 50/60 Hz	Auto range selection
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#### GENERAL

Internal Data Storage	16 MB nominal	
Power Consumption	< 65 W	
Warm-up Time	< 30 minutes	
Temperature Range	+5 °C ~ + 45 °C -20 °C ~ + 70 °C	Operating Storage
Dimensions & Weight	350(W) x 210(H) x 100(D) mm, Approx. 4.5kg 13.8(W) x 8.3(H) x 3.9(D) inch, Approx. 9.9lb	Inc. all options (Basic + TG + GPIB + Battery)

#### TRACKING GENERATOR (OPTIONAL)<sup>5</sup>

Frequency Range	100 kHz ~ 3 GHz	
Output Power	-50 dBm ~ 0 dBm in 0.5 dB steps	@160 MHz, -10 dBm, Source attenuation 10 dB, 20 ~ 30°C
Absolute Accuracy	$\pm$ 0.5 dB	
Output Flatness	Referenced ~ 160 MHz, -10 dBm 100 kHz ~ 2 GHz 2 GHz ~ 3 GHz	$\pm$ 1.5 dB $\pm$ 2 dB Referenced to -10 dBm Typical, output level = -10 dBm
Output Level Switching Uncertainty	$\pm$ 0.8 dB	
Harmonics	< -30 dBc	
Reverse Power	+30 dBm max.	
Connector Type	N-type female	
Impedance	50 $\Omega$	Nominal
Output VSWR	< 1.6:1	300 kHz ~ 3 GHz, source attenuation $\geq$ 12 dB

[5] The minimum RBW filter is 10kHz when the TG output is ON.

Note : The specifications apply when the GSP-9300B is powered on for at least 30 minutes to warm-up to a temperature of 20 °C to 30 °C, unless specified otherwise.

## ORDERING INFORMATION

### GSP-9300B 3GHz Spectrum Analyzer

#### ACCESSORIES :

Power Cord, Certificate of Calibration, CD-ROM (with Quick Start Guide, User Manual, Programming Manual, SpectrumShot Software, SpectrumShot Guide & IVI Driver)

#### OPTION

Opt. 01 Tracking Generator	Opt. 02 GPIB Interface
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#### OPTIONAL ACCESSORIES

GSC-009 Soft Carrying Case	GRA-415 Rack Adapter Panel
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#### FREE DOWNLOAD

SpectrumShot PC Software for Windows System (available on GW Instek website)  
IVI Driver Supports LabVIEW/LabWindows/CVI Programming (available on NI website)

# 1.8GHz Spectrum Analyzer



## GSP-818 1.8GHz Spectrum Analyzer

NEW



### FEATURES

- \* Frequency Range: 9kHz ~ 1.8GHz
- \* RBW: 10Hz ~ 3MHz, 10Hz ~ 500kHz in 1-10 steps
- \* Sensitivity: -140dBm @RBW 10Hz, PreAmp On
- \* Built-in AM/FM Demodulation
- \* Bandwidth Zoom Function
- \* Measurement Function: ACPR/OCBW/CHPW, NdB Bandwidth, Freq. Counter, Noise Marker, Limit Line
- \* Built-in 20dB Preamplifier Standard
- \* Interface: LAN, USB
- \* Screen: 10.4" SVGA Output (800x600)
- \* Options: Tracking Generator, EMI Filter & Detector (via software keycode)

GSP-818, a 1.8GHz basic spectrum analyzer launched by GW Instek, comes standard with a 20dB preamplifier and a resolution bandwidth (RBW) of 10Hz to 3MHz. With respect to measurement functions, GSP-818 provides AM / FM signal demodulation, ACPR / OCBW / CHPW, Counter, Limit Line and other functions. The built-in Time Spec function can be used to view the correlation between power, frequency and time. The bandwidth Zoom In / Out function can view the details of the signal in different spans. With these functions, users can perform a wider range of measurement applications.

In order to easily observe signals, GSP-818 utilizes a large 10.4-inch screen and supports a resolution of 800 \* 600. Communications interfaces include USB and LAN. In addition, GSP-818 provides two options, including TG and EMI Kit. Customers only need to purchase the corresponding software key (Software Keycode) to directly activate the option without having to send the equipment back to GW Instek, which greatly improves the operational efficiency.

### SPECIFICATIONS

FREQUENCY		
FREQUENCY		
Range	9 kHz ~ 1.8 GHz	
Resolution	1 Hz	
FREQUENCY SPAN		
Span Range	0 Hz, 100 Hz to max. frequency of instrument	
Span Uncertainty	±span / (sweep points-1)	
INTERNAL FREQUENCY REFERENCE		
Span Range	10.000000 MHz	
Reference Frequency	±[(days from last calibrate × freq aging rate) + temperature stability + initial accuracy]	
Accuracy	<2.5ppm	
Temperature Stability	<1ppm/year	
Aging Rate	15°C ~ 35°C	
SSB PHASE NOISE		
Offset From Carrier	fc-1 GHz, RBW=1 kHz, VBW=10 Hz, Average ≥ 40, 20°C ~ 30°	
10 kHz	< -82 dBc/Hz	
100 kHz	< -98 dBc/Hz	
1 MHz	< -110 dBc/Hz	
	Typical Typical Typical	
BANDWIDTH		
Resolution Bandwidth	10Hz ~ 500kHz (1-10 steps by sequence), 1MHz, 3MHz 200 Hz, 9 kHz, 120 kHz, 1 MHz	
RBW Uncertainty	< 5% < 18% < 5 : 1	
Resolution Filter Shape	< 5 : 1	
Factor(60dB:3dB)	10 Hz ~ 3 MHz	
Video Bandwidth(VBW)	10 Hz ~ 3 MHz	
	EMI Filter(6dB), Optional RBW ≤ 1 MHz RBW is 3 MHz Typical, digital and close to gaussian shape	
AMPLITUDE		
AMPLITUDE AND LEVEL		
Amplitude Measurement Range	DANL ~ + 10 dBm DANL ~ + 20 dBm	
Reference Level	-80 dBm ~ +30 dBm	
Preamp	20 dB	
Input Attenuation	0 ~ 40 dB, in 1 dB step	
Max Input DC Current	50 VDC	
Max Continuous Power	+30dBm	
	100 kHz ~ 1 MHz, Preamp Off 1 MHz ~ 1.5 GHz, Preamp Off 0.01dB by step 100 kHz ~ 1.8 GHz  Average continuous power	
DISPLAY AVERAGE NOISE LEVEL(DANL)		
Preamp Off	Input Attenuation= 0 dB, RBW=10 Hz, VBW=10Hz, Span=500Hz, ref. level=-60dBm, trace average ≥ 40	
100 kHz ~ 1 MHz	< -107 dBm	
1 MHz ~ 10 MHz	< -120 dBm	
10 MHz ~ 1 GHz	< -120 dBm	
1 GHz ~ 1.8 GHz	< -118 dBm	
Preamp On	Input Attenuation= 0 dB, RBW=10 Hz, VBW=10Hz, Span=500Hz, ref. level=-60dBm, trace average ≥ 40	
100 kHz ~ 1 MHz	< -127 dBm	
1 MHz ~ 10 MHz	< -140 dBm	
10 MHz ~ 1 GHz	< -140 dBm	
1 GHz ~ 1.8 GHz	< -138 dBm	
FREQUENCY RESPONSE		
Filter Bandwidth	20°C ~ 30°C, 30% ~ 70% relative humidity, input attenuation=10 dB, reference frequency=50 MHz	
Preamp Off, fc≥100 kHz	±0.8 dB	
Preamp On, fc≥100 MHz	±0.9 dB	
	±0.4 dB, Typical ±0.5 dB, Typical	
UNCERTAINTY AND ACCURACY		
RBW Switch Uncertainty	Reference: 10 kHz RBW at 50 MHz ±0.2 dB	
Input Attenuation Uncertainty	20°C~30°C, fc=50 MHz, Preamplifier Off, 10 dB RF attenuation 0~40 dB ±0.5 dB	
Absolute Amplitude	20°C to 30°C, fc=50 MHz, Span=200 kHz, RBW=10 kHz, VBW=10 kHz, peak detector, 10 dB RF attenuation, 95% confidence level	
Preamp Off	±0.4 dB	
Preamp On	±0.5 dB	
	Log resolution Input signal level -20 dBm Input signal level -40 dBm	
Uncertainty VSWR	±1.5 dB <1.5, Nominal	
	Input signal range 0 dBm ~ -50 dBm Input 10 dB RF attenuation, 1MHz ~ 1.8GHz	



# 1.8GHz Spectrum Analyzer

## Rear Panel



GSP-818

### SPECIFICATIONS

#### DISTORTION AND SPURIOUS RESPONSE

Second Harmonic Distortion	-65 dBc	$f_c \geq 50$ MHz, Preamp off, signal input -20 dBm, 0 dB RF attenuation, 20°C ~ 30°C
Third-order Intermodulation	+10 dBm	$f_c \geq 50$ MHz, Input double tone level -20 dBm, frequency interval 100 kHz, input attenuation 0 dB, preamplifier off, 20°C ~ 30°C
1 dB Gain Compression	>+2 dBm	Nominal, $f_c \geq 50$ MHz, 0 dB RF attenuation, Preamp off, 20°C ~ 30°C
Residual Response	Connect 50 $\Omega$ load at input port, 0 dB input attenuation, 20°C ~ 30°C <-85 dBm <-80 dBm <-60 dBc	from 100 kHz ~ 1.5 GHz from 1.5 GHz ~ 1.8 GHz -30 dBm signal at input mixer, 20°C ~ 30°C
Input Related Spurious	<-60 dBc	

#### SWEEP

##### SWEEP TIME

Range	10 ms to 3000 s 1 ms to 3000 s Continue, Single	None-zero Span Zero Span
Span Mode		

#### TRACKING GENERATOR (OPTION 01)

##### TRACKING GENERATOR OUTPUT

Frequency Range	100 kHz to 1.8GHz	
Output Power Level Range	-30 dBm to 0 dBm	
Output Power Level Resolution	1 dB	
Output Flatness	$\pm 3$ dB	
Maximum Safe Reverse Level	Average total power: 30 dBm, DC : $\pm 50$ VDC	
Impedance	50 $\Omega$	Nominal
Connector	N Type Female	

#### FREQUENCY COUNTER

##### FREQUENCY COUNTER

Resolution	1Hz, 10Hz, 100Hz, 1kHz	
Accuracy	$\pm(\text{frequency indication} \times \text{frequency reference accuracy}) + \text{counter resolution}$	

#### INPUTS AND OUTPUTS

##### RF INPUT

Impedance	50 $\Omega$	Nominal
Connector	N Type Female	

##### REFERENCE INPUT

Connector	BNC Female	
10MHz Reference Amplitude	0 dBm to +10 dBm	

##### USB

USB Host	Connector Protocol	A Plug USB 2.0 (Host End)
USB Device	Connector Protocol	B Plug 2.0 Version

##### VGA

VGA	Connector Resolution	15-pins, D-SUB(female) 800*600, 60 Hz
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#### GENERAL

Display	Type Resolution Size Color	TFT LCD 800*600 (SVGA) 10.4 inches 65536 colors
Remote Control	USB Device	B Plug, supports USB TMC
Mass Memory	LAN TCP/IP Interface	RJ-45, supports 10Base-T/100Base-Tx
Temperature	Internal Memory	256M Bytes
Dimensions & Weight	Operating Temperature	0 °C ~ 40°C
AC Power Socket	Storage Temperature	-20°C ~ 70°C
	421(W) × 221(H) × 115(D) mm ; Approx. 5.0 kg (without package)	
	100V ~ 240V, 50/60Hz	

### ORDERING INFORMATION

#### GSP-818 1.8 GHz Spectrum Analyzer

Opt. 01 Tracking Generator (Factory Installed)

Opt. 02 EMI Filter and EMI Detector (Factory Installed)

#### ACCESSORIES :

Power cord, Calibration Certificate, CD (including quick start guide, user manual, programming manual, PC software)

#### FIELD UPGRADE FOR GSP-818 OPTIONS

Opt.01 Tracking Generator for GSP-818 (License key upgrade, field installed)

Opt.02 EMI Filter and EMI Detector for GSP-818 (License key upgrade, field installed)

#### FREE DOWNLOAD

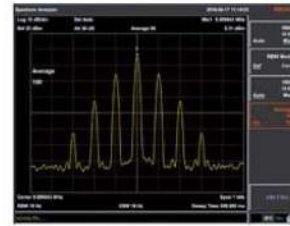
PC Software Dedicated Remote Control PC Software

## A. TRACE AND MARKER FUNCTIONS



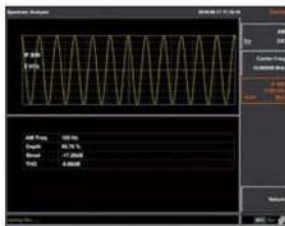
Five traces are provided, and the Marker function can be assigned to different traces.

## B. 10Hz RBW



GSP-818 provides a minimum 10Hz RBW resolution and provides a 1-10 steps setting below the 500kHz RBW to allow a flexible signal detection.

## C. AM / FM DEMODULATION



GSP-818 provides AM and FM demodulation and supports demodulated audio output.

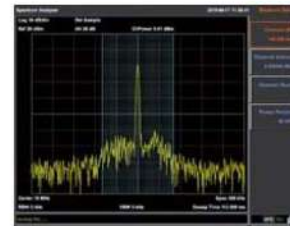
## D. ACPR, OCBW, CHPW



The ACPR function can set up to three sets of adjacent channel tests.

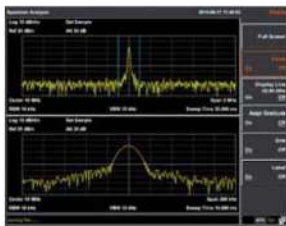


The power density of the signal can be measured through the OCBW function.



CHPW is used to measure the power strength of the signal in a user-defined channel.

## E. BANDWIDTH ZOOM



The Bandwidth Zoom function is used to view the spectral performance of the signal under different Span.

## F. TIME SPEC



This function can simultaneously view the correlation between display power, frequency and time, and it can also track frequency and power with the variation of time

## G. LIMIT LINE



It can directly judge whether the test result of the DUT is qualified according to the preset test qualification conditions. GSP-818 offers two Limit Line measurements: Windows Measure and Limit Line Measure.



# 3GHz Spectrum Analyzer & RF and Communications Trainer



## GSP-730 3GHz Spectrum Analyzer



## GRF-1300/1300A RF and Communication Trainer



### GSP-730 FEATURES

- \* Frequency Range : 150kHz ~ 3GHz
- \* Autoset Function
- \* Noise level :  $\leq -100\text{dBm}$
- \* RBW Range : 30kHz, 100kHz, 300kHz, 1MHz
- \* ACPR/CHPW/OCBW Measurement
- \* 3 Traces in Different Colors
- \* Split Window Function
- \* Limit Line Function
- \* Remote Control Software
- \* Presentation Material for Training Courses
- \* Support Interface : USB Device/Host, RS-232C
- \* 5.6" TFT LCD with VGA Output

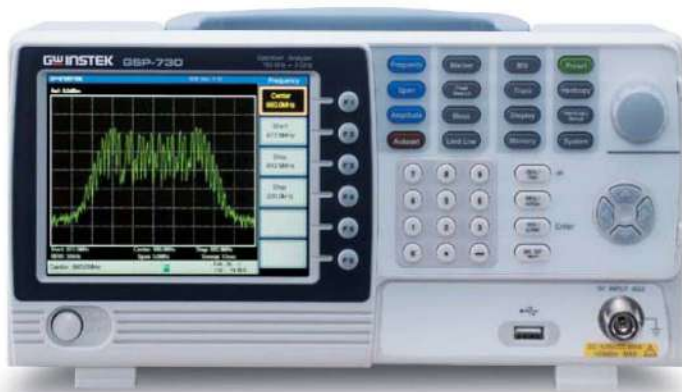
### GRF-1300/1300A FEATURES

- \* Waveform Support :  
Sine Wave : 0.1 ~ 3MHz  
Square Wave : 0.1 ~ 3MHz  
Triangle Wave : 0.1 ~ 3MHz
- \* RF Frequency : 870 ~ 920MHz
- \* AM Modulation & FM Modulation
- \* 5 On/Off Switches and 5 Test Points to Simulate 8 Failure Conditions for Learning Outcome Test
- \* USB Interface to Provide Remote Control
- \* Mixer & 2.4GHz Bandpass Filter (Only GRF-1300A)

GW Instek GSP-730 is a 3GHz Spectrum Analyzer developed mainly to fulfill the demands of RF Communication educations. Budget constraint and insufficient teaching tools are normally the two hurdles for schools to provide high-quality courses for RF communication experiments. GSP-730, featuring full functions, a moderate spectrum analyzer should provide, along with GRF-1300/1300A RF communication trainer possesses a unique position in the field as an economical turn-key solution for 3GHz RF Communication Experiment courses.

### GSP-730 SPECIFICATIONS

FREQUENCY		
Frequency Range		
Range	150kHz ~ 3GHz	
Center Frequency		
Setting Resolution Accuracy	0.1MHz $\pm 50\text{kHz}$	Frequency span : 0.3GHz ~ 2.6GHz, 20 $\pm 5^\circ\text{C}$
Frequency Span		
Range Accuracy	0 Hz (Zero Span), 1MHz ~ 3GHz $\pm 3\%$	Frequency span : 0.3GHz ~ 2.6GHz, 20 $\pm 5^\circ\text{C}$
Resolution Bandwidth (RBW)		
Offset from Carrier	30kHz, 100kHz, 300kHz, 1MHz	Nominal, -3dB bandwidth
SSB Phase Noise		
Offset from Carrier	$< -85\text{ dBc/Hz}$ @500kHz offset	Typical, RBW : 30kHz, Span:1MHz@1GHz
Spurious Response & Harmonics		
	less than -50dBc	Reference at -40dBm input
AMPLITUDE		
Reference Level		
Input Range Accuracy Unit	+20 ~ -40dBm Within $\pm 2\text{dB}$ dBm, dBV, dB $\mu\text{V}$	Reference at 1GHz, SPAN:5MHz
Average Noise Level		
	$\leq -100\text{dBm}$	Typical, center frequency:1GHz RBW:30kHz
Frequency Characteristics		
	@300MHz~2.6GHz @80~300MHz, 2.6~3GHz	$\pm 3.0\text{dB}$ $\pm 6.0\text{dB}$
SWEEP		
Sweep Time		
Range Accuracy	300ms ~ 8.4s, auto $\pm 2\%$	Not adjustable Frequency span : full span
RF INPUT		
Impedance VSWR Max Damage Level Connector	50 ohm less than 2.0@input att $\geq 10\text{dB}$ +30dBm(CW average power), 25VDC N-type female	Nominal
INTERFACE		
RS-232C USB Connector VGA Output Display	Sub-D female-D 9 pins USB Host/Device full speed supported Sub-D female 15 pins 640 x 480 RGB color LCD	
GENERAL		
Temperature Range	Operating: 5 ~ 45 $^\circ\text{C}$  Storage: -20 ~ 60 $^\circ\text{C}$ less than 45 $^\circ\text{C}$ / 90%RH	Guaranteed at 25 $\pm 5^\circ\text{C}$ , without soft carrying case Less than 60 $^\circ\text{C}$ / 70%RH
Operating Humidity Dimensions & Weight	296 (W) x 153 (H) x 105 (D) mm, Approx. 2.2kg	
Power Source	AC 100~240V, 50/60Hz	



**GSP-730**

**Rear Panel**



**GRF-1300 Front Panel**



**GRF-1300A Front Panel**



GRF-1300/1300A SPECIFICATIONS		
	GRF-1300A	GRF-1300
<b>BASE BAND</b>		
Waveforms	Sine, Square, Triangle	Sine, Square, Triangle
Frequency Range	0.1~3MHz , Step : 10kHz	0.1~3MHz , Step : 10kHz
Amplitude	≥1.5Vpp ≥0.75Vpp into 50 Ohm	≥1.5Vpp
Harmonic Distortion	≤-30dBc	≤-30dBc
<b>RF/FM ANALYSIS</b>		
Frequency Accuracy	±0.15MHz	±0.15MHz
Adjustable Range	≥45MHz (870M ~ 920MHz), Step : 1MHz	≥45MHz (870M ~ 920MHz), Step : 1MHz
Power Range	≥-15dBm	≥-15dBm
<b>FM</b>		
Max Frequency Deviation	>3MHz	>3MHz
<b>AM</b>		
Peak Difference	≥-18dBm	≥-18dBm
<b>MIXER</b>		
LO + IF	≥-35dBm	-
LO - IF	≥-35dBm	-
<b>MIXER + MODULATION</b>		
	≥-60dBm	-
<b>BANDPASS FILTER</b>		
Frequency Centre: 2.4GHz	Bandwidth: ±20MHz	-
<b>INTERFACE</b>		
USB Device	USB Type B	USB Type B
<b>DIMENSIONS &amp; WEIGHT</b>		
165(W) x 155(H) x 90(D)mm/6.5(W) x 6.1(H) x 3.5(D)in, Approx. 1.2kg/2.6lb		

## ORDERING INFORMATION

**GSP-730** 3GHz Spectrum Analyzer  
**GRF-1300/1300A** RF and Communication System Trainer

### ACCESSORIES :

**GSP-730** : Quick start manual x 1, User manual CD x 1, Power cord x1

**GRF-1300/1300A** : Experiment text book of student version, Power point file and remote control software CD,  
 GRF-1300 : RF cable x 3, Antenna x 1/GRF-1300A : RF cable x 6, Antenna x 2, N to SMA  
 adaptor connector x 1, Power cord x 1

### OPTION

**GBK-001** GRF-1300 Experiment text book of teacher version

**GBK-002** GRF-1300A Experiment text book of teacher version

### OPTIONAL ACCESSORIES

**ADP-001** BNC to N-TYPE Adaptor

**GTL-303** RF Cable, RG316 Assembly, 600mm, SMA(P/M)

**ADP-002** SMA to N-TYPE Adaptor

**GTL-246** USB Cable, USB 2.0, A-B Type, 1200mm

**ATA-001** Antenna, General FM Antenna, BNC(M)

### FREE DOWNLOAD

**PC Software** Training system remote control software



# 3GHz Spectrum Analyzer

## A TURN-KEY SOLUTION TO CLEAR AWAY TWO OBSTACLES

GSP-730, carrying 3GHz bandwidth and measurement functions including Autoset, Split Window, Limit Line, ACPR and OCBW etc., is regarded as the advanced educations of Mobile Communications (GSM, 3G, 4G/LTE...), Wi-Fi, Zigbee and RFID in the Electronic or the communications classes. The USB ports, the RS-232 interface and the VGA video output facilitate the teaching efficiency. The combination of GSP-730 and GRF-1300/1300A RF communications training is a turn-key system for both lecture and hands-on training purposes.

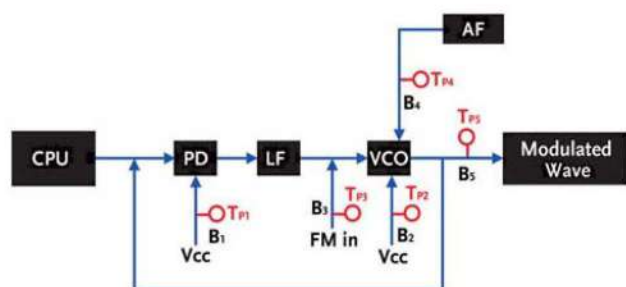
GRF-1300/1300A RF communications trainer, as the counterpart of GSP-730 for the basic RF communications experiment system, is capable of generating a baseband signal and a RF carrier signal for the built-in AM and FM communications operations. The baseband signal output contains the selections of Sine, Triangle, and Square waveforms in the frequency range of 100kHz ~ 3MHz, whereas the RF signal output is a frequency-variable Sine wave in the range of 870 ~ 920 MHz. Connecting the baseband signal output with AM or FM inputs on the panel, GRF-1300/1300A produces AM or FM signal output respectively by using the internal RF signal as the modulation carrier according to users' selected frequency.

The GRF-1300A RF training kit features not only all functions of GRF-1300 RF training kit but also augments itself with Mixer and Bandpass Filter. Users can better understand the characteristics of Mixer and Bandpass Filter by operating scalar network analyzer measurement which is produced by combining GSP-730 spectrum analyzer, GRF-1300A RF Communications Trainer, and USG signal generator. The combination of USG signal generator and GRF-1300A Mixer function can produce 2.4GHz AM and FM modulation signals. GRF-1300A Bandpass Filter can purify the output signals by filtering out harmonic and spurious produced by Mixer output signals.

An Experiment Textbook (student's book) is available as the standard accessory of GRF-1300/1300A to provide experiment courses. The curriculum of the textbook includes the introduction of the frequency domain and the time domain concepts, the operation theories of a spectrum analyzer, and nine experiments to perform hands-on training for the learning of basic RF communications theories and the RF measurement techniques using a spectrum analyzer. A CD, containing power-point slides for course presentation and the remote-control software for experiment, is attainable with GRF-1300/1300A, allowing teachers to give lecture of experiment theories and perform experiment simultaneously.

Another Experiment Textbook (teacher's book) is accessible as an optional accessory of GRF-1300/1300A. In addition to the same contents in the student's book, this book provides the experiment results to the questions and as well as some advanced experiment theories. Thus, a section of test-for-learning outcomes can also be seen in the lecturers' material in order to guide the students from the faulty diagnosis to the correct one in a RF communication circuitry. On the GRF-1300/1300A panel, there are five test points set at different joints of circuit blocks. Through turning on or off the corresponding relays of the five test points enables the teachers to simulate the faults and teach students diagnosis technique.

The economical solution of GSP-730 and GRF-1300 greatly lowers the budget barriers for providing fundamental RF Communications Educations and facilitates the establishment of RF communication experiment labs with more training stations in schools.



- **Introductions of Frequency Domain , Time Domain , and Spectrum Analyzer Basics.**

- **9 Experiments Include**

- Operations of Spectrum Analyzer
- Base band and RF signal measurements
- AM and FM signal measurements
- Communication system and product measurements

- **Learning Outcome Tests**

- **Auxiliary Tools**

- PPT files including all experiments contents
- Remote control software to control GRF-1300, GSP-730 simultaneously
- Experiment text books including the student version and the teacher(optional)

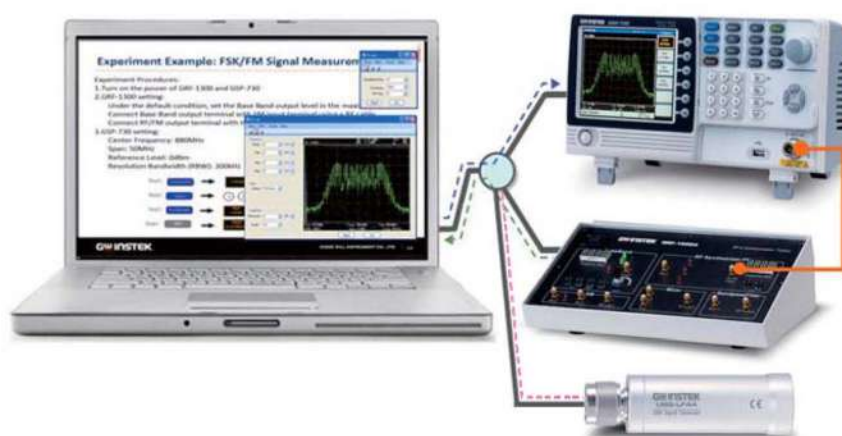
## Test Points on GRF-1300 for Fault Diagnosis

## CURRICULUM CONTENTS

### GSP-730+GRF-1300 Solution



### GSP-730+GRF-1300A+ USG-Series Solution



### Fully-electronic RF Training System

In class, teachers can connect GSP-730 and GRF-1300 with a PC via USB or RS-232 interface. First of all, all the contents of experiment has been converted into power-point slides and provided as the in-class materials. During lecturing the power-point slides, both GSP-730 and GRF-1300 can be remotely set by GRF Training System Control Software. Moreover, the signal shown on GSP-730 can be transferred to PC screen for further research. As a result, GSP-730 and GRF-1300 form an inclusive electronic-teaching-material package which efficiently simplifies lecturers' tasks before classes and shortens the process of the material preparation, and meanwhile, enhances the quality of the lecture. If the PC can only offer one USB interface, an extra purchase of USB hub\* may solve the problem of insufficient USB interfaces. With proper installation, PC can manage the conjunction of GSP-730 and GRF-1300.

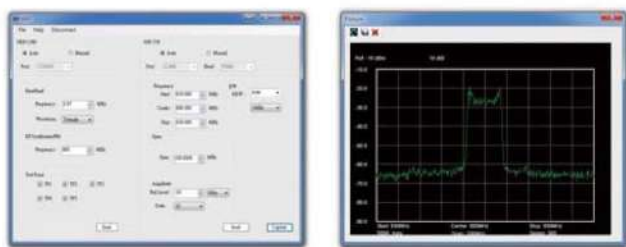
\* USB hub is excluded from the product standard accessories.

Properly connect Spectrum Analyzer, GRF-1300A RF and Communications Trainer, USG-LF44 RF Signal Generator and a PC to perform ongoing experiments while the lecture is being given. Using a PC, teacher can present teaching material with Power Point slides and simultaneously control GSP-730, GRF-1300A and USG-LF44 to perform experiments and get spectrum displays parameter readings on the PC screen. GSP-730, GRF-1300A and USG-LF44 easily transfer the current teaching materials including the PowerPoint slides, textbook and the remote control software into electronic-teaching system.



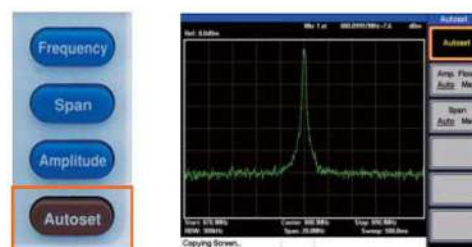
# 3GHz Spectrum Analyzer

## B. PC SOFTWARE FOR GSP-730 and GRF-1300 REMOTE CONTROL



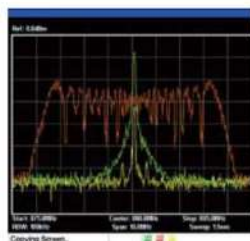
The dedicated PC software, Primary RF, is provided to support the remote control of GSP-730 and GRF-1300 simultaneously. The control includes base band signal waveform, frequency and RF signal frequency for GRF-1300 and Frequency, Span, Amplitude, RBW and spectrum transferring of GSP-730.

## C. AUTOSET FUNCTION



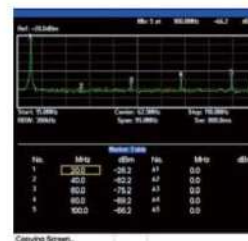
The AutoSet function automatically captures the signal and configures an appropriate setting for the optimum spectrum display at just one press of the button. With the AutoSet function, using a spectrum analyzer like GSP-730 is no longer an annoying and complicated task.

## D. THREE-TRACE DISPLAY WITH THREE-COLOR IDENTITY



GSP-730 can illustrate a signal with three colors simultaneously under various display modes, including Clear/Write, Max-Peak Hold, Min-Peak Hold, View, Blank and Average. Other useful trace functions such as trace math operations are also accomplishable.

## E. MARKER FUNCTION



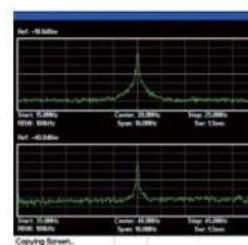
Five Markers can be used to obtain the measurement readings of specified points. Each marker has a counterpart  $\Delta$ Marker, the amplitude difference can be measured and indicated by setting the frequency of marker and the interval frequency of  $\Delta$ Marker between two signals. While several pairs of Markers are used for marking more than one pair of signals at the same time, the Marker Table can be turned on and it can process all the tests and demonstrate the reading figures.

## F. SETTING STATUS PRESENTED BY ICONS



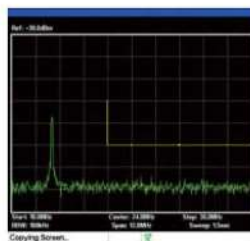
The intuitive icons help users grasp the current setting conditions all the time. As all status icons are clearly shown at the corner of the screen, there is no need to worry about the unknown settings, which may cause confusion and lead to measurement errors.

## G. SPLIT-WINDOW DISPLAY IN LIVE MODE



Under Split-Window Display Mode, the monitor will display two independent screens, which can respectively have separated settings. For instance, if processing the test between fundamental and harmonic signals, the separated screens can respectively set at different frequencies at the same time in order to process the measurement.

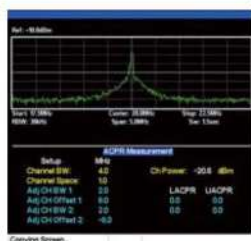
## H. PASS/FAIL JUDGMENTS



This function may run the “Pass” and “Fail” inspection with efficiency. Firstly, a limit line or upper and lower limit lines should be edited as the judgment criterion, then the LCD will display

“Pass” or “Fail” according to whether the input signal meets the condition defined by the limit lines to indicate the examined outcome.

## I. POWER MEASUREMENT FUNCTION



ACPR

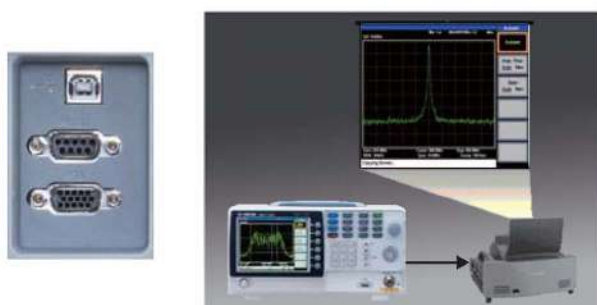


OCBW

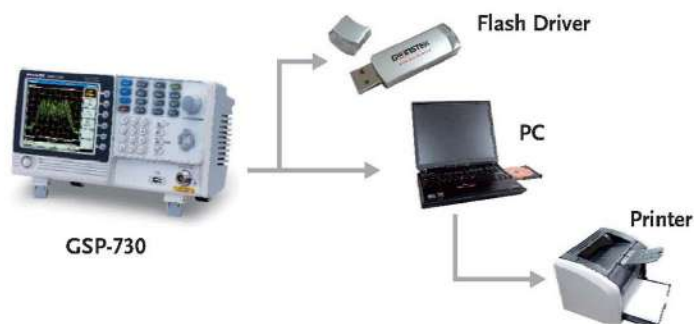
GSP-730 provides measurement functions such as ACPR, OCBW, and Channel Power. These items are regulated to be tested in recent communication systems, such as CDMA system. GSP-730

will illustrate channels by various colors so that the operation may become more precise and may minimize errors.

## J. FLEXIBLE INTERFACE



The USB host interface on GSP-730 front panel allows the measuring diagrams to be saved in the memory stick. The USB Device and RS-232C interfaces on the rear panel are capable of connecting with a PC for remote control. VGA output can transfer



whatever demonstrated on the LCD display to other display device or projector, which will strengthen the impression while giving the lectures.



# COMMUNICATIONS TESTERS OVERVIEW

## DEDICATED TESTERS OVERVIEW

Communications testers are test equipment designed for specific applications or technologies that are integrated in various test items and functions required in applications. There are two main applications of GWInstek communications testers, one is ASK/FSK Tester, and the other is IoT LoRa Tester.

There are many applications using ASK or FSK, such as tire pressure monitor TPMS, automotive remote control, door lock control, etc. These applications are communications methods based on ASK or FSK modulation technology. GWInstek C-1100 ASK/FSK Tester can meet the above-mentioned requirements.

LoRa is one of the wireless technologies in Internet of Things (IoT) applications. It has the advantages of long distance, low power consumption, low cost, and large coverage capacity. Common applications include smart agriculture, smart industry, and smart home appliances, etc. For example, the application of smart meters utilizes LoRa technology to transfer data. GW Instek's C-1200 IoT LoRa Tester can test various LoRa products to fulfill various LoRa applications.

MODEL	C-1100	C-1200
Mainly Application	ASK/FSK Applications	IoT LoRa Applications
Frequency Stability	±1ppm max. (per year)	±1ppm max. (per year)
Over Temperature Frequency Stability	±0.025 ppm (0 ~ 50 °C)	±0.025 ppm (0 ~ 50 °C)
Phase Noise	-88dBc/Hz @1GHz, 10kHz offset	-88dBc/Hz @1GHz, 10kHz offset
Overload Protection	+27dBm, ±50VDC	+27dBm, ±50VDC
RF In/Output Port	4 Port RF Input 1 Port RF Output 1 Port LF Output	1 Port RF Input 3 Port RF In/Output combine
RF Input Range	1MHz ~ 3.25GHz	1MHz ~ 3.25GHz
RF Output Range	LF Output : 125kHz (Wake up)  ASK/FSK RF Output : 315MHz (313 MHz ~ 320 MHz) 433MHz (425 MHz ~ 440 MHz)	LoRa: EU433, 420 MHz ~ 450 MHz CN490, 450 MHz ~ 570 MHz CN779, 770 MHz ~ 800 MHz EU868, 860 MHz ~ 880 MHz US915, 880 MHz ~ 960 MHz AS923, 880 MHz ~ 960 MHz  Special Band: SB1, 800 MHz ~ 860 MHz SB2, 2.4 GHz, zero span
RF Modulation Mode	FSK, ASK(OOK)	LoRa, FSK, GFSK
Interface	USB Host/Device, RS-232, LAN	USB Host, RS-232, LAN
Operation	Remote Control	Remote Control
Size	1U Height full rack	1U Height full rack
Power Source	AC100 ~ 240V, 50 ~ 60Hz	AC100 ~ 240V, 50 ~ 60Hz
Page	B26-B30	B31-B36

# ASK/FSK/TPMS Tester



C-1100



NEW

## FEATURES

- \* Four RF Input Channels
- \* 315/433 MHz Modulated Output and LF 125 KHz Output
- \* Editable Modulation Output And LF Output Contents
- \* Two Sets of Trigger Output and One Set of External Trigger Input
- \* Multi-display Mode: Spectrum, Modulation Signal Waveform, Symbol, Modulation Parameter
- \* ASK/FSK Demodulation Analysis Function
- \* 10MHz External Reference Time Base Input
- \* Free PC Software With Complete Functions and Multi-display
- \* Support Fcc and Etsi Test Regulations
- \* Support LAN, USB, RS232 Interfaces
- \* Full Remote Control
- \* 1U Standard Height

The matured and highly stabilized ASK/FSK technology has been widely utilized by various wireless communications systems of nowadays such as remote control, TPMS, and automotive RKE/PKE. Tx testing requires parameter measurements such as frequency and power. The demodulation of digital communications requires a spectrum analyzer or a signal analyzer with digital demodulation capability. Rx testing requires an arbitrary function generator and a RF signal generator to produce digital modulation signals to conduct tests.

C-1100 is the world's first ASK/FSK communications tester. In addition to four RF input channels, it also provides two signal output channels, including 315/433 MHz and LF 125kHz. C-1100 not only tests RF Tx and Rx but also "wakes up" device.

The C-1100 provides a complete PC software. In addition to the tests required for ASK/FSK, C-1100 also provides production debug analysis during production line testing, FCC, ETSI test specifications, and supports the corresponding LabVIEW program.

## SPECIFICATIONS

FREQUENCY			
Frequency			
Range	1 MHz ~ 3.25 GHz		
Resolution	1 Hz		
Frequency Reference			
Accuracy	$\pm(\text{period since last adjustment} \times \text{aging rate}) + \text{stability over temperature} + \text{supply voltage stability}$		
Aging Rate	$\pm 1$ ppm max.	1 year after last adjustment	
Frequency Stability Over Temperature	$\pm 0.025$ ppm	0 ~ 50 °C	
Supply Voltage Stability	$\pm 0.02$ ppm		
Frequency Readout Accuracy			
Start, Stop, Center, Marker	$\pm(\text{marker frequency indication} \times \text{frequency reference accuracy} + 10\% \times \text{RBW} + \text{frequency resolution})^1$		
Trace Points	Max 601 points, min 6 points		
Marker Frequency Counter			
Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz	RBW/Span $\geq 0.02$ ; Mkr level to DNL $>30$ dB	
Accuracy	$\pm(\text{marker frequency indication} \times \text{frequency reference accuracy} + \text{counter resolution})$		
Frequency Span			
Range	0 Hz (zero span), 100 Hz ~ 3.25 GHz	RBW: Auto	
Resolution	1 Hz		
Accuracy	$\pm$ frequency resolution <sup>1</sup>		
Phase Noise			
Offset from Carrier	Fc = 1 GHz; RBW = 1 kHz, VBW = 10 Hz; Average $\geq 40$		
10 kHz	$< -88$ dBc/Hz	Typical <sup>2</sup>	
100 kHz	$< -95$ dBc/Hz	Typical	
1 MHz	$< -113$ dBc/Hz	Typical	
Resolution Bandwidth (RBW) Filter			
Filter Bandwidth	1 Hz to 1 MHz in 1-3-10 sequence	-3dB bandwidth -6dB bandwidth Nominal <sup>3</sup> Nominal Nominal; Normal Bandwidth ratio: -60dB:-3dB	
	200 Hz, 9 kHz, 120 kHz, 1 MHz		
Accuracy	$\pm 8\%$ , RBW = 1 MHz		
	$\pm 5\%$ , RBW $< 1$ MHz		
Shape Factor	$< 4.5:1$		
Video Bandwidth (VBW) Filter			
Filter Bandwidth	1 Hz to 1 MHz in 1-3-10 sequenc	-3dB bandwidth	
[1] Frequency Resolution = Span/(Trace points - 1)			
[2] Typical specifications in this datasheet mean that the performance can be exhibited in 80% of the units with a 95% confidence level over the temperature range 20 to 30 °C. They are not covered by the product warranty.			
[3] Nominal values indicate expected performance. They are not covered by the product warranty.			
AMPLITUDE			
Amplitude Range			
Measurement Range	1 MHz ~ 10 MHz 10 MHz ~ 3.25 GHz	DANL ~ 21 dBm DANL ~ 25 dBm	
Attenuator			
Input Attenuator Range	0 ~ 50 dB, in 1 dB step	Auto or manual setup	
Maximum Safe Input Level			
Average Total Power	$\leq + 27$ dBm	Input attenuator $\geq 10$ dB	
DC Voltage	$\pm 50$ V		
1 dB Gain Compression			
Total Power at 1st Mixer	$> 0$ dBm	Typical; Fc $\geq 50$ MHz; preamp. off Typical; Fc $\geq 50$ MHz; preamp. on mixer power level (dBm) = input power (dBm) - attenuation (dB)	
Total Power at the Preamp	$> -22$ dBm		
<b>Displayed Average Noise Level (DANL)<sup>4</sup></b>			
Preamp off	0 dB attenuation; RF Input is terminated with a 50Ω load. RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60dBm; trace average $\geq 40$		
1 MHz ~ $< 2.7$ GHz	$< -117$ dBm	Nominal	
2.7 GHz ~ 3.25 GHz	$< -122$ dBm + 3 x (f/1 GHz) dB		
Preamp on	0 dB attenuation; RF Input is terminated with a 50Ω load ; RBW 10 Hz; VBW 10Hz; span 500 Hz; reference level = -60dBm; trace average $\geq 40$		
1 MHz ~ $< 2.4$ GHz	$< -137$ dBm	Nominal	
2.4 GHz ~ 3.25 GHz	$< -140$ dBm + 3 x (f/1 GHz) dB		
[4] DANL spec excludes spurious response in the proximity frequency range of 5 kHz.			
Absolute Amplitude Accuracy			
Absolute Point	Center=160 MHz ; RBW 10 kHz; VBW 1 kHz; span 100 kHz; log scale; 1 dB/div; peak detector; 23°C $\pm 1$ °C; Signal at Reference Level		
Preamp off	$\pm 0.3$ dB	Ref level 0 dBm; 10 dB RF attenuation Ref level -30 dBm; 0 dB RF attenuation	
Preamp on	$\pm 0.4$ dB		
Frequency Response			
Preamp off	Attenuation: 10 dB; Reference: 160 MHz; 20 ~ 30°C		
1 MHz ~ 2.0 GHz	$\pm 0.5$ dB		
2GHz ~ 3.25 GHz	$\pm 1.5$ dB		
Preamp on	Attenuation: 0 dB; Reference: 160 MHz; 20 ~ 30°C		
1 MHz ~ 2 GHz	$\pm 0.6$ dB		
2 GHz ~ 3.25 GHz	$\pm 0.8$ dB		



# ASK/FSK/TPMS Tester

## SPECIFICATIONS

### Attenuation Switching Uncertainty

Attenuator setting	0 ~ 50 dB in 1 dB step	reference: 160 MHz, 10dB attenuation
Uncertainty	± 0.25 dB	

### RBW Filter Switching Uncertainty

1 Hz to 1 MHz	± 0.25 dB	reference : 10 kHz RBW
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### Level Measurement Uncertainty

Overall Amplitude Accuracy	± 1.5 dB	20~30°C; frequency > 1 MHz; Signal input 0~-50 dBm; Reference level 0~-50 dBm; Input attenuation 10 dB; RBW 1 kHz; VBW 1 kHz; after cal; Preamp Off
	± 0.5 dB	Typical

### Spurious Response

Second Harmonic Intercept	Preamp off; signal input -30dBm; 0 dB attenuation +35 dBm +60 dBm	Typical; 10 MHz < fc < 775 MHz Typical; 775 MHz ≤ fc < 1.625 GHz
Third-order Intercept	Preamp off; signal input -30dBm; 0 dB attenuation > 1 dBm	300 MHz ~ 3.25 GHz
Input Related Spurious	< -60 dBc	Input signal level -30 dBm, Att. Mode, Att=0dB; 20-30°C
Residual Response (inherent)	< -90 dBm	Input terminated; 0 dB attenuation; Preamp off

### RF INPUT CHARACTERISTIC

#### Channel Performance

Channel Frequency Response	± 1dB	For all ports except port 1; Reference to port 1; Zeno span
Switching Time	0.5 ms	without sweep time

### SWEEP

#### Sweep Time

Range	204 μs ~ 1000 s 50 μs ~ 1000 s	Span > 0 Hz Span = 0 Hz; Min Resolution = 10 μs
Sweep Mode	Continuous; Single	
Trigger Source	Free run; Video; External	
Trigger Slope	Positive or negative edge	

### RF PREAMPLIFIER

#### RF Preamp

Frequency Range	1 MHz ~ 3.25 GHz	
Gain	18 dB	Nominal (installed as standard)

### LF WAKE UP

#### Frequency

LF Frequency	125 kHz
--------------	---------

#### Amplitude

Output Amplitude	3.3 V	
Bit Rate	3.9 kbps	NRZ, Nominal
Encoder	NRZ, Manchester	

### RF GENERATOR

#### Frequency

RF Frequency	315 MHz-Band 433.92 MHz-Band	315 MHz ~ 320 MHz 425 MHz ~ 440 MHz
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#### Frequency Reference

Accuracy	± 1 ppm	
Aging Rate	± 1 ppm / 1 year, ± 3 ppm / 10 year	1 year after last adjustment
Frequency Stability over	±0.5 ppm	-40 ~ +85°C

#### Amplitude

Output Power	-20 dBm ± 1 dB@ 315 MHz FCC -15 dBm ± 1 dB@ 433.92 MHz FCC +9 dBm ± 1 dB@ 433.92 MHz ETSI	Typical Typical Typical
Output Flatness	± 1 dB ± 1 dB in 1dB step	315 MHz-Band, Reference: 315 MHz 433.92 MHz-Band, Reference: 433.92 MHz
Power Range	-20 dBm ~ -70dBm@ 315 MHz +9 dBm ~ -65dBm@ 433.92 MHz	Typical Typical
Spurious Emissions (incl. harmonics)	Testing equipment condition: Reference level ≥ -15 dBm; Attenuation < -35 dBm, typical < -35 dBm, typical Testing equipment condition: Reference level ≥ 10 dBm; Attenuation < -54 dBm, typical < -36 dBm, typical < -30 dBm, typical 70 dB, typical	315 MHz FCC 15.231 433.92 MHz FCC 15.231  433.92 MHz ETSI EN 300 220,47-74MHz,87.5MHz-118MHz,174-230MHz,470-790MHz 433.92 MHz ETSI EN 300 220, other <1 GHz 433.92 MHz ETSI EN 300 220, >1 GHz at 315MHz / 433.92MHz
Isolation		
Phase Noise		
10 kHz	<-90 dBc/Hz, typical	315 MHz
100 kHz	<-90 dBc/Hz, typical	315 MHz
1 MHz	<-95 dBc/Hz, typical	315 MHz
10 kHz	<-90 dBc/Hz, typical	433.92 MHz
100 kHz	<-85 dBc/Hz, typical	433.92 MHz
1 MHz	<-100 dBc/Hz, typical	433.92 MHz

### RF MODULATION

#### Modulation

Mode	FSK / OOK	
Bit Rate	110,300,600,1200,2400,4800,9600,14400,19200,28800,38400,56000,57600,115200 bps	NRZ, Nominal
Encoder	NRZ, Manchester, Differential Manchester, Miller, Bi phase	

#### FSK

Deviation	1 kHz ~ 100 kHz	Nominal
Deviation Step	610 Hz	Nominal

#### OOK

On Off Isolation	55 dB
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### FRONT PANEL INPUT/OUTPUT

#### LED indicator

POWER	orange green	Standby mode System normal mode
SYSTEM	green	LED off, system is booting up LED on, system ready or system into power off LED off, LAN disconnected

SPECIFICATIONS		
LAN	green	LED on, get IP address
STATUS	green	LED on, system ready LED flashing for 1 second, system is booting up or system into power off LED flashing for 250 ms, system upgrade
<b>USB Host</b>		
Connector Type	A plug	
Power Protocol	5VDC/0.5A Version 2.0	Nominal Supports Full/High/Low speed
<b>LF Output</b>		
Connector Type	BNC female	
LF output LED	green	When 125 kHz to be used
<b>RF Input</b>		
Connector Type	4-port N-type female	
RF input LED	blue	When port to be used
VSWR	<2.1:1	300 kHz ~ 3.25 GHz; Input attenuator ≥ 10 dB
<b>RF Output</b>		
Connector Type	N-type female	
RF output LED	green orange	When 315 MHz to be used When 433.92 MHz to be used
VSWR	<1.5:1	Output power < -30 dBm
<b>REAR PANEL INPUT/OUTPUT</b>		
<b>Reference Input</b>		
Connector Type	BNC female	
Input Reference Frequency	10 MHz	
Input Amplitude	-5 dBm ~ +10 dBm	
Frequency Lock Range	Within ± 5 ppm of the input reference frequency	
<b>Reference Output</b>		
Connector Type	BNC female	
Output Frequency	10 MHz	Nominal
Output Amplitude	3.3V CMOS	
Output Impedance	50 ohm	
<b>Trigger Input</b>		
Connector Type	BNC female	
Input Amplitude	3.3V CMOS	
<b>Trigger 1 &amp; Trigger 2 Output</b>		
Connector Type	2-port BNC female	
Output Amplitude	3.3V / 2.5V	
Mode	Toggle mode	Always low, 5ms high when trigger output
<b>LAN TCP/IP Interface</b>		
Connector Type	RJ-45	
Base	10Base-T; 100Base-Tx; Auto-MDIX	
<b>USB Device</b>		
Connector Type	B plug	For remote control only; supports USB TMC
Power Protocol	5VDC/0.5A Version 2.0	Nominal Supports Full/High/Low speed
<b>RS232 Interface</b>		
Connector Type	D-sub 9-pin female	Tx,Rx,RTS,CTS
<b>AC Power Input</b>		
Power Source	AC 100 V ~ 240 V, 50 / 60 Hz	Auto range selection
<b>GENERAL</b>		
Internal Data storage	16 MB nominal	
Power Consumption	< 82 W	
Warm-up Time	< 45 minutes	
Temperature Range	+5 °C ~ +45 °C -20 °C ~ +70 °C	Operating Storage Basic Approximately
Weight	7.4 kg (16.3 lb)	
Dimensions	434(W) x 44(H) x 521(D)mm 17.1(W) x 1.73(H) x 20.5(D)inch	

## ORDERING INFORMATION

C-1100 ASK/FSK Tester

## ACCESSORIES:

Power cord, Factory certificate

CD-ROM (user manual, programming manual, C-1100 dedicated software)

## FREE DOWNLOAD

PC Software C-1100 PC control software (download from GW Instek website)



# ASK/FSK/TPMS Tester

## A. THE WORLD'S FIRST ASK/FSK TESTER



Multi-channel ASK/FSK Communications Tester

C-1100 is the world's first ASK/FSK communications tester. In addition to four RF input channels, it also provides two signal output channels, including 315/433 MHz and LF 125kHz. C-1100 not only tests RF Tx and Rx but also “wakes up” device.

## B. 4 RF INPUT CHANNELS

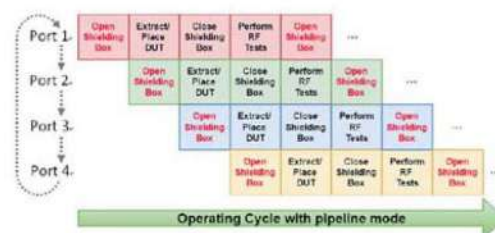


Illustration of the Operating Cycle of C-1100 Under the Pipeline Mode

Under the ATE pipeline production line, four RF input channels can accommodate maximum four DUTs' pipeline allocation. Test can be conducted simultaneously while the robotic arms placing and removing DUTs. Users do not need to invest four sets of test equipment to substantially increase productivity.

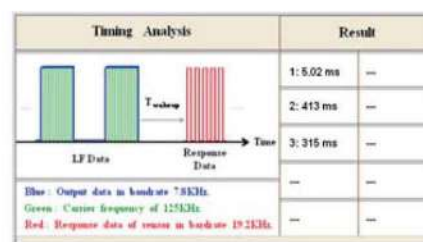
## C. COMPLETE PC SOFTWARE SUPPORT



PC Software Display of C-1100

C-1100 provides a dedicated PC software that eliminates the need for users to write ATE programs and instrument integration time. The required parameters and displays are completely provided for Tx or Rx analysis verification, or mass production testing.

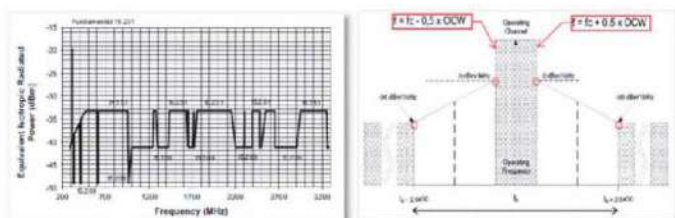
## D. DEBUG ANALYSIS FOR PRODUCTION LINE



Time Sequence Analysis Display

While encountering abnormalities during production processes, time sequence or Tx Mask function can be utilized to conduct DUT decoding analysis for Tx-Rx. Wake-up time sequence analysis and DUT Tx regulation analysis are conducive to the yield rate analysis for production lines.

## E. BUILT-IN FCC/ETSI TEST REGULATIONS



Built-in FCC and ETSI Regulations in the PC Software

In addition to testing for ASK/FSK, C-1100 operates through the software's spectrum mode and can be used with the built-in FCC and ETSI test regulations to verify that the tested DUT is compliant.

## F. SUPPORT LABVIEW DRIVER



LabVIEW Display

Support LabVIEW driver and provide example programs for frequent used applications to shorten the writing time for ATE so as to expedite the application time for production.

## G. 1U HEIGHT AND VARIOUS PC INTERFACES

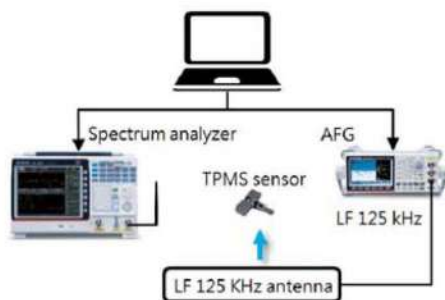


The Output and Input Terminals on The Front and Rear Panel

With the 1U design, C-1100 is ideal for rackmount applications. The USB Host on the front panel and the USB Device on the rear panel can be applied to meet future software update

requirements. In addition, the LAN and RS-232 communications interfaces on the rear panel allow users to control the device via PC software.

## H. COMPARISON FOR DIFFERENT TESTING METHODS ON TPMS SENSOR

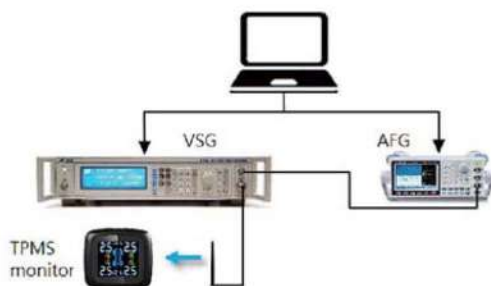


The conventional TPMS Sensor test method requires a spectrum analyzer and an arbitrary wave generator, and software integration is also required that makes the control more complicated. C-1100 has integrated the signal source and



spectrum analyzer required for testing, and a dedicated test software is also provided to make tests more convenient for users.

## I. COMPARISON FOR DIFFERENT TESTING METHODS ON TPMS MONITOR



The conventional TPMS Monitor test requires an arbitrary wave generator and a high-frequency signal generator, and software integration is also required that makes the control more complicated. C-1100 has integrated the signal generator and



arbitrary function generator required for testing, and a dedicated test software is also provided to make tests more convenient for users.





NEW

C-1200



## FEATURES

- \* 1 Low Power RF TX Port and 3 RF TRX Ports (Switching Type)
- \* The Minimum Output Level of Low Power TX Power: -148 dBm
- \* Support Full LoRa Test Demand
- \* Support LoRa/FSK Modulation Signals
- \* Support Sub-GHz and 2.4 GHz
- \* Complete PC Software and Built-in MP Test Function
- \* Built-in FCC 15.209/15.247 Test Regulations
- \* Built-in Temperature Control Calibration Signal
- \* Support SPI, UART, I<sup>2</sup>C Interfaces to Directly Control DUT (Must Collocate With IO Extension, C-1201)
- \* Simultaneously Test DUT's Current Consumption (Must Collocate With PPH-1503 DC Power Supply)

## C-1201 USB I/O Extension Box



C-1200 is an One Box Tester that incorporates LoRa TX and RX tests. It provides spectrum analysis, time domain, FEI (Frequency Error Indicator), and TOA (Time On Air) for transmitter tests, and sensitivity, BER (Bit Error Rate), and PER (Packet Error Rate) for receiver tests. In addition to Sub-GHz, C-1200 also supports the 2.4 GHz bandwidth and the FSK signal test. Users can also edit the transmitted payload by themselves. When receiving data, the formats include binary, HEX, and ASCII code, which allow data transmission results to be easily confirmed.

In addition to the signaling test of the finished product, C-1201 is a transfer box connecting C-1200 to LoRa module that directly controls the DUT to perform non-signaling tests on semi-finished products through UART/SPI/I2C interfaces.

## SPECIFICATIONS

### RX ANALYZER

#### FREQUENCY

##### Frequency

Range	1 MHz ~ 3.25 GHz
Resolution	1 Hz

##### Frequency Reference

Accuracy	$\pm(\text{period since last adjustment} \times \text{aging rate}) + \text{stability over temperature} + \text{supply voltage stability}$	
Aging Rate	$\pm 1$ ppm max.	1 year after last adjustment
Frequency Stability over Supply Voltage Stability	$\pm 0.025$ ppm	0 ~ 50 °C
	$\pm 0.02$ ppm	

##### Frequency Readout Accuracy

Start, Stop, Center, Marker Trace points	$\pm(\text{marker frequency indication} \times \text{frequency reference accuracy} + 10\% \times \text{RBW} + \text{frequency resolution})^1$	
	Max 601 points, min 6 points	

##### Marker Frequency Counter

Resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz	
Accuracy	$\pm(\text{marker frequency indication} \times \text{frequency reference accuracy} + \text{counter resolution})$	RBW/Span $\geq 0.02$ ; Mkr level to DNL $> 30$ dB

##### Frequency Span

Range	0 Hz (zero span), 100 Hz ~ 3.25 GHz	
Resolution	1 Hz	
Accuracy	$\pm$ frequency resolution <sup>1</sup>	RBW: Auto

##### Phase Noise

Offset from Carrier	Fc = 1 GHz; RBW = 1 kHz, VBW = 10 Hz; Average $\geq 40$	
10 kHz	$< -88$ dBc/Hz	Typical <sup>2</sup>
100 kHz	$< -95$ dBc/Hz	Typical
1 MHz	$< -113$ dBc/Hz	Typical

##### Resolution Bandwidth (RBW) Filter

Filter Bandwidth	1 Hz ~ 1 MHz in 1-3-10 sequence 200 Hz, 9 kHz, 120 kHz, 1 MHz	-3dB bandwidth -6dB bandwidth Nominal <sup>3</sup>
Accuracy	$\pm 8\%$ , RBW = 1 MHz $\pm 5\%$ , RBW < 1 MHz	Nominal
Shape Factor	$< 4.5:1$	Nominal ; Normal Bandwidth ratio: -60dB:-3dB

##### Video Bandwidth (VBW) Filter

Filter Bandwidth	1 Hz to 1 MHz in 1-3-10 sequence	-3dB bandwidth
------------------	----------------------------------	----------------

[1] Frequency Resolution = Span/(Trace points - 1)

[2] Typical specifications in this datasheet mean that the performance can be exhibited in 80% of the units with a 95% confidence level over the temperature range 20 to 30 °C. They are not covered by the product warranty.

[3] Nominal values indicate expected performance. They are not covered by the product warranty.

### AMPLITUDE

#### Amplitude Range

Measurement Range	1 MHz ~ 10 MHz 10 MHz ~ 3.25 GHz	DANL ~ 21 dBm DANL ~ 25 dBm
Modulated Mode	Maximum measurement level +25 dBm Att. Auto, in Sub-1GHz Band and 2.4GHz Band, support time domain, frequency domain and waveform demodulation	
	Trigger level $> -40$ dBm Trigger level $> -70$ dBm	Preamp off Preamp on

#### Attenuator

Input Attenuator Range	0 ~ 50 dB, in 1 dB step	Auto or manual setup
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#### Maximum Safe Input Level

Average Total Power	$\leq +27$ dBm	Input attenuator $\geq 10$ dB
DC Voltage	$\pm 50$ V	

#### 1 dB Gain Compression

Total Power at 1st Mixer	$> 0$ dBm	Typical; Fc $\geq 50$ MHz; preamp. off
Total Power at the Preamp	$> -22$ dBm	Typical; Fc $\geq 50$ MHz; preamp. on mixer power level (dBm) = input power (dBm) - attenuation (dB)

#### Displayed Average Noise Level (DANL)<sup>4</sup>

Preamp off	0 dB attenuation; RF Input is terminated with a 50 $\Omega$ load. RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60dBm; trace average $\geq 40$	
1 MHz ~ 2 GHz	$< -120$ dBm	Nominal
2 GHz ~ 3.2 GHz	$< -115$ dBm	Nominal
3.2 GHz ~ 3.25 GHz	$< -113$ dBm	Nominal
Preamp on	0 dB attenuation; RF Input is terminated with a 50 $\Omega$ load ; RBW 10 Hz; VBW 10Hz; span 500 Hz; reference level = -60dBm; trace average $\geq 40$	
1 MHz ~ 10 MHz	$< -139$ dBm	Nominal
10 MHz ~ 3.25 GHz	$< -139$ dBm + 3 x (f/1 GHz) dB	Nominal

[4] DANL spec excludes spurious response in the proximity frequency range of 3 kHz.

#### Absolute Amplitude Accuracy

Absolute Point	Center=160 MHz; RBW 10 kHz; VBW 1 kHz; span 100 kHz; log scale; 1 dB/div; peak detector; 23°C $\pm$ 1°C; Signal at Reference Level	
Preamp off	$\pm 0.3$ dB $\pm 0.2$ dB	Ref level 0 dBm; 10 dB RF attenuation After Self Calibration <sup>5</sup>
Preamp on	$\pm 0.4$ dB	Ref level -30 dBm; 0 dB RF attenuation

[5] Self Calibration can be used after the C-1200 power on over 3 minutes. When Self Calibration always turn on, for three items change the Self Calibration will auto recalibrate.

• Time of every hour

• Ambient temperature changes more than  $\pm 3$  °C

• Reference 10 MHz changes

SPECIFICATIONS		
Frequency Response		
Preamp off 1 MHz to 2.0 GHz 2 GHz to 3.25 GHz <sup>6</sup>	Attenuation: 10 dB; Reference: 160 MHz; 20 ~ 30°C ± 0.5 dB ± 1.5 dB	
Preamp on 1 MHz to 2 GHz 2 GHz to 3.25 GHz	Attenuation: 0 dB; Reference: 160 MHz; 20 ~ 30°C ± 0.6 dB ± 0.8 dB	
[6] If others ports are unused should be connected to 50 ohm terminal, otherwise the frequency response will be falling beyond 2.6 GHz.		
Attenuation Switching Uncertainty		
Attenuator setting	0 to 50 dB in 1 dB step	
Uncertainty	± 0.25 dB	reference: 160 MHz, 10dB attenuation
RBW Filter Switching Uncertainty		
1 Hz ~ 1 MHz	± 0.25 dB	reference : 10 kHz RBW
Level Measurement Uncertainty		
Overall Amplitude Accuracy	± 1.5 dB ± 0.5 dB	20~30°C; frequency>1MHz; Signal input 0~-50dBm; Reference level 0~-50dBm; Input attenuation 10dB; RBW 1kHz; VBW 1kHz; after cal; Preamp Off Typical
Spurious Response		
Second Harmonic Intercept	Preamp off; signal input -30dBm; 0 dB attenuation +35 dBm +60 dBm	Typical; 10 MHz < f <sub>c</sub> < 775 MHz Typical; 775 MHz ≤ f <sub>c</sub> < 1.625 GHz
Third-order Intercept	Preamp off; signal input -30dBm; 0 dB attenuation > 1 dBm	300 MHz ~ 3.25 GHz
Input Related Spurious	< -60 dBc	Input signal level -30 dBm, Att. Mode, Att=0dB; 20-30°C
Residual Response (inherent)	< -90 dBm	Input terminated; 0 dB attenuation; Preamp off
SWEEP		
Sweep Time		
Range	204 μs ~ 1000 s 50 μs ~ 1000 s	Span> 0 Hz Span= 0 Hz; Min. Resolution= 10 μs
Sweep Mode	Continuous; Single	
Trigger Source	Free run; Video; External	
Trigger Slope	Positive or negative edge	
RF Preamplifier		
Frequency Range	1 MHz to 3.25 GHz	
Gain	18 dB	Nominal (installed as standard)
TX GENERATOR		
FREQUENCY		
LoRaWAN Band <sup>7</sup>		
EU433	420 MHz ~ 450 MHz	Reference: 433 MHz
CN490	450 MHz ~ 570 MHz	Reference: 490 MHz
CN779	770 MHz ~ 800 MHz	Reference: 779 MHz
EU868	860 MHz ~ 880 MHz	Reference: 868 MHz
US915	880 MHz ~ 960 MHz	Reference: 915 MHz
AS923	880 MHz ~ 960 MHz	Reference: 923 MHz
[7] Refer to LoRaWAN 1.1 Regional Parameters		
Special Band		
SB1	800 MHz ~ 860 MHz	Reference: 845 MHz
SB2	2.4 GHz	Zero span
Frequency Reference		
Accuracy	± 2 ppm	before frequency calibration
Aging Rate	± 1 ppm / 1 year	1 year after last adjustment
Frequency Stability over	± 0.5 ppm	-40 ~ +85°C
Resolution	1 Hz 198 Hz	All Bands except SB2 SB2
AMPLITUDE		
Amplitude (Port 1)		
Output Power Range	-60 dBm ~ -148 dBm, in 1 dB step -60 dBm ~ -132 dBm, in 1 dB step	All Bands except SB2 SB2
Uncertainty	± 1 dB ± 1 dB	@ -10 x n dBm n= 6 to 14, integer, All Bands except SB2 n= 6 to 13, integer, SB2 Output power other than above, and reference to -10 x m dBm, m=int( X /10), X=nominal output level int(Y) means taking integer part of Y @ -60 dBm Typical
Output Flatness	± 2 dB ± 1 dB	
Amplitude (Port 2, Port 3, Port 4)		
Output Power Range	-10 dBm ~ -100 dBm, in 1 dB step	All Bands @ -10 x n dBm
Uncertainty	± 1 dB ± 1 dB	n= 1 to 10, integer 1. Output power other than above 2. Reference to -10 x m dBm, m=int( X /10), X=nominal output level int(Y) means taking integer part of Y @ -10 dBm Typical
Output Flatness	± 2 dB ± 1 dB	
MODULATION / DEMODULATION		
LoRa Mode		
Spreading Factor (SF)	SF5, SF6, SF7, SF8, SF9, SF10, SF11, SF12	All Bands
Signal Bandwidth (BW)	7.8 kHz, 10.4 kHz, 15.6 kHz, 20.8 kHz, 31.25 kHz, 41.7 kHz, 62.5 kHz, 125 kHz, 250 kHz, 500 kHz 203.125 kHz, 406.25 kHz, 812.5 kHz, 1.625 MHz	All Bands except SB2, Nominal
Coding rate (CR)	4/5, 4/6, 4/7, 4/8	SB2, Nominal
Preamble length	4 ~ 400 symbols	The 4 preamble length that including 2 Up-Chirp and 2 Down-Chirp,
Payload length	0~255 bytes	Nominal
FSK Mode		
All Bands except SB2		
Deviation	0.6 kHz ~ 200 kHz	Nominal
Bit Rate	0.6 ~ 300 kbps	Nominal
Encoder / Decoder	Whitening	Nominal
Preamble length	10 ~ 400 bytes	Nominal
Payload length	0~64 bytes	Nominal



# IoT LoRa Tester

## SPECIFICATIONS

### GFSK Mode

SB2		
Bit Rate	125, 250 kbps 250, 400, 500 kbps 400, 500, 800, 1000 kbps 800, 1000, 1600, 2000 kbps	300 kHz Occupied Bandwidth, Nominal 600 kHz Occupied Bandwidth, Nominal 1.2 MHz Occupied Bandwidth, Nominal 2.4 MHz Occupied Bandwidth, Nominal
Encoder / Decoder	Whitening	Nominal
Preamble length	10 ~ 400 bytes	Nominal
Payload length	0~64 bytes	Nominal

### COMMON SPECIFICATION

#### RF CHARACTERISTIC

Input/Output Performance		
Switching Error	± 1 dB	For port3 and port 4 ; Reference to port 2; Zero span without sweep time
Switching Time	0.5 ms	
Input Isolation	Input Power - 10 dBm 30 dB 60 dB	Between port 3 and port 4 otherwise
Output Isolation	Output Power - 60 dBm 30 dB 60 dB	Between port 1 and port 2 or Between port 3 and port 4 otherwise

#### FRONT PANEL INPUT/OUTPUT

##### LED Indicator

POWER	orange	Standby mode
SYSTEM	green	System normal mode
LAN	green	LED off, system is booting up LED on, system ready or system into power off
STATUS	green	LED off, LAN disconnected LED on, get IP address LED on, system ready LED flashing for 1 second, system is booting up or system into power off LED flashing for 250 ms, system upgrade

##### RF Input/Output

Connector Type	4-port N-type female	Port 1, Output only; Port 2 ~ 4, Input and Output
RF Input LED	blue	When port to be used
VSWR	<2:1	1 MHz to 3.25 GHz; Input attenuator ≥ 10 dB
RF Output LED	green	When port to be used
VSWR	<1.5:1	Frequency at LoRaWAN Bands, and special Band, Output power< -80 dBm

##### USB Host

Connector Type	A plug	
Power	5VDC/0.5A	Nominal
Protocol	Version 2.0	Supports Full/High/Low speed

#### REAR PANEL INPUT/OUTPUT

##### Reference Input

Connector Type	BNC female	
Input Reference Frequency	10 MHz	
Input Amplitude	-5 dBm ~ +10 dBm	
Frequency Lock Range	Within ± 5 ppm of the input reference frequency	

##### Reference Output

Connector Type	BNC female	
Output Frequency	10 MHz	Nominal
Output Amplitude	3.3V CMOS	
Output Impedance	50 ohm	

##### Trigger Input

Connector Type	BNC female	
Input Amplitude	3.3V CMOS	

##### Trigger 1 & Trigger 2 Output

Connector Type	2-port BNC female	
Output Amplitude	3.3V / 2.5V Toggle mode	Always low, 5ms high when trigger output

##### LAN TCP/IP Interface

Connector Type	RJ-45	
Base	10Base-T; 100Base-Tx; Auto-MDIX	

##### IP Reset

TACT Switch		
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##### AC Power Input

Power Source	AC 100 V ~ 240 V, 50 / 60 Hz	Auto range selection
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### GENERAL

Internal Data storage	16 MB nominal	
Power Consumption	< 82 W	
Warm-up Time	< 45 minutes	
Temperature Range	+5 °C ~ +45 °C -20 °C ~ +70 °C	Operating Storage
Weight	7.7 kg (16.9 lb)	Basic, without optional
Dimensions	434(W) x 44(H) x 554(D)mm/17.1(W) x 1.73(H) x 21.8(D)inch	Approximately

#### C-1201, IO EXTENSION (OPTIONAL)

Connector Type	USB B	For remote control only
Support Voltage	1.8V & 3.3V	
Output Logic Voltage	1.8V & 3.3V	VCC_DUT should be connected to 1.8V or 3.3V
Output Interface	I <sup>2</sup> C*1 & UART*4 & SPI*4	
Output Current	300 mA	Maximum, Nominal

## ORDERING INFORMATION

C-1200 LoRa Tester ACCESSORIES:Power cord, Factory certificate, CD-ROM(user manual, programming manual, C-1200 dedicated software)

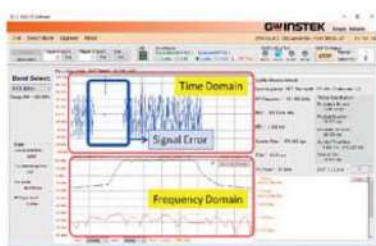
### OPTION

C-1201 USB I/O Extension Box

### FREE DOWNLOAD

PC Software C-1200 PC control software (download from GW Instek website)

## A. COMPLETE MEASUREMENT AND ANALYSIS FUNCTION



### Frequency Domain and Time Domain Measurement

C-1200 can directly perform signal measurement in the frequency domain and the time domain for the transmitted signal of LoRa. In the frequency domain, LoRa's CSS (Chirp Spread Spectrum) signal spectrum can be directly displayed; in the time domain, the signal change of the signal within a set time range can be displayed. For example, in the figure below, the signal error that occurs during the transmission of the data can only be found in the time domain measurement (the blue box of the picture).

### FEI (Frequency Error Indicator)

When the signal of LoRa is sent out, there may be a frequency error caused by environmental factors, which may result in a decrease in sensitivity or loss of a packet. FEI can be used to measure the DUT transmission frequency error and adjust or correct this error during production or quality control to ensure communications quality when deploying LoRa networks.

### TOA (Time On Air)

TOA is a mechanism to measure the actual transmission time of data in space and check whether it is normal to confirm the quality of LoRa communications quality. The example in the following figure shows that the theoretical Time On Air calculated by the system should be 59.648ms, but the actual TOA time is 51.39ms, which means that the signal is different during transmission. You can find out the signal error by comparing the waveform displayed in the time domain.

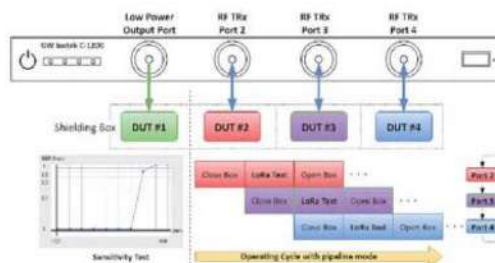
## B. SUPPORT THE COMMON LORA BANDWIDTHS IN THE WORLD

Band Select:	Area / Bandwidth	Frequency Range
EU433	EU 433MHz	433 ~ 435 MHz
EU433	CN 490MHz	470 ~ 510 MHz
CN490	EU 868MHz	862 ~ 875 MHz
EU868	US 915MHz	900 ~ 928 MHz
US915	AS 923MHz	900 ~ 928 MHz
AS923	2.4GHz	2397 ~ 2403 MHz
2.4 GHz		

### Support the LoRa Bandwidths

The frequency bandwidths used by LoRa in different countries are different. The frequency bandwidths supported by C-1200 are as follows.

## C. PROVIDE 1 LOW POWER RF TX PORT AND 3 RF TRX PORTS



### Suitable for Pipeline Production

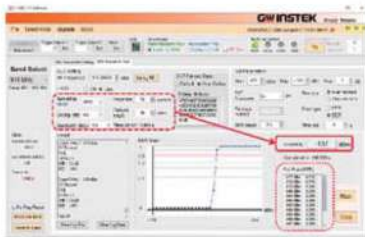
With 1 low power RF TX Port and 3 RF TRX Ports, C-1200 is ideal for mass production testing of LoRa products. As shown in the flow chart below, the production process of each channel is a series of actions required to set up the DUT on the system. When the system starts to operate, the robot arm will open the isolation box, place the DUT, close the isolation box, and then conduct test. When the test is complete, the robot arm will open the isolation box and remove the DUT to position, then perform the same test steps for the next DUT.



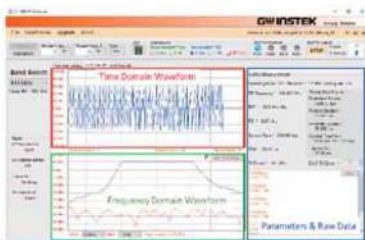
## D. COMPLETE PC SOFTWARE SUPPORT



Equipped with PC Software



Transmitter(DUT Rx)



Receiver(DUT Tx)



MP Test



Spectrum(Specification) Mode

C-1200 provides a dedicated PC software that eliminates the need for users to write ATE programs and instrument integration time. The required parameters and displays are completely provided for Tx or Rx analysis verification, or mass production testing. The software interface is similar to the SDK package provided by Semtech. Users can quickly operate the software if they are familiar with the operation of the kit. The software has four modes of operation:

- \* Transmitter (DUT Rx)
- \* Receiver (DUT Tx)
- \* MP Test
- \* Spectrum (Specification)

In this mode, C-1200 acts as a transmitter to test the DUT's receiving sensitivity and data error rate (Error Rate). The Packet Error Rate (PER) is the test item required by the LoRa system. In addition to the PER test, C-1200 also provides the BER (Bit Error Rate) test commonly used in communications systems for engineers to analyze.

In this mode, C-1200 acts as a receiver to test the signal transmitted by the DUT. As mentioned above, the analysis of the transmitted signal in the time domain and the frequency domain, FEI, and TOA are operated in this mode. The parameters and decoded data (Raw Data) of LoRa can also be analyzed.

This model is designed for a large number of repetitive tests on the production line. With C-1200 1 low power RF TX Port and 3 RF TRX Ports and pipeline production method introduced in the previous paragraph, the production quality of LoRa products can be ensured and the production efficiency can be greatly improved. There are several main parts in the MP Test settings:

- \* General Setting: The basic parameters of LoRa are measured, such as frequency range, power, data length, SF (Spreading factor), BW (Bandwidth), CR (Coding Rate), etc.
- \* Tx/Rx Setting: Set the required items for Tx or Rx test. Users can check the parameters to be tested according to the test requirements.
- \* Power consumption: collocating with a PPH-1503 high-precision power supply or a GDM-9061 six-and-a-half digit digital meter, the power consumption of the DUT can be measured.
- \* Test Status & Test Log: Shows whether the DUT meets the test results. The Test Log data generated by the system can also be output to text format.

In addition to testing for LoRa, C-1200 is also a spectrum analyzer that operates through the software's spectrum mode and can be used with the built-in FCC 15.209/15.247 test regulations to verify that the tested DUT is compliant. The testable regulations are FHSS (Frequency Hopping Spread Spectrum) and DSSS (Direct Sequence Spread Spectrum).

## E. EXTENDED APPLICATIONS

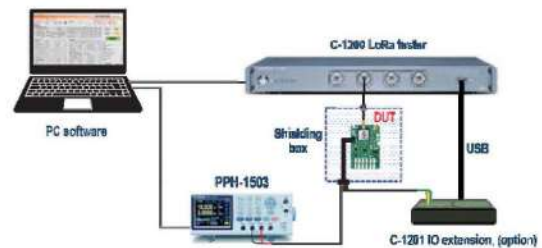


**C-1201 USB I/O Extension Box**

C-1201 is a transfer box that connects the C-1200 to the LoRa module. It is converted to UART/SPI/I2C interfaces to directly control the DUT through the USB interface of the front panel of C-1200. The interfaces supported by C-1201 are:

\*Four 4-wire SPI interfaces \*Four UART interfaces \*One I2C interface  
\*With respect to power, it supports DC 1.8V and 3.3V and the highest current output is 300mA.

Through C-1201 extension box, users can create the program commands corresponding to the switching circuit and the design without using the C-1200 PC software or command sets to directly control the parameters



**Power Consumption Test**

and actions of the DUT for non-signaling test (NST). In the mass production process or semi-finished product testing process, using C-1201 for NST can save the time of establishing communications channels to speed up the test.

Since LoRa devices are usually located outdoors, even in remote areas, power consumption characteristics become an important part of the LoRa system. C-1200 collocating with a PPH-1503 high-precision power meter or a GDM-9061 six-and-a-half digit digital meter can directly perform the power consumption test through the PC software, making the LoRa test more comprehensive.

## F. COMMUNICATIONS INTERFACE



**Controlled by LAN**

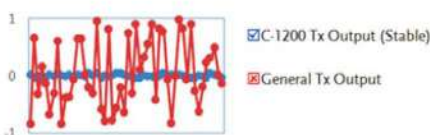
C-1200 uses the LAN interface for control, and the supported programming regulations conform to IEEE488.2, which is the same as the common regulations and is easy for users to write.



**Command Conversion via USB**

The USB on the front panel of C-1200 provides users with the ability to control the DUT through the C-1201 extension box or a self-defined software, and it can perform a Non-Signaling Test.

## G. OTHER FUNCTION



**Built-in Temperature Control Calibration Signal**

Since the built-in Tx output signal of C-1200 requires high signal sensitivity and accuracy, the built-in temperature control calibration signal allows the Tx signal to be very stable at the output, making the sensitivity test more accurate.



**Tx/Rx Signal Indicator**

The two-color indicator design is adopted at the signal input and output terminal. The green light design is for the Tx mode, and the blue light design is for the Rx mode. The transmission of the indicator light through the angle shows a uniform aura, in addition to the sense of technology and fashion; users can quickly understand the current action situation.



**Appearance and Handle Design**

In the choice of design, the 1U industry standard rack design can effectively reduce the space used. Both the panel and handles adopt aluminum block cutting and molding techniques and anodized and the laser engraving is used to improve durability and texture. The handle is standard, which makes it convenient for C-1200 to enter and exit the cabinet. In addition, when users accidentally face C-1200 down, the damage of the terminals can be effectively avoided.



## ACCESSORIES

MODEL	DESCRIPTION	CATEGORY	APPLICABLE DEVICE
ADP-001	Adaptor, 50Ω, BNC(J/F) - N(P/M)	Adaptor	GSP-Series, C-1100, C-1200
ADP-002	Adaptor, 50Ω, SMA(J/F) - N(P/M)	Adaptor	GSP-Series, C-1100, C-1200
ADP-101	Adaptor, 75Ω BNC(J/F) - 50Ω BNC(P/M)	Adaptor	GSP-Series
ATN-100	Adaptor, 10dB Attenuator, 50Ω, N(J/F)-N(P/M)	Adaptor	GSP-Series, C-1100, C-1200
GAK-001	Adaptor, 50Ω Termination, N(P/M)	Adaptor	GSP-Series, C-1100, C-1200
GAK-002	Adaptor, Cap with Chain, N(P/M)	Adaptor	GSP-Series, C-1100, C-1200
GSC-009	Soft Carrying Case	Bag	GSP-9330, GSP-9300B
GTL-246	USB Cable, USB 2.0, A-B Type, 1200mm	Communication Cable	GSP-Series, C-1100
GTL-248	GPIO Cable, Double Shielded, 2000mm	Communication Cable	GSP-9330, GSP-9300B
GTL-250	GPIO Cable, Double Shielded, 600mm	Communication Cable	GSP-9330, GSP-9300B
GTL-110	BNC Cable, BNC(P/M)-BNC(P/M), 1000mm	General Lead	GSP-Series, C-1100, C-1200
GTL-301	RF Cable, RG223 Assembly, 1000mm, N(P/M)	General Lead	GSP-Series, C-1100, C-1200
GTL-302	RF Cable, RG223 Assembly, 300mm, N(P/M)	General Lead	GSP-Series, C-1100, C-1200
GTL-303	RF Cable, RG316 Assembly, 600mm, SMA(P/M)	General Lead	GSP-Series, GRF-1300/1300A, C-1100, C-1200
GTL-304	RF Cable, RG223 Assembly, 280mm, N(P/M) - N(J/F)	General Lead	GSP-Series, C-1100, C-1200
GRA-415	Rack Mount Kit, 19", 6U Size	Rack	GSP-9330, GSP-9300B
ADB-002	Adapter, DC Block, BNC(P/M)-BNC(J/K), 50W, 10MHz~2.2GHz	EMI Application	GSP-Series
ADB-006	Adapter, DC Block, N(P/M)-N(J/K), 50W, 10MHz~6GHz	EMI Application	GSP-Series
ADB-008	Adapter, DC Block SMA(P/M)-SMA(J/K), 50W, 0.1MHz~8GHz	EMI Application	GSP-Series
GKT-008	EMI Probe Kit Set, Including ANT-04, ANT-05, PR-01, PR-02, ADP-002, GTL-303	EMI Application	GSP-Series
GLN-5040A	Line Impedance Stabilization Network (LISN), AC Single Phase, 9kHz~30MHz	EMI Application	GSP-Series
GIT-5060	Isolated transformer, 900VA Capacity	EMI Application	GSP-Series
GPL-5010	Transient Limiter, Input: BNC(J/F), Output: M(P/M), 9kHz~200MHz	EMI Application	GSP-Series
ATA-001	Antenna, General FM Antenna, BNC(P/M)	Special Application	GSP-Series
GBK-001	GRF-1300 Experiment Text Book of Teacher Version	Special Application	GRF-1300
GBK-002	GRF-1300A Experiment Text Book of Teacher Version	Special Application	GRF-1300A
GKT-001	General Kit Set, Including ADP-002, ATN-100, GTL-303, GSC-002	Special Application	GSP-Series
GKT-002	CATV Kit Set, Including ADP-001, ADP-101, GTL-304, GSC-003	Special Application	GSP-Series
GKT-003	RLB Kit Set, Including GAK-001, GAK-002, GTL-302, GSC-004	Special Application	GSP-Series
RLB-001	Return Loss Bride, 10MHz - 1GHz, Source/Load: N(J/F), Coupling: N(P/M)	Special Application	GSP-Series

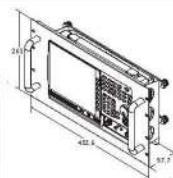
**GTL-110** BNC Cable, BNC(P/M)-BNC(P/M), 1000mm



**GTL-246** USB Cable, USB 2.0, A-B Type, 1200mm



**GRA-415** Rack Adapter Kit



**GTL-248** GPIO Cable, Double Shielded, 2000mm



**GTL-250** GPIO Cable, Double Shielded, 600mm



**GPL-5010** Transient Limiter, Input: BNC(J/F), Output: M(P/M), 9kHz~200MHz



**GLN-5040A** Line Impedance Stabilization Network (LISN), AC Single Phase, 9kHz~30MHz



**GIT-5060** Isolated transformer, 900VA Capacity



## ACCESSORIES

### RLB-001

Return Loss Bridge  
10MHz ~ 1GHz



Frequency Range	10MHz ~ 1GHz
Directivity	10MHz ~ 100MHz : >48dB ; 100MHz ~ 1000MHz : >38dB
Insertion Loss	Source to Load : <10dB ; Load to Coupler : <6dB
Return Loss	Source Return Loss : >7dB ; Load Return Loss : >11dB Coupler Return Loss : >17dB
Characteristic Impedance	50 Ohm
Connector	N Type ; Source and Load : Female ; Coupler : Male
Dimension & Weight	88 x 54 x 32 (mm) , 230 g

### ATA-001

BNC Antenna  
For: GSP-Series  
(An additional ADP-001 is needed  
for fitting GSP spectrum analyzers)



### GKT-008 EMI Probe Kit Set

ADP-002 : Adaptor SMA(J/F) ~ N (P/M) x 1  
GTL-303 : RF Cable SMA(P/M) ~ SMA(P/M) x 1  
PR-01 : AC Voltage Probe x 1  
PR-02 : Touch Passive RF Probe x 1  
ANT-04 : H-field Probe x 1  
ANT-05 : H-field Probe x 1



### GKT-001 General Kit Set

ADP-002  
ATN-100  
GTL-303  
GSC-002



### GKT-002 CATV Kit Set

ADP-001  
ADP-101  
GTL-304  
GSC-003



### GKT-003 RLB Kit Set

GAK-001  
GAK-002  
GTL-302  
GSC-004



### ADP-001

Adaptor  
BNC(J/F)~N(P/M)



### ADP-002

Adaptor  
SMA(J/F)~N(P/M)



### GAK-001

Termination 50Ω  
N (P/M)



### GAK-002

Cap with Chain  
N (P/M)



### GTL-301

RF Cable (RG 223  
N(P/M) ,  
1000mm)



### GTL-302

RF Cable Assembly  
(RG223, N(P/M),  
300mm)



### GTL-303

RF Cable Assembly  
(SMA(P/M),RG316,  
600mm)



(An additional  
ADP-002 is needed  
for fitting GSP  
spectrum analyzers)

### GTL-304

RF Cable Assembly  
(Rg223, N(P/M)  
~N(J/F),280mm)



### ADB-002

DC Block BNC 50Ω 10MHz~2.2GHz



### ADB-006

DC Block N-TYPE 50Ω 10MHz~6GHz



### ADB-008

DC Block SMA 50Ω 0.1MHz~8GHz



### GAK-003

50Ω Impedance Adaptor



### ADP-101

BNC(J/F) 75Ω ~  
BNC(P/M) 50Ω

(An additional ADP-001 is needed  
for fitting GSP spectrum analyzers)



### ATN-100

10dB Attenuator  
N(J/F) ~ N(P/M)







## SIGNAL SOURCES

GW Instek has been one of the major signal source suppliers for worldwide users by providing the advanced-featured products for decades. The wide product lines including MFG(Multi-Channel Function Generator), AFG (Arbitrary Function Generator), RF Signal Generator, DDS (Direct Digital Synthesized) Function Generators, and Analog Function Generators are well provided. MFG-2000 Series is a brand new product of function generator. The special feature is that you can output maximum for five channels simultaneously. It also has RF Generator and the frequency is from 1uHz to 160MHz/320MHz. The most important is isolated design. Output Channels, synchronization and modulation input/output connector grounding are isolated from instrument chassis. The MFG-2000 Series is designed for scientific research and educational applications by the RF Generator and the isolated design. The AFG-3000 Series is designed for industrial, scientific research and educational applications by the high sample rate and the wide frequency bandwidth. The AFG-2000 and AFG-200 series are designed to accommodate the educational and basic industrial requirements. The USG Series is a pocket-sized, and USB interface compatible RF signal generator. The SFG-series is a DDS based design for entry level engineering and educational applications. To fit versatile applications, each product line features different frequency ranges and/or specifications to meet the demands. Last but not least, Audio Generators are also provided for the specific fields.

## PRODUCTS

- Arbitrary Function Generator
- Multi-Channel Function Generator
- USB Modular Arbitrary Function Generator
- DDS Function Generator
- Analog Function Generator
- Audio Generator
- RF Signal Generator

## ARBITRARY FUNCTION GENERATOR OVERVIEW

Arbitrary function generator (ARB) is a digital-synthesized-technique based signal generator which generates both arbitrary and function waveforms. For the arbitrary waveform, the demanded waveform data can be edited by different means, saved into the memory, and sent out thru a digital to analog converter as a stimulus source. For the function waveform generation part in arbitrary function generator, the commonly used function waveforms like sine, square, triangle, ramp, pulse ... etc. are built into the memory for selection, which is referred to DDS (Direct Digital Synthesized) type function generator. The AM, FM, FSK, PWM and Sweep function, etc are usually optional features.

One major difference of the circuit structure between ARB and DDS function generator is that a low pass filter is used at the digital-to-analog converter (DAC) output to smooth out the quantization steps in DDS function generator. Therefore when a function waveform is demanded, in order to obtain low-distortion waveform, the signal generated from function section is suggested instead of ARB section.

The major specifications for arbitrary waveform generation are described as follows.

### Sample Rate, Repetition Rate and True-Point-by-Point Arbitrary Waveform

The profile of arbitrary waveform is composed of a series of data. The frequency of arbitrary waveform is derived from sampling rate divided by the number of points constructing a complete waveform, i.e.  $\text{frequency} = \text{sampling rate} / \text{number of points in waveform}$ . Based on the equation, the higher the sampling rate, the higher the arbitrary waveform frequency can be available.

The ultimate case of composing an arbitrary waveform is the waveform made of two points. The frequency of the two-points-waveform is supposed to be half of the sample rate according to the above equation. But many ARB waveform generators do not follow this rule. The Repetition Rate is used to describe the limitation of highest frequency can be composed for the arbitrary waveform. It could be one third, one forth... etc of the sample rate. In case of the repetition is half of sample rate, it is true-point-by-point arbitrary waveform generator.

### Vertical Resolution

The vertical resolution in arbitrary waveform represents the quantization distortion level, which the bit number of DAC plays the main role to decide it.

The higher bit DAC generates the output levels in finer steps, the output signal is less distorted and with less noise.

### Memory Length

The waveform data is stored in the memory for sending out. More memory allows more waveform data to be stored, which is convenient for users to create a complex or lasting long waveform.



# ARBITRARY FUNCTION GENERATOR

## ARBITRARY FUNCTION GENERATOR SELECTION GUIDE OF AFG-3000 Series

	MODEL	AFG-3032	AFG-3031	AFG-3022	AFG-3021	AFG-3081	AFG-3051
	Technology	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS
CHANNEL	Analog Channel	2	1	2	1	1	1
ISOLATED DESIGN	Isolated	V	V	V	V	-	-
RF	RF Generator Frequency	-	-	-	-	-	-
FREQUENCY	Frequency Range	1μHz ~ 30MHz	1μHz ~ 30MHz	1μHz ~ 20MHz	1μHz ~ 20MHz	1μHz ~ 80MHz	1μHz ~ 50MHz
	Frequency Resolution	1μHz	1μHz	1μHz	1μHz	1μHz	1μHz
ARB	Sample Rate	250MSa/s	250MSa/s	250MSa/s	250MSa/s	200MSa/s	200MSa/s
	Repetition Rate	125MHz	125MHz	125MHz	125MHz	100MHz	100MHz
	Memory Length	8M Points	8M Points	8M Points	8M Points	1M Points	1M Points
	Vertical Resolution	16-bit	16-bit	16-bit	16-bit	16-bit	16-bit
OUTPUT	Amplitude Range (@50Ω)	1mVpp ~ 10Vpp	1mVpp ~ 10Vpp	1mVpp ~ 10Vpp	1mVpp ~ 10Vpp	1mVpp ~ 10Vpp	1mVpp ~ 10Vpp
	DC Offset (@50Ω)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)
	Attenuator	-	-	-	-	-	-
	Amplitude Unit	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm
	Impedance Switch	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z
FAN OUT	CMOS Output	-	-	-	-	-	-
	TTL Output/Sync Output	V	V	V	V	V	V
SQUARE	Square Rise/Fall Time	<8ns	<8ns	<8ns	<8ns	<8ns	<8ns
CHARACTERISTIC	Square Duty Cycle	20% ~ 80%	20% ~ 80%	20% ~ 80%	20% ~ 80%	20% ~ 80%	20% ~ 80%
PULSE	Pulse Width	20ns~999830s	20ns~999830s	20ns~999830s	20ns~999830s	8ns~1999.9s	8ns~1999.9s
CHARACTERISTIC	Duty Cycle	0.017%~99.983%	0.017%~99.983%	0.017%~99.983%	0.017%~99.983%	-	-
	Leading and Trailing Edge Time	9.32ns~799900s	9.32ns~799900s	9.32ns~799900s	9.32ns~799900s	<8ns	<8ns
BASIC WAVEFORM	Sine	V	V	V	V	V	V
	Square	V	V	V	V	V	V
	Triangle/Ramp	V	V	V	V	V	V
	Pulse	V	V	V	V	V	V
	Noise	V	V	V	V	V	V
	Harmonic	V	V	V	V	-	-
	Burst	V	V	V	V	V	V
	DC	V	V	V	V	V	V
SWEEP FUNCTION	Sweep	V	V	V	V	V	V
	AM	V	V	V	V	V	V
MODULATION	FM	V	V	V	V	V	V
	PM	V	V	V	V	-	-
	FSK	V	V	V	V	V	V
	ASK	-	-	-	-	-	-
	PSK	-	-	-	-	-	-
	PWM	V	V	V	V	V	V
	SUM	V	V	V	V	-	-
COUNTER FUNCTION	Counter	-	-	-	-	-	-
OTHERS	Ext. Trigger Input	V	V	V	V	V	V
	Ext. Modulation Input	V	V	V	V	V	V
	Trigger Output	-	-	-	-	V	V
	Modulation Output	-	-	-	-	V	V
	Marker Output	-	-	-	-	V	V
POWER AMPLIFIER	Power Amplifier, Inout, Output	-	-	-	-	-	-
INTERFACE	GPIB(Including option)	V	V	V	V	V	V
	USB Host	V	V	V	V	V	V
	USB Device	V	V	V	V	V	V
	LAN	V	V	V	V	-	-
	RS-232C	-	-	-	-	V	V
DISPLAY	Display	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD
	Voltage Display	V	V	V	V	V	V
DSO LINK	DSO Link	V	V	V	V	V	V
STORAGE MEMORY	Internal Storage Memory	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups
LABVIEW	LabView Driver	V	V	V	V	V	V
POWER	Power Source	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V
	Power Consumption	85VA	50VA	85VA	50VA	65VA	65VA
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# ARBITRARY FUNCTION GENERATOR

## ARBITRARY FUNCTION GENERATOR SELECTION GUIDE OF MFG-2000 Series

MODEL		MFG-2220HM	MFG-2260MRA	MFG-2260MFA	MFG-2260M	MFG-2230M	MFG-2160MR	MFG-2160MF	MFG-2130M	MFG-2120MA	MFG-2120	MFG-2110
	Technology	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS
CHANNEL	Analog Channel	2	2	2	2	2	1	1	1	1	1	1
ISOLATED DESIGN	Isolated	-	V	V	V	V	V	V	V	V	V	V
RF	RF Generator Frequency	-	320MHz	160MHz	-	-	320MHz	160MHz	-	-	-	-
FREQUENCY	Frequency Range	200MHz	60MHz	60MHz	60MHz	30MHz	60MHz	60MHz	30MHz	20MHz	20MHz	10MHz
	Frequency Resolution	1μHz	1μHz	1μHz	1μHz	1μHz	1μHz	1μHz	1μHz	1μHz	1μHz	1μHz
ARB	Sample Rate	250MS/s	200MSa/s	200MSa/s	200MSa/s	200MSa/s	200MSa/s	200MSa/s	200MSa/s	200MSa/s	200MSa/s	200MSa/s
	Repetition Rate	125MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz	100MHz
	Memory Length	16k Points	16k Points	16k Points	16k Points	16k Points	16k Points	16k Points	16k Points	16k Points	16k Points	16k Points
	Vertical Resolution	14-bit	14-bit	14-bit	14-bit	14-bit	14-bit	14-bit	14-bit	14-bit	14-bit	14-bit
OUTPUT	Amplitude Range (@50Ω)	1mVpp~10Vpp	1mVpp~10Vpp	1mVpp~10Vpp	1mVpp~10Vpp	1mVpp~10Vpp	1mVpp~10Vpp	1mVpp~10Vpp	1mVpp~10Vpp	1mVpp~10Vpp	1mVpp~10Vpp	1mVpp~10Vpp
	DC Offset (@50Ω)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC)
	Attenuator	-	-	-	-	-	-	-	-	-	-	-
	Amplitude Unit	Vpp,Vrms,dBm	Vpp,Vrms,dBm	Vpp,Vrms,dBm	Vpp,Vrms,dBm	Vpp,Vrms,dBm	Vpp,Vrms,dBm	Vpp,Vrms,dBm	Vpp,Vrms,dBm	Vpp,Vrms,dBm	Vpp,Vrms,dBm	Vpp,Vrms,dBm
	Impedance Switch	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z
FAN OUT	CMOS Output	-	-	-	-	-	-	-	-	-	-	-
	TTL Output/Sync Output	V	V	V	V	V	V	V	V	V	V	V
SQUARE	Square Rise/Fall Time	<15ns	<15ns	<15ns	<15ns	<15ns	<15ns	<15ns	<15ns	<15ns	<15ns	<15ns
CHARACTERISTIC	Square Duty Cycle	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%
PULSE	Pulse Width	20ns~999.9ks	20ns~999.9ks	20ns~999.9ks	20ns~999.9ks	20ns~999.9ks	20ns~999.9ks	20ns~999.9ks	20ns~999.9ks	20ns~999.9ks	20ns~999.9ks	20ns~999.9ks
CHARACTERISTIC	Duty Cycle	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%	0.01%~99.99%
	Leading and Trailing Edge Time	10ns~20s	10ns~20s	10ns~20s	10ns~20s	10ns~20s	10ns~20s	10ns~20s	10ns~20s	10ns~20s	10ns~20s	10ns~20s
BASIC WAVEFORM	Sine	V	V	V	V	V	V	V	V	V	V	V
	Square	V	V	V	V	V	V	V	V	V	V	V
	Triangle/Ramp	V	V	V	V	V	V	V	V	V	V	V
	Pulse	V	V	V	V	V	V	V	V	V	V	V
	Noise	V	V	V	V	V	V	V	V	V	V	V
	Harmonic	-	-	-	-	-	-	-	-	-	-	-
	Burst	V	V	V	V	V	V	V	V	V	-	-
	DC	-	-	-	-	-	-	-	-	-	-	-
SWEEP FUNCTION	Sweep	V	V	V	V	V	V	V	V	V	-	-
MODULATION	AM	V	V	V	V	V	V	V	V	V	-	-
	FM	V	V	V	V	V	V	V	V	V	-	-
	PM	V	V	V	V	V	V	V	V	V	-	-
	FSK	V	V	V	V	V	V	V	V	V	-	-
	ASK(RF Channel)	V	V	V	-	-	V	V	-	-	-	-
	PSK(RF Channel)	V	V	V	-	-	V	V	-	-	-	-
	PWM	V	V	V	V	V	V	V	V	V	-	-
	SUM	V	V	V	V	V	V	V	V	V	-	-
COUNTER FUNCTION	Counter	V	V	V	V	V	V	V	V	V	-	-
OTHERS	Ext. Trigger Input	V	V	V	V	V	V	V	V	V	-	-
	Ext. Modulation Input	V	V	V	V	V	V	V	V	V	-	-
	Trigger Output	V	V	V	V	V	V	V	V	V	-	-
	Modulation Output	-	-	-	-	-	-	-	-	-	-	-
	Marker Output	V	V	V	V	V	V	V	V	V	-	-
POWER AMPLIFIER	Power Amplifier,Inout,Output	V	V	V	-	-	-	-	-	V	-	-
INTERFACE	GPIO(Including option)	-	-	-	-	-	-	-	-	-	-	-
	USB Host	V	V	V	V	V	V	V	V	V	V	V
	USB Device	V	V	V	V	V	V	V	V	V	V	V
	LAN(By Model)	V	V	V	V	V	-	-	-	-	-	-
	RS232C	-	-	-	-	-	-	-	-	-	-	-
DISPLAY	Display	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD	4.3" TFT LCD
	Voltage Display	V	V	V	V	V	V	V	V	V	V	V
DSO LINK	DSO Link	V	V	V	V	V	-	-	-	-	-	-
STORAGE MEMORY	Internal Storage Memory	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups
LABVIEW	LabView Driver	V	V	V	V	V	V	V	V	V	V	V
POWER	Power Source	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V
	Power Consumption	30W~80W	30W~80W	30W~80W	30W~80W	30W~80W	30W~80W	30W~80W	30W~80W	30W~80W	30W~80W	30W~80W
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# ARBITRARY FUNCTION GENERATOR

## ARBITRARY FUNCTION GENERATOR SELECTION GUIDE OF AFG-2000 Series

MODEL		AFG-2225	AFG-2125	AFG-2112	AFG-2105	AFG-2025	AFG-2012	AFG-2005
	Technology	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS
CHANNEL	Analog Channel	2	1	1	1	1	1	1
RF	RF Generator Frequency	-	-	-	-	-	-	-
FREQUENCY	Frequency Range	1μHz ~ 25MHz	0.1Hz ~ 25MHz	0.1Hz ~ 12MHz	0.1Hz ~ 5MHz	0.1Hz ~ 25MHz	0.1Hz ~ 12MHz	0.1Hz ~ 5MHz
	Frequency Resolution	1μHz	0.1Hz	0.1Hz	0.1Hz	0.1Hz	0.1Hz	0.1Hz
ARB	Sample Rate	120MSa/s	20MSa/s	20MSa/s	20MSa/s	20MSa/s	20MSa/s	20MSa/s
	Repetition Rate	60MHz	10MHz	10MHz	10MHz	10MHz	10MHz	10MHz
	Memory Length	4k Points	4k Points	4k Points	4k Points	4k Points	4k Points	4k Points
	Vertical Resolution	10-bit	10-bit	10-bit	10-bit	10-bit	10-bit	10-bit
OUTPUT	Amplitude Range (@50Ω)	1mVpp ~ 10Vpp (≤ 20MHz) 1mVpp ~ 5Vpp (>20MHz)	1mVpp ~ 10Vpp (≤ 20MHz) 1mVpp ~ 5Vpp (>20MHz)	1mVpp ~ 10Vpp	1mVpp ~ 10Vpp	1mVpp ~ 10Vpp (≤ 20MHz) 1mVpp ~ 5Vpp (>20MHz)	1mVpp ~ 10Vpp	1mVpp ~ 10Vpp
	DC Offset (@50Ω)	±5Vpk (AC+DC) (≤ 20MHz) ±2.5Vpk (AC+DC) (>20MHz)	±5Vpk (AC+DC) (≤ 20MHz) ±2.5Vpk (AC+DC) (>20MHz)	±5Vpk (AC+DC)	±5Vpk (AC+DC)	±5Vpk (AC+DC) (≤ 20MHz) ±2.5Vpk (AC+DC) (>20MHz)	±5Vpk (AC+DC)	±5Vpk (AC+DC)
	Attenuator	-	-	-	-	-	-	-
	Amplitude Unit	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm
	Impedance Switch	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z
FAN OUT	CMOS Output	-	-	-	-	-	-	-
	TTL Output/Sync Output	-	V	V	V	V	V	V
SQUARE CHARACTERISTIC	Square Rise/Fall Time	≤ 25ns	≤ 25ns	≤ 25ns	≤ 25ns	≤ 25ns	≤ 25ns	≤ 25ns
	Square Duty Cycle	1% ~ 99%	1% ~ 99%	1% ~ 99%	1% ~ 99%	1% ~ 99%	1% ~ 99%	1% ~ 99%
PULSE CHARACTERISTIC	Pulse Width	20ns~1999.9s	-	-	-	-	-	-
	Duty Cycle	-	-	-	-	-	-	-
	Leading and Trailing Edge Time	-	-	-	-	-	-	-
BASIC WAVEFORM	Sine	V	V	V	V	V	V	V
	Square	V	V	V	V	V	V	V
	Triangle/Ramp	V	V	V	V	V	V	V
	Pulse	V	V	V	V	V	V	V
	Noise	V	V	V	V	V	V	V
	Burst	V	-	-	-	-	-	-
SWEEP FUNCTION	Sweep	V	V	V	V	-	-	-
MODULATION	AM / Modulation	V	V	V	V	-	-	-
	FM	V	V	V	V	-	-	-
	PM	V	-	-	-	-	-	-
	FSK	V	V	V	V	-	-	-
	ASK	-	-	-	-	-	-	-
	PSK	-	-	-	-	-	-	-
	PWM	-	-	-	-	-	-	-
	SUM	V	-	-	-	-	-	-
COUNTER FUNCTION	Counter	V	V	V	V	-	-	-
OTHERS	Ext. Trigger Input	V	V	V	V	-	-	-
	Ext. Modulation Input	V	V	V	V	-	-	-
	Trigger Output	V	-	-	-	-	-	-
	Modulation Output	-	V	V	V	-	-	-
	Marker Output	-	-	-	-	-	-	-
INTERFACE	GPIO(Including option)	-	-	-	-	-	-	-
	USB Host	V	V	V	V	V	V	V
	USB Device	V	V	V	V	V	V	V
	LAN	-	-	-	-	-	-	-
	RS232C	-	-	-	-	-	-	-
DISPLAY	Display	3.5" TFT LCD	3.5" 3-Color LCD	3.5" 3-Color LCD	3.5" 3-Color LCD	3.5" 3-Color LCD	3.5" 3-Color LCD	3.5" 3-Color LCD
	Voltage Display	V	V	V	V	V	V	V
DSO LINK	DSO Link	V	X	X	X	X	X	X
STORAGE MEMORY	Internal Storage Memory	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups	10 Groups
LABVIEW	LabView Driver	V	V	V	V	V	V	V
POWER	Power Source	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V	AC100 ~ 240V
	Power Consumption	25W	25VA	25VA	25VA	25VA	25VA	25VA
Page		C23-25	C23-25	C23-25	C23-25	C23-25	C23-25	C23-25

# ARBITRARY FUNCTION GENERATOR

## ARBITRARY FUNCTION GENERATOR SELECTION GUIDE OF AFG-100/200 Series

MODEL		AFG-225P	AFG-225	AFG-125P	AFG-125
	Technology	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS	Arbitrary / DDS
CHANNEL	Analog Channel	2	2	1	1
FREQUENCY	Frequency Range	1μHz ~ 25MHz	1μHz ~ 25MHz	1μHz ~ 25MHz	1μHz ~ 25MHz
	Frequency Resolution	1μHz	1μHz	1μHz	1μHz
ARB	Sample Rate	120MSa/s	120MSa/s	120MSa/s	120MSa/s
	Repetition Rate	60MHz	60MHz	60MHz	60MHz
	Memory Length	4k Points	4k Points	4k Points	4k Points
	Vertical Resolution	10-bit	10-bit	10-bit	10-bit
OUTPUT	Amplitude Range (@50Ω)with USB	1mVpp~ 2.0Vpp	1mVpp~ 2.0Vpp	1mVpp~ 2.0Vpp	1mVpp~ 2.0Vpp
	Amplitude Range(@50Ω)with DC power	1mVpp ~ 2.5Vpp	1mVpp ~ 2.5Vpp	1mVpp ~ 2.5Vpp	1mVpp ~ 2.5Vpp
	DC Offset (@50Ω)	±1.25Vpk (AC+DC)	±1.25Vpk (AC+DC)	±1.25Vpk (AC+DC)	±1.25Vpk (AC+DC)
	Attenuator	-	-	-	-
	Amplitude Unit	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm	Vpp, Vrms, dBm
FAN OUT	Impedance Switch	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z	50Ω / Hi-Z
	CMOS Output	-	-	-	-
SQUARE CHARACTERISTIC	TTL Output/Sync Output	V	V	V	V
	Square Rise/Fall Time	≤10ns	≤10ns	≤10ns	≤10ns
PULSE CHARACTERISTIC	Square Duty Cycle	1% ~ 99%	1% ~ 99%	1% ~ 99%	1% ~ 99%
	Pulse Width	20ns~1999.6s	20ns~1999.6s	20ns~1999.6s	20ns~1999.6s
	Duty Cycle	-	-	-	-
BASIC WAVEFORM	Leading and Trailing Edge Time	-	-	-	-
	Sine	V	V	V	V
	Square	V	V	V	V
	Triangle/Ramp	V	V	V	V
	Pulse	V	V	V	V
	Noise	V	V	V	V
SWEEP FUNCTION	Burst	V	V	V	V
	Sweep	V	V	V	V
MODULATION	AM/Modulation	V	V	V	V
	FM	V	V	V	V
	PM	V	V	V	V
	FSK	V	V	V	V
	ASK	-	-	-	-
	PSK	-	-	-	-
	PWM	-	-	-	-
	SUM	V	V	V	V
COUNTER FUNCTION	GCV Function	-	-	-	-
	VCF Function	-	-	-	-
OTHERS	Counter	-	-	-	-
	Trigger Output	-	-	-	-
	Modulation Output	-	-	-	-
INTERFACE	Marker Output	-	-	-	-
	GPB(Including option)	-	-	-	-
	USB Host	-	-	-	-
	USB Device	V	V	V	V
DISPLAY	RS-232C	-	-	-	-
	Display	-	-	-	-
DSO LINK	Voltage Display	V	V	V	V
	DSO Link	-	-	-	-
STORAGE MEMORY	Internal Storage Memory	10 Groups	10 Groups	10 Groups	10 Groups
LABVIEW	LabView Driver	-	-	-	-
POWER	Power Supply(Optional)	V	-	V	-
	Power Source	DC 5V	DC 5V	DC 5V	DC 5V
	Power Consumption	10W	10W	10W	10W
Page	Page	C26-27	C26-27	C26-27	C26-27

### USB MODULAR ARBITRARY FUNCTION GENERATOR SOLUTION FOR ORDERING

MODEL	AFG-225P	AFG-225	AFG-125P	AFG-125
Stand-alone Operation	GPA-501/502, GTL-246 option	GPA-501/502, GTL-246 option	GPA-501/502, GTL-246 option	GPA-501/502, GTL-246 option
Collocation with GDS-2000A Series DSO	DS2-FH1, GPA-501/502 option	DS2-FH1 option	DS2-FH1, GPA-501/502 option	DS2-FH1 option
Page	C28-29	C28-29	C28-29	C28-29



# 30MHz/20MHz Arbitrary Function Generator



## AFG-303X/302X



### FEATURES

- \* 1  $\mu$ Hz ~ 20 or 30MHz, 20Vpp. 1 or 2 Channel (s)
- \* Arbitrary Waveform 250MSa/s, 16-bit Resolution, 8M Memory Depth
- \* Isolation Channel Circuit Design
- \* Synchronized Phase Operates up to 6 Units and 12 Channels
- \* Harmonic Signal Generator
- \* Dual Channel Models Support SUM Modulation, Coupling, Tracking, and Phase Functions
- \* Pulse Waveform Parameters Can be Set Independently
- \* Built-in AM/FM/PM/FSK/PWM/SUM Modulation, Sweep and Burst Functions
- \* Built-in Medical and Automotive Electronic Waveforms
- \* Built-in I/Q baseband Waveform on AFG-3032/3022
- \* Provide USB/LAN/GPIB (Optional) Instrument Control Interface

GW Instek AFG-303X/302X arbitrary function generators include 20MHz/30MHz single isolated channel and 20/30 MHz dual isolated channel models, designed to meet industry, scientific research, and education applications. Not only output channel is earth ground isolation, dual channel models are also independently earth ground isolation, which is suitable for floating circuits (up to  $\pm 42$ V). Without taking grounding reference into consideration, each channel of dual channel models can be operated independently and multi ARB units can output simultaneously. Applications are, for instance, the ignition control or transmission device of automotive electronics. The series features sample rate of 250MSa/s, 16-bit resolution, and 8M point memory depth arbitrary waveform characteristics. Users can rebuild maximum 8M memory depth waveforms through using a GW Instek digital storage oscilloscope with the built-in DSOLink function of the AFG-303X/302X.

The series supports synchronized phase for multi channel operation and the maximum phase synchronization operation is up to 6 units and 12 channels. 10 MHz atomic clock frequency standard can be input via external signal source to elevate precision for frequency output. The series supports frequency sweep and amplitude sweep that can also integrate functions, including linear/logarithm, one-way (saw tooth)/two-way (triangle) waveforms, continuous/single trigger/gated trigger to meet various application requirements by applying different sweep methods. Frequency sweep tests the frequency response of electronic components such as filter and low frequency amplifier. Amplitude sweep simulates vibration tests (requires a vibration tester), and it also conducts aging tests of various materials and linearity tests of low frequency amplifier.

The main features of the AFG-303X/302X include output amplitude from 1mVpp to 10Vpp (connected with a 50 ohm load); frequency range from 1 $\mu$ Hz to 20MHz or 30MHz; 1 $\mu$ Hz frequency resolution; and built-in sine, square, pulse, triangle, ramp, DC voltage, harmonic and noise. The waveform width, rise edge time and fall edge time of pulse waveform can be adjusted flexibly. Pulse waveform, with duty cycle from 0.017% to 99.983%, can be applied as trigger signals. Users can conduct arbitrary editing via 65 built-in function waveforms. The series supports AM/FM/PM/FSK/PWM modulation, frequency sweep, amplitude sweep and burst to satisfy industrial application requirements. Dual channel models provide SUM modulation, coupling, tracking, and phase to meet the test requirements of differential signal, phase control and amplifier distortion. Built-in 8th harmonic signal generator simulates harmonic signal of switching power supplies and it also tests EMI power filter characteristics. The AFG-303X/302X provides free arbitrary waveform editing software (AWES) for users to quickly edit waveforms from the built-in diagrams so as to execute measurements.

### SPECIFICATIONS

	AFG-3031	AFG-3032	AFG-3021	AFG-3022
CHANNELS				
	1	2	1	2
FEATURES				
I/O Signal Ground for the Instrument Chassis	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 $\pm 42$ Vpk. (DC + AC Peak)			
Each of the Signal Ground of CH1/CH2 Standard Waveforms	—	Isolated	—	Isolated
	Sine, Square, Triangle, Ramp, Pulse, Noise, Harmonic, DC			
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 ~ 8M points			
Trigger	Infinite/Manual/External			
Built-in Arbitrary Waveforms	Sine, Square, Ramp, Sinc, Exp Rise, Exp Fall, DC, Pulse, Abstan, Haver cosine, Sinever, Absinn, 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, Ln, Sqrt, Since, Lorentz, Xsquare, Gauss, Arccos, Arctan, Sech, Arccot, Arctanh, Sinh, Arcsc, Cosh, Tan, Arcsec, Cot, Tanh, Arcsin, Csc, Arcsinh, Sec, Barthannwin, Chebwin, Kaiser, Bartlett, Flattopwin, Triang, Blackman, Hamming, Tukeywin, Bohmanwin, Hann, Cardiac, EOG, EEG, EMG, PLETH, RESP, ECG1, ECG2, ECG3, ECG4, ECG5, ECG6, ECG7, ECG8, ECG9, ECG10, ECG11, ECG12, ECG13, ECG14, ECG15, LFPULSE, TENS1, TENS2, TENS3, IGNITION, SP, VR, TP1, TP2A, TP2B, TP3A, TP3B, TP4, TP5A, TP5B			
	Note: It is required to update the ARB data first prior to enabling both Medical (Cardiac, EOG, EEG, EMG, PLETH, RESP, ECG1, ECG2, ECG3, ECG4, ECG5, ECG6, ECG7, ECG8, ECG9, ECG10, ECG11, ECG12, ECG13, ECG14, ECG15, LFPULSE, TENS1, TENS2, TENS3) and AutoElec (IGNITION, SP, VR, TP1, TP2A, TP2B, TP3A, TP3B, TP4, TP5A, TP5B) waveforms.			
IQ WAVEFORMS				
Source Type	Random, Fixed Pattern			
	ASK, MSK, FSK, 2FSK, 4FSK, 8FSK, BPSK, QPSK, DQPSK, OQPSK, pi/4-QPSK, pi/4-DQPSK, 8PSK, 16APSK, 32APSK, 16QAM, 32QAM, 64QAM			
FREQUENCY CHARACTERISTICS				
Sine/Square Pulse	1 $\mu$ Hz ~ 30MHz 1 $\mu$ Hz ~ 25MHz	1 $\mu$ Hz ~ 30MHz 1 $\mu$ Hz ~ 25MHz	1 $\mu$ Hz ~ 20MHz 1 $\mu$ Hz ~ 20MHz	1 $\mu$ Hz ~ 20MHz 1 $\mu$ Hz ~ 20MHz
Triangle/Ramp	1 $\mu$ Hz ~ 1MHz			
Resolution	1 $\mu$ Hz			
Accuracy	$\pm 1$ ppm 0 ~ 50 $^{\circ}$ C ; $\pm 0.3$ ppm 18 ~ 28 $^{\circ}$ C			
Stability	$\pm 1$ ppm, per 1 year			
Aging	$\leq 1$ $\mu$ Hz			
Tolerance				
OUTPUT CHARACTERISTICS (2)				
Amplitude	Range	1 mVpp ~ 10 Vpp (into 50 $\Omega$ ); 2 mVpp to 20 Vpp (into open-circuit)		
	Accuracy	$\pm 1\%$ of setting $\pm 1$ mVpp (at 1 kHz / into 50 $\Omega$ without DC offset)		
	Resolution	0.1 mV or 4 digits		
	Flatness	0.1dB <10 MHz; 0.2 dB 10 MHz ~ 30 MHz (sinewave relative to 1 kHz/into 50 $\Omega$ )		
	Units	Vpp, Vrms, dBm,		
Offset	Range	$\pm 5$ Vpk ac + dc (into 50 $\Omega$ ) ; $\pm 10$ Vpk ac + dc (into open circuit)		
	Accuracy	1% of setting + 2 mV+ 0.5% of amplitude		
Waveform Output	Impedance	50 $\Omega$ typical (fixed); > 10M $\Omega$ (output disabled)		
SYNC Output	Protection	Short-circuit protected ; Overload relay automatically disables main output		
	Ground Isolation	42Vpk max.		
	Level	TTL-compatible into>1k $\Omega$		
	Impedance	50 $\Omega$ 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 ~ 20 kHz			
Spurious(non-harmonic)(5)	-60 dBc DC~1 MHz; -50 dBc 1MHz~20MHz;			
	-50 dBc+ 6 dBc/octave 1MHz~30MHz(AFG-3031/3032only)			
Phase Noise	<-110dBc/Hz typical, 15 kHz offset, fc = 10MHz			



AFG-3032/3022



AFG-3031/3021

## SPECIFICATIONS

		AFG-3031	AFG-3032	AFG-3021	AFG-3022
SQUARE WAVE CHARACTERISTICS					
Rise/Fall Time	<8 ns (3)				
Overshoot	< 5%				
Asymmetry(@50% duty)	1% of period+1 ns				
Variable Duty Cycle	20.0%~80.0%, ≤ 25 MHz; 40.0%~60.0% , 25~30MHz			20.0%~80.0% , ≤ 20 MHz	
Jitter	0.01%+525ps<2 MHz; 0.1%+75ps>2 MHz				
RAMP CHARACTERISTICS					
Linearity	< 0.1% of peak output				
Variable Symmetry	0% ~ 100% (0.1% resolution)				
PULSE CHARACTERISTICS					
Pulse Width	20ns ~ 999,830s (Extended mode 0.00ns~1,000ks <sup>(*)</sup> ; Width-0.625 x [(Rise Time-0.6ns) + (Fall Time-0.6ns)] ≥ 0 ; Period ≥ Width-0.625 x [(Rise Time-0.6ns)+(Fall Time-0.6ns)]				
Duty Setting Range	0.017% ~ 99.983%(Extended mode 0.0000%~100,0000% <sup>(*)</sup> )				
Period	40ns ~ 1,000,000s				
Rise Time and Fall Time <sup>(*)</sup>	9.32ns ~ 799.89ks				
Resolution	0.0001%				
Overshoot	<5%				
Jitter	100 ppm + 50 ps				
Noise					
Noise Type	Gaussian				
Noise Bandwidth	100MHz equivalent bandwidth				
HARMONIC					
Harmonic Order	≤ 8				
Harmonic Type	Even, Odd, All, User ; Amplitude and Phase can be set for all harmonics				
AM and AM(DSB-SC)					
Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse, Noise, Arb				
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp				
Modulating Frequency	2 mHz ~ 20 kHz				
Depth	0% ~ 120.0%				
Source	Internal / External				
FM					
Carrier Waveforms	Sine, Square, Triangle, Ramp				
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp				
Modulating Frequency	2 mHz ~ 20 kHz				
Peak Deviation	DC ~ 30 MHz (1μHz resolution)			DC~20 MHz (1μHz resolution)	
Source	Internal / External				
PM					
Carrier Waveforms	Sine, Triangle, Ramp				
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp				
Phase Deviation	0°~ 360°, 0.1° resolution				
Modulating Frequency	2 mHz ~ 20 kHz				
Source	Internal				
PWM					
Carrier Waveforms	Square				
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp				
Modulating Frequency	2 mHz ~ 20 kHz				
Deviation	0% ~ 100.0% of pulse width, 0.1% resolution				
Source	Internal / External				
PSK					
Carrier Waveforms	Sine, Square, Triangle, Ramp				
Modulating Waveforms	50% duty cycle square				
Internal Rate	2 mHz to 1 MHz				
Frequency Range	DC ~ 30 MHz			DC ~ 20 MHz	
Source	Internal / External				
ADDITIVE MODULATION (SUM)					
Carrier Waveforms	Sine, Triangle, Ramp, Pulse, Noise				
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp				
Ratio	0% ~ 100% of carrier amplitude, 0.01% resolution				
Modulating Frequency	2 mHz ~ 20 kHz				
Source	Internal / External				
FSK					
Carrier Waveforms	Sine, Square, Triangle, Ramp				
Modulating Waveforms	50% duty cycle square				
Internal Rate	2 mHz ~ 1 MHz				
Frequency Range	DC ~ 30 MHz			DC ~ 20 MHz	
Source	Internal / External				

- Note : 1. A total of ten waveforms can be stored(Every waveform can composed of 8M points maximum)
- Add 1/10 th of output amplitude and offset specification per °C for operation outside of 0~C~28~C range(1-year specification)
  - Edge time decreased at higher frequency
  - Sine and square waveforms above 25 MHz are allowed only with an "Infinite" count
  - Harmonic distortion and Spurious noise at low amplitudes is limited by a -70 dBm floor
  - Loss may occur if the pulse width is beyond the setting range of the normal mode. The pulse may vanish at times.
  - Rise time and Fall time should be ≥0.01% of period.



# 30MHz/20MHz Arbitrary Function Generator

AFG-3032/3022 Rear Panel



AFG-3031/3021 Rear Panel



## SPECIFICATIONS

	AFG-3031	AFG-3032	AFG-3021	AFG-3022
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/Stop Frequency	Any frequency within the waveform's range			
Sweep Time	1 ms ~ 500 s (1 ms resolution)			
Trigger Mode	Single, External, Internal			
Trigger Source	Internal / External			
BURST				
Waveforms	Sine, Square, Triangle, Ramp, Pulse, Noise			
Frequency	1 μHz ~ 30 MHz (4)	1 μHz ~ 30 MHz (4)	1 μHz ~ 20 MHz	1 μHz ~ 20 MHz
Burst Count	1 ~ 1,000,000 cycles or Infinite			
Start / Stop Phase	-360.0 ~ +360.0° (0.1° resolution)			
Internal Period	1 μs ~ 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 : 0 μs ~ 100s (1us resolution)			
EXTERNAL MODULATION INPUT				
Type	AM, AM(DSB-SC), FM, PWM, Sum			
Voltage Range	± 5V full scale			
Input Impedance	10kΩ			
Frequency	DC ~ 20 kHz			
Modulation Output	Yes	—	Yes	—
Type	AM, AM(DSB-SC), 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 ~ 1 MHz			
Input Impedance	10kΩ,DC coupled			
LATENCY				
Sweep	< 1 μs (typical); Burst : < 0.55 ns (typical); ARB : < (27.5/sample rate)+274ns			
JITTER				
Sweep	2.5 μs ; 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 ~ 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) x 39 ±25nS; Parallel connection : (N-1) x 6 ±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	AC100 ~ 240V , 50 ~ 60Hz			
Power Consumption	50VA	85VA	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 & Weight	265 (W) x 107 (H) x 374 (D)mm, Approx. 4kg			

Note : The specifications apply when the function generator is powered on for at least 30 minutes under +20°C~+30°C.

## ORDERING INFORMATION

AFG-3031	30MHz Single channel Arbitrary Function Generator
AFG-3032	30MHz Dual channel Arbitrary Function Generator
AFG-3021	20MHz Single channel Arbitrary Function Generator
AFG-3022	20MHz Dual channel Arbitrary Function Generator

### ACCESSORIES :

Quick Start Guide x 1, CD-ROM with AFG software and user manual x 1  
 GTL-110 BNC Cable, BNC(P/M)-BNC(P/M), 1000mm x 1 (only AFG-3031/3021)  
 GTL-110 BNC Cable, BNC(P/M)-BNC(P/M), 1000mm x 2 (only AFG-3032/3022)

### OPTIONAL

Opt.01	GPIB Interface	GRA-432	Rack Adapter Kit
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### OPTIONAL ASSESSORIES

GTL-246	USB Type A to Type B cable
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### FREE DOWNLOAD

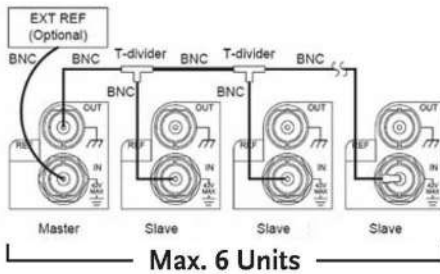
PC Software	Arbitrary Waveform Editing Software
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## A. CIRCUIT DESIGN FOR GROUND ISOLATION AMONG OUTPUT/INPUT TERMINAL, INSTRUMENT CHASSIS, AND DUAL CHANNELS



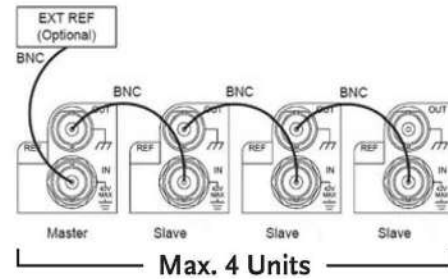
Channel 1, channel 2, reference 10 MHz input, synchronization and modulation input/output connector grounding are isolated from instrument chassis. The output channels of dual channel models are independently isolated. These connectors can sustain maximum isolation voltage up to  $\pm 42\text{Vpk}$  (DC+ AC peak value) to earth ground that is ideal for floating circuit tests. Multi units output can be achieved without factoring in grounding reference issue. Applications include ignition controller or transmission devices of automotive electronics. The built-in DC bias voltage of the AFG-3000 Series can be applied on various waveforms. The DC bias voltage is  $\pm 5\text{V}$  under  $50\Omega$  load. For automotive electronic applications require higher DC bias voltage such as ignition controller or transmission devices, the external power supplies can be used to bring up the DC bias voltage to  $\pm 42\text{Vpk}$  (DC+ AC peak value).

## B. MULTI CHANNEL SYNCHRONIZED PHASE OPERATION



Method one uses reference frequency output (REF OUT) and reference frequency input (REF IN), 50 ohm BNC cable (RG-58A/U) and T type BNC connector to connect up to 6 units to conduct synchronized phase operation.

Users can implement multi channel synchronized phase operation up to 6 units and 12 channels (AFG-3032/3022). There are two methods to execute synchronized phase applications. Under different frequency, master unit can synchronize each channel and modulate individual phase.



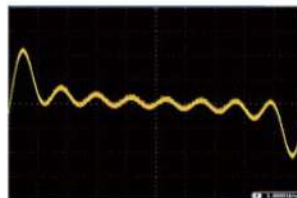
Method two uses reference frequency output (REF OUT) and reference frequency input (REF IN), 50 ohm BNC cable (RG-58A/U) to connect up to 4 units to conduct synchronized phase operation.

At 10 MHz reference frequency input (REF IN) connector, users can input 10 MHz atomic clock frequency standard via external signal source to enhance precision for frequency output.

## C. HARMONIC SIGNAL GENERATOR



Harmonic Signal Generator



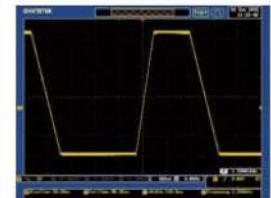
Harmonic Signal

Harmonic signal generator simulates the harmonic signal of switching power supplies and conducts characteristics tests on EMI power filter. Users can set order number and phase for harmonic signals to obtain desired signals. The above diagrams show 8th harmonic signal.

## D. PULSE GENERATOR



Pulse Generator



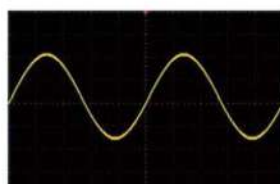
Pulse Signal

The output frequency for pulse reaches 25 MHz and its duty cycle is from 0.017% to 99.983%. Users can set pulse width, duty cycle, rise edge time, fall edge time and edge time to support trigger signal. The following diagrams show settings for pulse signal.

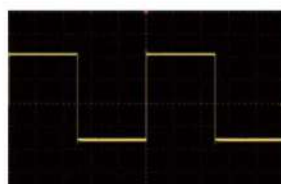


# 30MHz/20MHz Arbitrary Function Generator

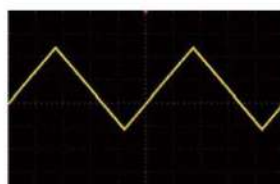
## E. VERSATILE OUTPUT WAVEFORM SELECTIONS



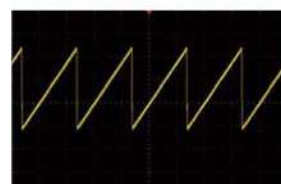
Sine



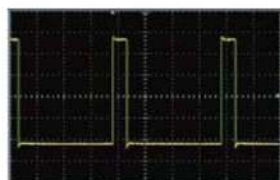
Square



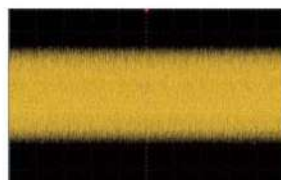
Triangle



Ramp



Pulse



Noise

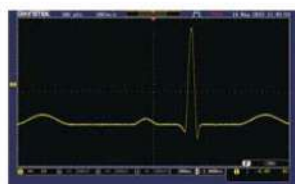


DC Voltage

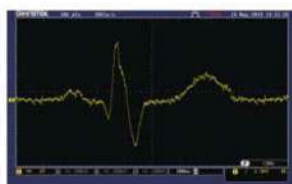


Arbitrary Waveform

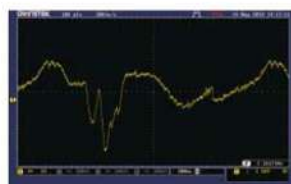
### MEDICAL APPLICATION WAVEFORMS



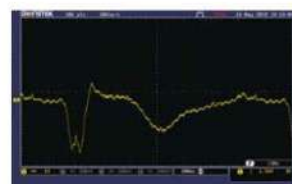
Cardiac



ECG1

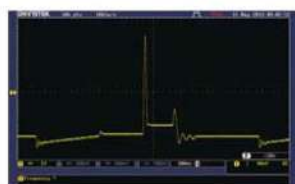


ECG2

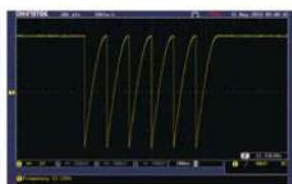


ECG3

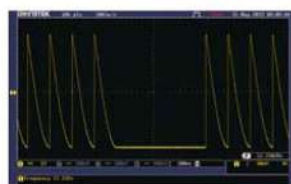
### AUTOMOTIVE ELECTRONIC WAVEFORMS



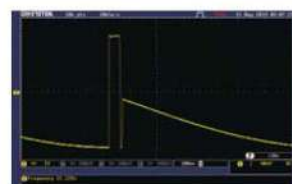
Ignition



ISO7637-2 TP3A



ISO7637-2 TP3B

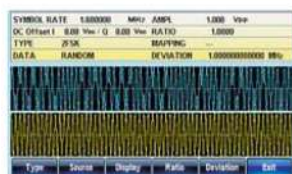


ISO7637-2 TP2B

There are standard waveforms for the series such as sine, square, triangle, ramp, pulse, noise, DC voltage. In addition, 102 built-in waveforms, including medical application waveforms and

commonly used automotive electronic waveforms allow users to easily select desired waveforms.

## F. IQ BASEBAND WAVEFORM OUTPUT FUNCTION FOR AFG-3032/3022



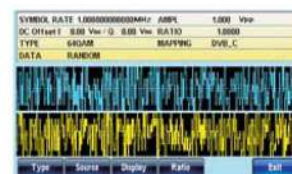
FSK



MSK



PSK

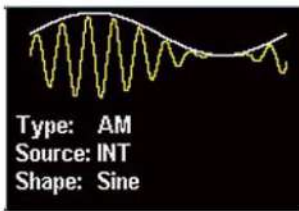


QAM

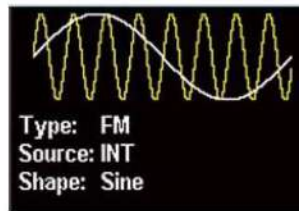
The CH1 and CH2 of AFG-3032/22 provide the IQ baseband waveform outputs, which include ASK, MSK, FSK(2FSK, 4FSK, 8FSK), PSK(BPSK, QPSK, DQPSK, QPPSK, pi/4 QPSK, pi/4DQPSK,

8PSK), APSK(16APSK, 32APSK), QAM(16QAM, 32QAM, 64QAM), etc. New IQ waveform commands are also available in the user manual.

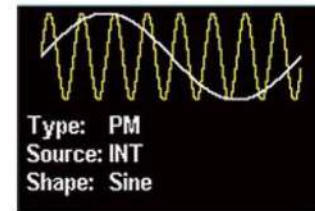
## G. MODULATION FUNCTION



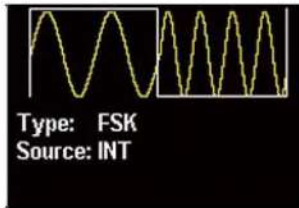
Amplitude Modulation



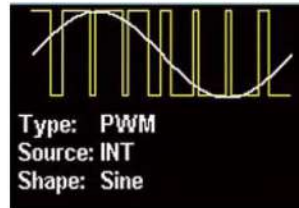
Frequency Modulation



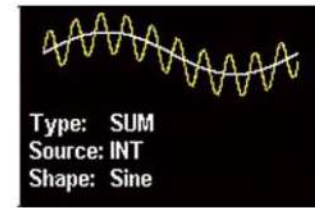
Phase Modulation



Frequency-shift Keying Modulation



Pulse Width Modulation



Sum Modulation

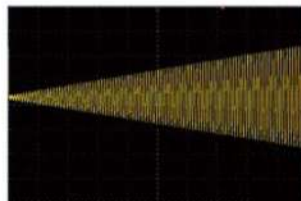
The series supports AM, FM, PM, FSK, PWM and SUM modulation. Modulation source can be from inside or outside.

Applications include the baseband of communications systems, motor control and light adjustment, etc.

## H. SWEEP FUNCTION



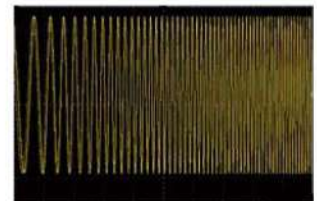
Amplitude Sweep Setting



Amplitude Sweep Signal



Frequency Sweep Setting



Frequency Sweep Signal

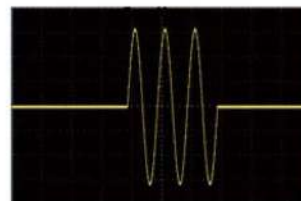
The series supports frequency sweep and amplitude sweep that can also integrate functions, including linear/logarithm, one-way (saw tooth)/two-way (triangle) waveforms, continuous/single trigger/gated trigger to meet various application requirements by different sweep methods. Frequency sweep carries out tests

on the frequency response of electronic components such as filter and low frequency amplifier. Amplitude sweep simulates vibration tests (requires a vibration tester), and it also conducts aging tests of various materials and linearity tests of low frequency amplifier.

## I. BURST FUNCTION



Burst Setting



Burst Signal

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

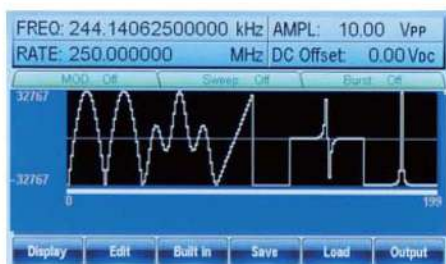


# 30MHz/20MHz Arbitrary Function Generator

## J. FLEXIBLE ARBITRARY WAVEFORM EDITING

### Four methods to obtain arbitrary waveforms

#### • Front Panel Operation



#### • CSV file Upload

	A	B	C
1	Start:	0	
2	Length:	629	
3	Sample Rate:	20000000	
4		0	
5		328	
6		655	
7		983	
8		1310	

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

```
Start: 0
Length: 629
Sample Rate: 20000000
0
328
655
983
1310
1638
```

Supports CSV file

Via single unit's panel, arbitrary waveforms can be selected, edited, stored, recalled, output, triggered from 65 built-in waveforms.

Support CSV file upload produced by MATLAB and Excel.

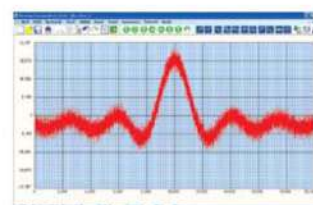
#### • Direct Waveform Reconstruction (DWR)



Direct Waveform Reconstruction from the DSO

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



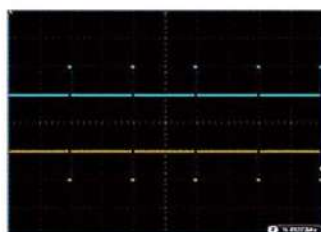
A Sinc Waveform with Gaussian Noise



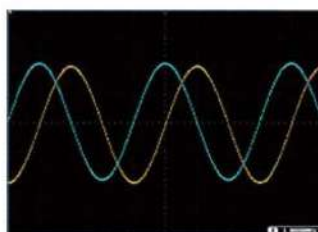
Digital Signal

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.

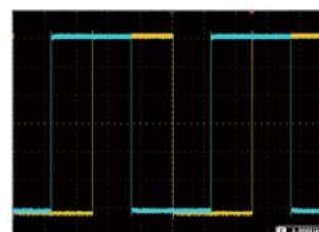
## K. CORRELATED FUNCTIONS OF DUAL CHANNEL OUTPUTS



Differential Signal



Sine and Cosine Signal



Square Signal Phase Adjustment

AFG-3032/3022 models support independent channel or correlated channel applications. Four correlated functions are provided including SUM modulation, coupling, tracking, and phase.

\* SUM modulation combines two signals and outputs the signal via one single channel. Combining noise and sine waveform to execute speaker's distortion test is one of the applications.

\* Coupling function arbitrarily sets ratio and difference for frequency and amplitude between two channels to realize a simultaneous effect for all parameters of dual channel. The example is amplifier using third order interpolation point(IP3) measurement to simulate signal output of two different frequency oscillators.

\* Tracking function produces differential signal with same frequency, same amplitude, and 180 degree phase difference.

\* Phase function arbitrarily sets phase parameters between two channels such as simulating sine/ cosine/square signal phase adjustment.

# 80MHz/50MHz Arbitrary Function Generator



## AFG-3081/3051



### FEATURES

- \* Wide Frequency Range From 1 $\mu$ Hz~80/50MHz
- \* 1 $\mu$ Hz Frequency Resolution Throughout Full Range
- \* Standard Waveform : Sine, Square, Triangle, Ramp, Pulse, Noise
- \* Built-In AM, FM, PWM, FSK, Sweep, Burst Functions
- \* 16bit, 200MSa/s, 1M-Point Deep Arbitrary Waveform
- \* DWR (Direct Waveform Reconstruction) Capability
- \* Arbitrary Waveform Editing PC Software
- \* 4.3" High Resolution LCD Display
- \* GPIB, RS-232C, USB Host/Device Standard Interfaces

The AFG-3081/3051 is an Arbitrary Waveform and Digital-Synthesized Function Generator designed for industrial, scientific research and educational applications. The series comes with bandwidth of 80MHz for AFG-3081 and 50MHz for AFG-3051. The AFG-3081/3051, featuring 200MSa/s sample rate, 100MHz repetition rate by true point-by-point edit, 16-bit vertical resolution and 1M points waveform length, is a very useful and flexible signal source to meet diversified application needs in the market today.

The user-friendly operation, the On-Screen Help, and the multiple ways of arbitrary waveform editing make AFG-3081/3051 just a plug-and-play equipment. The point by point waveform data entry or standard waveform clipping through front panel operation, the CSV file waveform data download, the direct waveform reconstruction through DSO waveform data import, and the PC software edited waveform download are the 4 methods available for arbitrary waveform editing.

A 4.3-inch high resolution TFT LCD in the AFG-3081/3051 front panel is used to display waveform and set parameters. The large and high-resolution screen is especially useful when the arbitrary waveform construction is done through front panel operation. The impedance of AFG-3081/3051 can be selected between 50 Ohm and Hi-Z to ensure right impedance compatibility between AFG and DUT.

SPECIFICATIONS		AFG-3081		AFG-3051	
WAVEFORMS					
Standard Waveform		Sine, Square, Ramp, Pulse, Noise, DC, Sin(x)/x, Exponential Rise, Exponential Fall, Negative Ramp			
ARBITRARY WAVEFORMS					
ARB Function		Built in			
Sample Rate		200 MSa/s			
Repetition Rate		100MHz			
Waveform Length		1M points			
Amplitude Resolution		16 bits			
Non-Volatile Memory		Ten 1M waveforms *1			
User define Output Section		Any section from 2 to 1M points			
User define Mark Output		Any section from 2 to 1M points			
FREQUENCY CHARACTERISTICS					
Range	Sine, Square	80MHz		50MHz	
	Triangle, Ramp	1MHz			
Resolution		1μHz			
Accuracy	Stability	±1 ppm 0 ~ 50℃			
	Aging	±1 ppm, per 1 year			
	Tolerance	≤1μHz			
OUTPUT CHARACTERISTICS *2					
Amplitude	Range	10 mVpp to 10 Vpp ( into 50Ω); 20 mVpp to 20 Vpp(open-circuit)			
	Accuracy	±1% of setting ±1 mVpp (at 1 kHz,>10 mVpp)			
	Resolution	0.1 mV or 4 digits			
	Flatness	±1%(0.1dB)<10MHz; ±2%(0.2dB)10MHz~50MHz; ±10%(0.9 dB)50MHz~70MHz; ±20%(1.9dB)70MHz~80MHz (sinewave relative to 1kHz)			
Offset	Units	Vpp, Vrms, dBm			
	Range	±5 Vpk ac +dc (into 50Ω); ±10Vpk ac +dc (Open circuit)			
	Accuracy	1% of setting + 2 mV+ 0.5% of amplitude			
Waveform Output	Impedance	50Ω typical (fixed); >10MΩ (output disabled)			
SYNC Output	Protection	Short-circuit protected;overload relay auto-matically disables main output			
	Level	TTL-compatible into>1kΩ			
	Impedance	50Ω nominal			
SINEWAVE CHARACTERISTICS					
Harmonic Distortion *5		-60dBc DC~1MHz, Ampl<3Vpp -55dBc DC~1MHz, Ampl>3Vpp -45dBc 1MHz~5MHz, Ampl>3Vpp -30dBc 5MHz~80MHz, Ampl>3Vpp			
Total Harmonic Distortion		<0.2%+0.1mVrms DC ~ 20 kHz			
Spurious (non-harmonic)*5		-60dBc DC~1MHz; -50dBc 1MHz~20MHz; -50dBc + 6dBc/octave 1MHz~80MHz			
Phase Noise		<-65dBc typical 10MHz, 30kHz band; <-47dBc typical 80MHz, 30kHz band			
SQUARE WAVE CHARACTERISTICS					
Rise/Fall Time	<8ns *3				
Duty Cycle	20%~80%				
Overshoot	< 5%				
Asymmetry	1% of period+1ns				
Variable Duty Cycle	20.0%~80.0% ≤ 25MHz; 40.0%~60.0%, 25~50MHz; 50.0%(Fixed), 50~80MHz				
Jitter	0.01% + 525ps < 2MHz; 0.1% + 75ps > 2MHz				
RAMP CHARACTERISTICS					
Linearity	< 0.1% of peak output				
Variable Symmetry	0%~100%				
PULSE CHARACTERISTICS					
Period	20ns ~ 2000s				
Pulse Width	8ns ~ 1999.9s				
	Minimum Pulse Width: 8ns when FREQ≤50MHz; 5% of setting period when FREQ≤6.5MHz				
	Resolution: 1ns when FREQ≤50MHz; 1% of setting period when FREQ≤6.5MHz				
Overshoot	<5%				
Jitter	100 ppm +50 ps				
AM MODULATION					
Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse, Arb				
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp				
Modulating Frequency	2mHz ~ 20kHz				
Depth	0% ~ 120.0%				
Source	Internal/External				
FM MODULATION					
Carrier Waveforms	Sine, Square, Triangle, Ramp				
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp				
Modulating Frequency	2mHz ~ 20kHz				
Peak Deviation	DC ~ 80MHz			DC ~ 50MHz	
Source	Internal/External				
PWM					
Carrier Waveforms	Square				
Modulating Waveforms	Sine, Square, Triangle, Up/Dn Ramp				
Modulating Frequency	2mHz ~ 20kHz				
Deviation	0% ~ 100.0% of pulse width				
Source	Internal/External				
FSK					
Carrier Waveforms	Sine, Square, Triangle, Ramp, Pulse				
Modulating Waveforms	50% duty cycle square				
Internal Rate	2 mHz ~ 100 kHz				
Frequency Range	DC ~ 80MHz			DC ~ 50MHz	
Source	Internal/External				



# 80MHz/50MHz Arbitrary Function Generator

## Rear Panel



AFG-3081/3051

SPECIFICATIONS		AFG-3081	AFG-3051
SWEEP			
Waveforms	Sine, Square, Triangle		
Type	Linear or Logarithmic		
Source	Internal/External		
Start/Stop FREQ	100μHz ~ 80 MHz	100μHz ~ 50MHz	
Sweep Time	1ms ~ 500s		
Trigger	Single, External, Internal		
Marker	Falling edge of Mark signal (Programmable frequency)		
Source	Internal/External		
BURST			
Waveforms	Sine, Square, Triangle, Ramp		
Frequency	1μHz ~ 80MHz *4	1μHz ~ 50 MHz *4	
Burst Count	1 ~ 1000000 cycles or Infinite		
Start/Stop Phase	-360.0 ~ +360.0°		
Internal Period	1ms ~ 500s		
Gate Source	External Trigger		
Trigger Source	Single, External or Internal Rate		
Trigger Delay	N-Cycle, Infinite : 0s ~ 85s		
EXTERNAL MODULATION INPUT			
Type	for AM, FM, Sweep, PWM		
Voltage Range	± 5V full scale		
Input Impedance	10kΩ		
Frequency	DC ~ 20 kHz		
EXTERNAL TRIGGER INPUT			
Type	for FSK, Burst, Sweep		
Input Level	TTL Compatible		
Slope	Rising or falling(selectable)		
Pulse Width	> 100 ns		
Input Impedance	10kΩ, DC coupled		
Latency	Sweep: <10us (typical); Burst: <100ns (typical)		
Jitter	Sweep: 2.5us; Burst: 1ns; except pulse, 300ps		
MODULATION OUTPUT			
Type	for AM, FM, Sweep, PWM		
Amplitude	Range: ≥1Vpp; Impedance: >10kΩ typical (fixed)		
TRIGGER OUTPUT			
Type	for Burst, Sweep		
Level	TTL Compatible into 50 Ω		
Pulse Width	> 450 ns		
Maximum Rate	1 MHz		
Fan-out	≥ 4 TTL load		
Impedance	50 Ω typical		
MARKER OUTPUT			
Type	for ARB, Sweep		
Level	TTL Compatible into 50 Ω		
Fan-out	≥ 4 TTL load		
Impedance	50 Ω typical		
Store/Recall	10 Groups of Setting Memories		
Interface	GPIB, RS-232C, USB Host/Device		
Display	4.3 inch TFT LCD; 480 × 3 (RGB) × 272		
SYSTEM CHARACTERISTICS			
Configuration Times (typical)	Function Change: Standard>102ms, Pulse>660ms, Built-In Arb>240ms Frequency Change: 24ms; Amplitude Change: 50ms; Offset Change: 50ms Select User Arb: < 2s for 1M points; Modulation Change: < 200ms		
Arb Download Times (typical)	Binary Code: GPIB/RS-232C (115 Kbps), USB(Device) ASC II Code: USB(Host)*6		
GENERAL SPECIFICATIONS			
Power Consumption	65VA		
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%		
POWER SOURCE			
AC100 ~ 240V , 50 ~ 60Hz			
POWER CONSUMPTION			
65VA			
DIMENSIONS & WEIGHT			
265 (W) x 107 (H) x 374 (D)mm, Approx. 4kg			

- \*1. A total of ten waveforms can be stored (Every waveform can composed of 1M points maximum)
- \*2. Add 1/10th of output amplitude and offset specification per °C for operation outside of 0°C~28°C range (1year specification)
- \*3. Edge time decreased at higher frequency
- \*4. Sine and square waveforms above 25MHz are allowed only with an "Infinite" count
- \*5. Harmonic distortion and Spurious noise at low amplitudes is limited by a -70 dBm floor
- \*6. Arb Download Times :

	Binary Code		ASCII Code
Typical	GPIB/RS-232C (115 Kbps)	USB (Device)	USB (Host)
1M points	189 Sec	34 Sec	70 Sec
512K points	95 Sec	18Sec	35 Sec
256K points	49 Sec	9 Sec	18 Sec
64K points	16 Sec	3 Sec	6 Sec
16K points	7 Sec	830mS	1340 mS
8K points	6 Sec	490mS	780mS
4K points	6 Sec	365mS	520 mS
2K points	5 Sec	300mS	390 mS

## ORDERING INFORMATION

AFG-3081 80MHz Arbitrary Function Generator AFG-3051 50MHz Arbitrary Function Generator

### ACCESSORIES :

CD (User manual + Software) × 1, Quick Start Guide × 1, Power Cord × 1, GTL-110 Test Lead × 1

### OPTIONAL ASSESSORIES

GTL-232 RS-232C Cable  
GTL-246 USB Cable, USB 2.0 A-B Type Cable, 4P  
GTL-248 GPIB Cable (2.0m)

GTL-250 GPIB Cable, Double Shielded, 600mm  
GRA-432 Rack Adapter Kit

### FREE DOWNLOAD

PC Software Arbitrary Waveform Editing Software

# Multi-Channel Function Generator



## MFG-2000 Series



### FEATURES

- \* **Maximum Five Output Channels**
  - 2 Equivalent Performance Arbitrary Channels  
Frequency : 1mHz~10/20/30/60/200MHz
  - RF Channel Frequency (FG/ARB/MOD) : 160/320MHz
  - Pulse Generator Frequency : 25MHz
  - Power Amplifier : Low Frequency, 5Hz~100kHz, 20dB /20W(limited by current setting)
- \* **True Point by Point Output Arbitrary Waveform**  
Function: MFG-2220HM Sample Rate: 250MSa/s, Repetition Rate: 125MHz; Other models Sample Rate: 200MSa/s, Repetition Rate: 100MHz, 14-bit Resolution, 16k Points Memory Depth
- \* **Earth Ground Isolation Design Among I/O Terminals and Instrument Chassis**  
(MFG-2220HM Excluded)
- \* **Frequency Counter : 150MHz, 8-bit Frequency Resolution**
- \* **AM/FM/PM/ASK/FSK/PSK/SUM/PWM Modulation**
- \* **Built-in Medical and Automotive Electronic Waveforms**
- \* **USB Host/USB Device/LAN (MFG-22XX only)**
- \* **4.3 Inch TFT Color Display**

### MFG-2220HM Rear Panel



### MFG-2260MRA Rear Panel



The MFG-2000 series is a multi-channel function generator, which has up to 5 simultaneous output channels, including CH1 and CH2 equivalent performance dual channel arbitrary function generator with the maximum 200MHz for both channels; RF signal generator, a standard AFG, which produces the maximum 320MHz sine wave and various modulation RF signals; pulse generator, whose frequency reaches 25MHz; power amplifier, which is ideal for audio range. The above-mentioned five different functionality channels are separately or totally allocated on 11 models, which extend from the basic single-channel AFG with pulse generator models to five-channel models so as to satisfy various educational and industrial applications.

The AFG channel of the MFG-2000 series outputs sine, square, and triangle, etc. The series features true point by point output arbitrary waveform characteristics of 200 MSa/s sample rate, 100MHz waveform repetition rate, 14-bit resolution, and 16k points memory depth. The MFG-2220HM offers up to 250MSa/s sample rate and 125MHz repetition rate. Some models provide various modulation methods such as AM/FM/PM/FSK/PWM. Sweep, Burst, Trigger, 150MHz Frequency Counter and 25MHz pulse generator are also available for some models. 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, 20dB, 5Hz~100kHz bandwidth, and distortion less than 0.1% can be applied to the audio application.

The overall design of the MFG-2000 series (MFG-2220HM excluded) 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.

The AFG of the MFG-2000 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. 102 built-in waveforms allow users to edit arbitrary waveforms and to output the whole segment or divided segments.

With the multi-functionality channels, the MFG-2000 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.

**The MFG-2000 series can maximally and simultaneously output five functional channels. The functionalities of each channel are as follows:**

Channel 1	1uHz-200MHz max. FG With 250MSa/s ARB	AM,FM,PM,FSK,SUM PWM, Sweep, Burst, Trigger, Frequency Counter	ASK, PSK
Channel 2			
RF Channel	1uHz-320MHz max. FG With 200MSa/s ARB		
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/5Hz~100kHz/<0.1% (Ampl >1Vpp 20Hz~20kHz)		

\* ASK, PSK are standard equipped in MFG-2220HM



# Multi-Channel Function Generator

SPECIFICATIONS						
	CH1 (Function With ARB)	CH2 (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		●
MFG-2230M	● 30MHz	● 30MHz	●			●
MFG-2260M	● 60MHz	● 60MHz	●			●
MFG-2260MFA	● 60MHz	● 60MHz	●	● 160MHz	●	●
MFG-2260MRA	● 60MHz	● 60MHz	●	● 320MHz	●	●
MFG-2220HM	● 200MHz	● 200MHz	●			●
CH1/CH2						
WAVEFORMS	Standard		Sine, Square, Triangle, Ramp, Pulse, Noise			
ARBITRARY FUNCTIONS	Arb Function Sample Rate Repetition Rate Waveform Length Amplitude Resolution Non-volatile Memory User-defined Output Section		Built-in 200 MSa/s ; MFG-2220HM:250MSa/s 100MHz ; MFG-2220HM:125MHz 16k points 14 bits 10sets 16k points(1) From point 2 ~ 16384			
FREQUENCY	Range		MFG-2220HM:Sine:200MHz(Max.);Square:60MHz(Max.);Triangle,Ramp:5MHz;Others:Sine:60MHz(Max.) Square:25MHz(Max.);Triangle,Ramp:1MHz			
CHARACTERISTICS	Resolution Accuracy Stability Aging Tolerance		1 μHz ±20 ppm ±1 ppm, per 1 year ≤1 μHz			
OUTPUT CHARACTERISTICS (2)	Amplitude Range  Accuracy Resolution Flatness  Units		1mVpp ~ 10 Vpp(into 50Ω) ; 2mVpp ~ 20 Vpp (open-circuit) MFG-2220HM : 1mVpp ~ 10Vpp ≤20MHz ; 1mVpp ~ 5Vpp ≤70MHz ; 1mVpp ~ 2Vpp ≤120MHz ; 1mVpp ~ 1Vpp ≤ 200MHz(into 50Ω) ±2% of setting ±1 mVpp (at 1 kHz/into 50Ω without DC offset) 0.1mV or 4 digits ±1% (0.1dB) ≒ 1MHz ; ±3% (0.3dB) ≒ 50 MHz ; ±16% (1.5dB) ≒ 60MHz (sinewave relative to 1 kHz/into 50Ω), MFG-2220HM: ±1% (0.1dB) ≤10MHz; ±2% (0.2dB) ≤60 MHz ±4% (0.4dB) ≤100MHz; ±8% (0.8dB) ≤160MHz; ±10% (1dB) ≤200MHz; (sinewave relative to 1 kHz/into 50Ω) Vpp, Vrms, dBm			
OFFSET	Range Accuracy		±5 Vpk AC + DC (into 50Ω); ±10Vpk AC + DC (open circuit) ±(1% of setting + 5mV + 0.5% of amplitude)			
WAVEFORM OUTPUT	Impedance Protection Ground Isolation		50Ω typical (fixed); > 10MΩ (output disabled) Short-circuit protected; Overload relay automatically disables main output 42Vpk max (MFG-2220HM excluded)			
SYNC OUTPUT	Range Impedance Ground Isolation		TTL-compatible into>1kΩ 50Ω standard 42Vpk max (MFG-2220HM excluded)			
SINE WAVE CHARACTERISTICS (3)	Harmonic Distortion  Total 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 ; -35 dBc 10MHz ~ 30MHz, Ampl > 0.1Vpp ; -27 dBc 30MHz ~ 60MHz, Ampl > 0.1Vpp MFG-2220HM:<-60 dBc <200kHz ; <-55 dBc 200kHz ~ 1 MHz ; <-45 dBc 1MHz ~ 10 MHz; <-35 dBc 10MHz ~ 30MHz ; <-30 dBc 30MHz ~ 200MHz ; (at 1Vpp/into 50Ω without DC offset) < 0.1% (Ampl>1Vpp) DC~100 kHz			
SQUARE WAVE CHARACTERISTICS	Rise/Fall Time Overshoot Asymmetry Variable duty Cycle Jitter		<15ns ; MFG-2220HM:<6ns <5% 1% of period +5 ns 0.01% to 99.99% (limited by the current frequency setting) 20ppm +500ps(4)			
RAMP CHARACTERISTICS	Linearity Variable Symmetry		< 0.1% of peak output 0% ~ 100%			
PULSE CHARACTERISTICS	Frequency Pulse Width Variable duty Cycle Overshoot Jitter		1uHz ~ 25MHz ≒ 20nS ; MFG-2220HM ≒ 10nS (limited by the current frequency setting) 0.01% ~ 99.99% (limited by the current frequency setting) <5% 20ppm + 500ps(4)			
PULSE GENERATOR						
PULSE GENERATOR	Amplitude Offset Frequency Pulse Width Variable duty Cycle Leading and Trailing Edge Time(5) Overshoot Jitter		1mVpp ~ 2.5 Vpp (into 50Ω) ; 2mVpp ~ 5 Vpp (open-circuit) ±1 Vpk AC + DC (into 50Ω) ; ±2Vpk AC + DC (Open circuit) 1uHz ~ 25MHz 20nS ~ 999.7ks (limited by the current frequency setting) 0.1% ~ 99.9% (limited by the current frequency setting) 10nS ~ 20S(1ns resolution) (limited by the current frequency and pulse width settings) <5% 100ppm + 500ps(4)			
RF GENERATOR						
ARBITRARY FUNCTIONS	ARB function Sample Rate Repetition Rate Waveform Length Amplitude Resolution User-defined output section Jitter		Built-in 200 MSa/s 100MHz 16k points 14 bits From point 2~16384 20ppm +5ns			

SPECIFICATIONS		
<b>FREQUENCY CHARACTERISTICS</b>	Range Resolution Accuracy Stability Aging Tolerance	Sine: 1uHz~160MHz(DDS)/1uHz~60MHz(ARB) for MFG-2XXXMF; 1uHz~320MHz(DDS)/1uHz~60MHz(ARB) for MFG-2XXXMR Square: 25MHz(max); Triangle, Ramp: 1MHz 1 $\mu$ Hz $\pm 20$ ppm $\pm 1$ ppm, per 1 year $\leq 1$ $\mu$ Hz
<b>OUTPUT CHARACTERISTICS(2)</b>	Amplitude(into 50 $\Omega$ ) Accuracy Resolution Flatness	1mVpp to 2 Vpp (MFG-2XXXMF); 1mVpp to 1 Vpp (MFG-2XXXMR) $\pm 2\%$ of setting $\pm 1$ mVpp(at 1 kHz/into 50 $\Omega$ without DC offset) 1mV or 3 digits $\pm 1\%$ (0.1dB) $\leq 1$ MHz; $\pm 3\%$ (0.3dB) $\leq 50$ MHz; $\pm 10\%$ (0.9dB) $\leq 160$ MHz; $\pm 35\%$ (3.5dB) $\leq 320$ MHz (sinewave relative to 1 kHz/into 50 $\Omega$ )
<b>OFFSET WAVEFORM OUTPUT SINE WAVE CHARACTERISTICS(3)</b>	Impedance Harmonic Distortion Total Harmonic Distortion	$\pm 1$ Vpk AC +DC (into 50 $\Omega$ ); $\pm 2$ Vpk AC +DC (Open circuit) 50 $\Omega$ typical(fixed); $> 10$ M $\Omega$ (output disabled) -60 dBc $< 200$ kHz; -55 dBc 200 kHz~1 MHz; -45 dBc 1 MHz~10 MHz; -30 dBc 10 MHz~320 MHz $< 0.1\%$ (Ampl $> 1$ Vpp) DC~100 kHz
<b>SQUARE WAVE CHARACTERISTICS</b>	Rise/Fall Time Overshoot Asymmetry Variable duty Cycle Jitter	$< 15$ ns $< 5\%$ 1% of period +5 ns 0.01% to 99.99%(limited by the current frequency setting) 20ppm+500ps(4)
<b>RAMP CHARACTERISTICS</b>	Linearity Variable Symmetry	$< 0.1\%$ of peak output 0% to 100%
<b>MODULATION/ SWEEP</b>	Modulation Type Sweep type Source Modulating Frequency	AM, FM, PM, FSK, PWM (The detail same as CH1 modulation specification) Frequency INT/EXT (INT only for AM, FM, PM, PWM) Sine-DDS 5us~327.68mS (Resolution: 5uS); Sine-ARB 2mHz~20kHz (Resolution: 1mHz)
<b>PSK</b> (MFG-2220HM also provided)	Carrier Waveforms Modulating Waveforms Internal Frequency Phase Range Source	Sine-DDS 50% duty cycle square 2 mHz to 1 MHz 0° ~ 360.0° Internal / External
<b>ASK</b> (MFG-2220HM also provided)	Carrier Waveforms Modulating Waveforms Internal Frequency Amplitude Range Source	Sine-DDS 50% duty cycle square 2 mHz to 1 MHz 1mVpp to 10Vpp Internal / External
POWER AMPLIFIER		
<b>POWER AMPLIFIER</b>	Input Impedance Input Voltage Working Mode Gain Output Power (RL=8 $\Omega$ ) Output Voltage Output Current Rise/Fall Time Full Power Bandwidth Overshoot Total Harmonic Ddistortion Ground Isolation	10K $\Omega$ 1.25Vpmax Constant Voltage 20dB 20W (Square) 12.5Vpmax 1.6Amax $< 2.5$ uS 5Hz ~ 100kHz 5% $< 0.1\%$ (Ampl $> 1$ Vpp); 20Hz ~ 20 kHz 42Vpk max
ADVANCED FUNCTIONS		
<b>AM MODULATION</b>	Carrier Waveforms Modulating Waveforms Modulating Frequency Depth Source	Sine, Square, Triangle, Ramp, Pulse, Arb Sine, Square, Triangle, Up ramp, Dn ramp 2mHz ~ 20kHz; MFG-2220HM: 2mHz ~ 50kHz(Int); DC ~ 20kHz; MFG-2220HM: DC ~ 50kHz (Ext) 0% ~ 120.0% Internal / External
<b>FM MODULATION</b>	Carrier Waveforms Modulating Waveforms Modulating Frequency Peak Deviation Source	Sine, Square, Triangle, Ramp Sine, Square, Triangle, Up ramp, Dn ramp 2mHz ~ 20kHz; MFG-2220HM: 2mHz ~ 50kHz(Int); DC ~ 20kHz; MFG-2220HM: DC ~ 50kHz (Ext) DC to max frequency; MFG-2220HM: DC ~ 0.5*max frequency Internal / External
<b>PM</b>	Carrier Waveforms Modulating Waveforms Modulation Frequency Phase Deviation Source	Sine, Square, Triangle, Ramp Sine, Square, Triangle, Up ramp, Dn ramp 2mHz ~ 20kHz; MFG-2220HM: 2mHz ~ 50kHz(Int); DC ~ 20kHz; MFG-2220HM: DC ~ 50kHz (Ext) 0° ~ 360.0° Internal / External
<b>SUM</b>	Carrier Waveforms Modulating Waveforms Modulation Frequency SUM Depth Source	Sine, Square, Triangle, Ramp; MFG-2220HM: Sine, Square, Triangle, Pulse, Ramp, Noise Sine, Square, Triangle, Up ramp, Dn ramp 2mHz ~ 20kHz; MFG-2220HM: 2mHz ~ 50kHz(Int); DC ~ 20kHz; MFG-2220HM: DC ~ 50kHz (Ext) 0% ~ 100.0% Internal / External
<b>PWM</b>	Carrier Waveforms Modulating Waveforms Modulation Frequency Phase Deviation Source	Square Sine, Square, Triangle, Up ramp, Dn ramp 2mHz ~ 20kHz; MFG-2220HM: 2mHz ~ 50kHz(Int); DC ~ 20kHz; MFG-2220HM: DC ~ 50kHz (Ext) 0% ~ 100.0% pulse width Internal / External
<b>FSK</b>	Carrier Waveforms Modulating Waveforms Internal Frequency Frequency Range Source	Sine, Square, Triangle, Ramp, Pulse 50% duty cycle square 2 mHz to 1 MHz 1 $\mu$ Hz to max frequency Internal / External
<b>SWEEP</b>	Waveforms Type Sweep Direction Start/Stop Freq Sweep Time	Sine, Square, Triangle, Ramp Linear or Logarithmic Sweep up or sweep down 1uHz to max frequency 1ms to 500s



# Multi-Channel Function Generator

## SPECIFICATIONS

	Source Trigger Marker Source	Internal / External Single, External, Internal Marker signal on falling edge (programmable) Internal / External
BURST	Waveforms Frequency Pulse Count Start/Stop Phase Internal Frequency Gate Source Trigger Source	Sine, Square, Triangle, Ramp Max Frequency 25MHz 1~1000000 Cycles or infinite -360.0° ~ +360.0° 1 us ~ 500 s External Trigger Single, External, Internal
TRIGGER DELAY	NCycle, Infinite	0s ~ 100 s
EXTERNAL TRIGGER INPUT	Type Input Level Slope Pulse Width Input Impedance	For FSK, Burst, Sweep TTL Compatibility Rising or Falling(Selectable) >100ns 10k $\Omega$ , DC coupled
EXTERNAL MODULATION INPUT	Type Voltage Range Input Impedance Frequency Ground Isolation	For AM, FM, PM, SUM, PWM $\pm 5V$ full scale 10k $\Omega$ DC ~ 20kHz(MFG-2220HM : DC ~ 50KHz) 42Vpk max(MFG-2220HM excluded)
TRIGGER OUTPUT	Type Level Pulse Width Maximum Rate Fan-out Impedance	For ARB, Burst, Sweep TTL Compatible into 50 $\Omega$ >450ns ; MFG-2220HM : >100ns 1MHz $\geq 4$ TTL Load 50 $\Omega$ Typical
REFERENCE INPUT (MFG-2220HM only)	Input Voltage Output Impedance Input Frequency Waveform	0.5Vpp to 5Vpp 1k $\Omega$ , unbalanced, AC coupled 26.8436MHz $\pm 10$ Hz Sine or Square (50 $\pm 5\%$ duty)
REFERENCE OUTPUT (MFG-2220HM only)	Output Voltage Output Impedance Output Frequency	3.3Vpp square wave 5 $\Omega$ , AC coupled 26.8436MHz
FREQUENCY COUNTER	Range Accuracy Time Base Resolution Input Impedance Sensitivity Ground Isolation	5Hz ~ 150MHz Time Base accuracy $\pm 1$ count $\pm 20$ ppm (23°C $\pm 5^\circ$ C) The maximum resolution is : 100nHz for 1Hz, 0.1Hz for 100MHz 1k $\Omega$ /1pf 35mVrms ~ 30Vrms (5Hz ~ 150MHz) 42Vpk max(MFG-2220HM excluded)
Dual Channel Function (CH1/CH2)	Phase Track Coupling Dsolink	-180° ~ 180° Synchronize phase CH2=CH1 Frequency (Ratio or Difference); Amplitude & DC Offset $\checkmark$
OTHER	Store/Recall Interface Display	10 Groups of Setting Memories LAN (MFG-22XX Series only), USB 4.3 inch TFT LCD, 480 x 3 (RGB) x 272
GENERAL SPECIFICATIONS	Power Source Power Amplifier Source Power Consumption Operating Environment  Operating Altitude Pollution Degree Storage Temperature Dimensions & Weight	AC 100~240V, 50~60Hz DIP switch, AC 100~120V/AC 220~240V, 50~60Hz (MFG-2120MA, MFG-2260MFA, MFG-2260MRA only) 30W or 80W (With power amplifier) Temperature to satisfy the specification : 18 ~ 28°C ; Operating temperature : 0 ~ 40°C ; Relative humidity : $\leq 80\%$ , 0 ~ 40°C, $\leq 70\%$ , 35 ~ 40°C ; Installation category : CAT II 2000 Meters IEC 61010 degree 2, Indoor use -10 ~ 70°C, Humidity : $\leq 70\%$ 266(W) x 107(H) x 293(D) mm ; Approx. 2.5kg

The specifications apply when the function generator is powered on for at least 30 minutes under +20°C~+30°C  
 Note : (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 Pulse channel support

## ORDERING 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
MFG-2230M	30MHz Dual Channel Arbitrary Function Generator with Pulse Generator, Modulation
MFG-2260M	60MHz Dual Channel Arbitrary Function Generator with Pulse Generator, Modulation
MFG-2260MFA	60MHz Dual Channel Arbitrary Function Generator with Pulse Generator, Modulation, 160MHz RF Signal Generator, Power Amplifier
MFG-2260MRA	60MHz Dual Channel Arbitrary Function Generator with Pulse Generator, Modulation, 320MHz RF Signal Generator, Power Amplifier
MFG-2220HM	200MHz Dual Channel Arbitrary Function Generator with Pulse Generator, Modulation

### ACCESSORIES :

Quick Start Guide x 1,	CD-ROM with MFG Software and User Manual x 1
GTL-101	BNC-Alligator test lead x 1 (MFG-2110/2120/2120MA/2130M/2160MF/2160MR)
GTL-101	BNC-Alligator test lead x 2 (MFG-2230M/2260M/2260MFA/2260MRA)
GTL-110	BNC cable x 2 (MFG-2220HM)

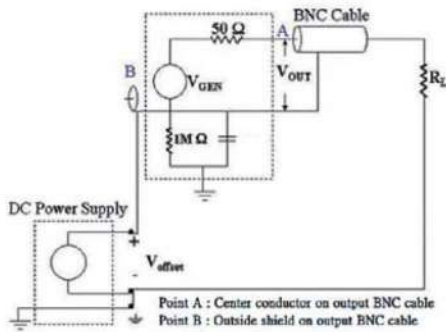
### OPTIONAL ACCESSORIES

GTL-246	USB Type A to Type B cable
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### FREE DOWNLOAD

PC Software	Arbitrary Waveform Editing Software
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## A. CIRCUIT DESIGN FOR GROUND ISOLATION AMONG OUTPUT/INPUT TERMINALS AND INSTRUMENT CHASSIS



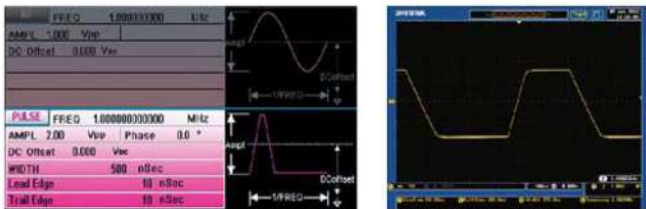
Connection diagram for MFG connecting with a power supply to increase D.C. bias voltage to  $\pm 42\text{Vpk}$  (DC+ AC peak value).

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-2000 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.

(\* MFG-2220HM excluded )

## B. 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, and fall edge time to support trigger signal.

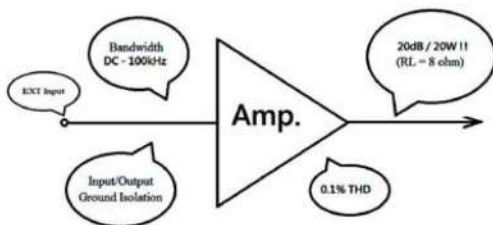
The pulse width can be fine-tuned to the minimum of 20ns and the leading/trailing edge times can be set independently to the minimum of 10ns.

## C. RF SIGNAL GENERATOR

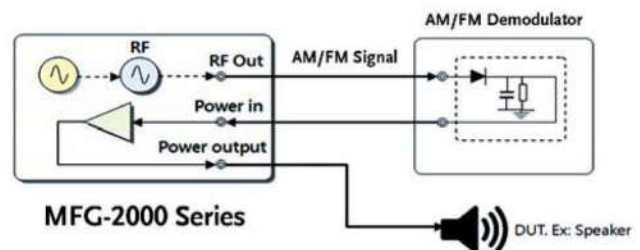


RF signal generator is a full function AFG signal source. Identical to CH1/CH2, it can output sine, square, ramp, pulse, noise, etc. Its sine wave frequency reaches 160MHz or 320MHz. And its true point by point output arbitrary waveform function supports 200 MHz sample rate, 100MHz waveform repetition 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.

## D. POWER AMPLIFIER



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)

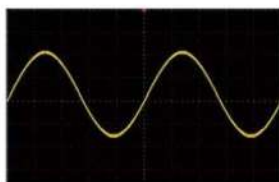


Users can connect a speaker with the low frequency power amplifier of the MFG-2000 series to realize various physics experiments.

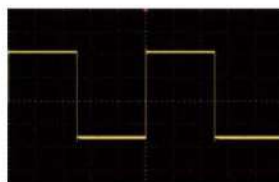


# Multi-Channel Function Generator

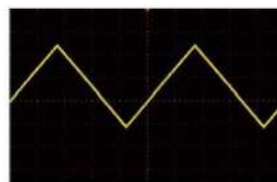
## E. VERSATILE OUTPUT WAVEFORM SELECTIONS



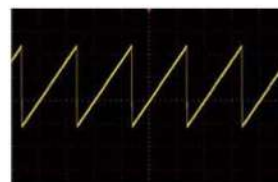
Sine



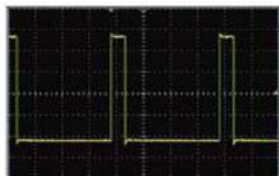
Square



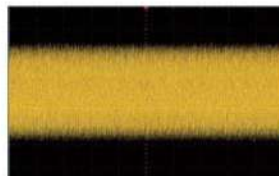
Triangle



Ramp



Pulse



Noise

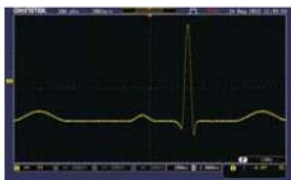


DC Voltage

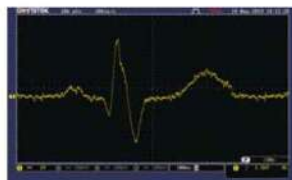


Arbitrary Waveform

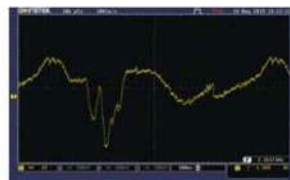
### MEDICAL APPLICATION WAVEFORMS



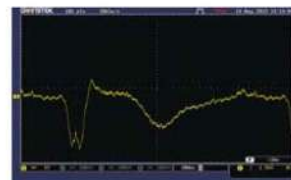
Cardiac



ECG1

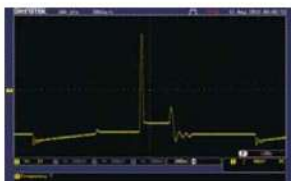


ECG2

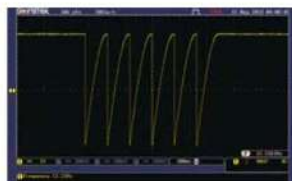


ECG3

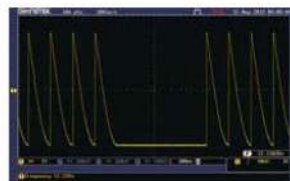
### AUTOMOTIVE ELECTRONIC WAVEFORMS



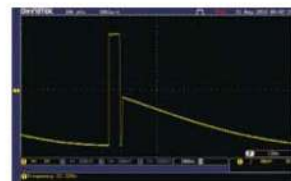
Ignition



ISO7637-2 TP3A



ISO7637-2 TP3B

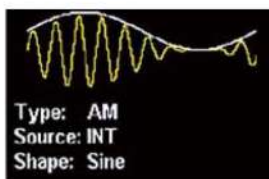


ISO7637-2 TP2B

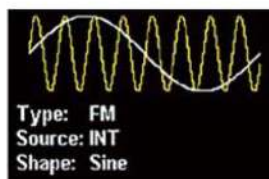
There are standard waveforms for the series such as sine, square, triangle, ramp, pulse, noise, DC voltage. In addition, 102 built-in waveforms, including medical application waveforms and

commonly used automotive electronic waveforms allow users to easily select desired waveforms.

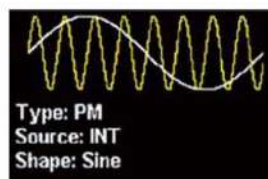
## F. VARIOUS MODULATION FUNCTION



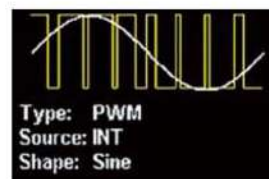
Amplitude Modulation



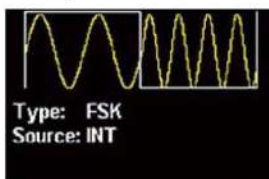
Frequency Modulation



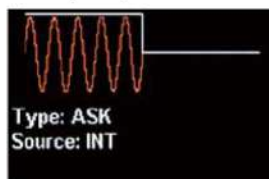
Phase Modulation



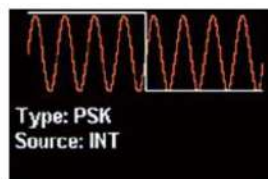
Pulse Width Modulation



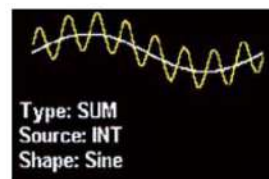
Frequency-shift Keying Modulation



Amplitude-shift Keying Modulation



Phase-Shift Keying Modulation

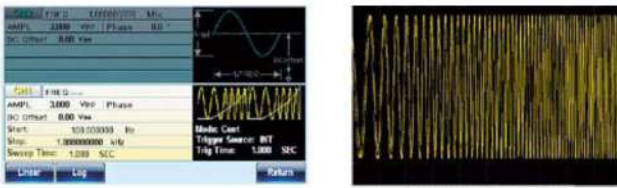


Sum Modulation

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

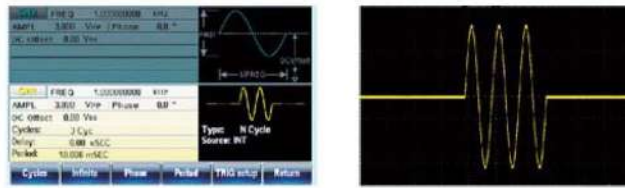
and PSK Modulation. The most modulation sources can be internal or external. Applications include communications systems' base band, motor control and light adjustment.

## G. SWEEP FUNCTION



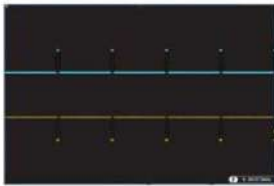
The series supports frequency sweep that can also integrate other functions, including linear/logarithm and INT/EXT/Manual trigger to meet various application requirements. Frequency sweep carries out tests on the frequency response of electronic components such as filter and low frequency amplifier.

## H. BURST FUNCTION

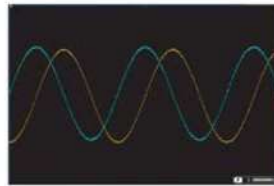


The series supports N-period or gated trigger. Phase angle, duration time, frequency, waveform infinite can be adjusted to meet non-continuous output applications.

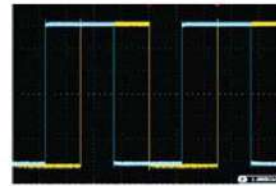
## I. THE OUTPUT CORRELATED FUNCTIONS OF EQUIVALENT PERFORMANCE DUAL CHANNEL



Differential Signal



Sine and Cosine Signal



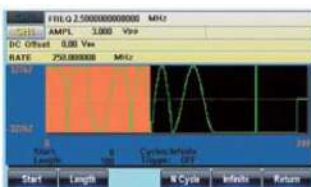
Square Wave Phase Setting

The CH1 and CH2 of MFG-2220HM/2230M/2260M/2260MFA/2260MRA can be applied separately. These two channels provide four correlated functions, including sum, coupling, tracking and phase.

\* The coupling function allows users to freely set ratio and offset values for frequency and amplitude of both channels to realize that all parameters are simultaneously effective for both channels. The measurement of the Third-Order Intercept Point for an amplifier and the simulations of two different frequency oscillators outputting signals are two applied examples for coupling function.

- \* The tracking function can produce 180 degree phase offset differential signals with same frequency and amplitude.
- \* The phase function allows users to freely set phase parameters for both channels such as sine wave, cosine wave, and square wave signals.
- \* The sum modulation function can sum up two signals into one and output this signal via one channel. One of the related applications is to sum up sine waveform and noise to execute speaker distortion tests.

## J. 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 102 built-in waveforms.



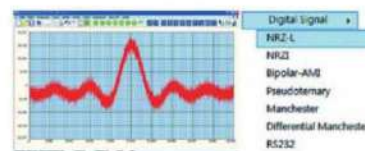
Direct Waveform Reconstruction

Collocate with GDS series digital oscilloscopes to retrieve waveforms and upload them to arbitrary generator to achieve direct waveform reconstruction. (DSO LINK is only for MFG-22XX Series)

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

CSV File Upload

Support CSV file upload produced by MATLAB and Excel.



Arbitrary Waveform Editing PC Software

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

## K. MULTI-CHANNEL SYNCHRONIZED PHASE OPERATION



MFG-2220HM features reference input and reference output interfaces. Users can drive up to four MFG-2220HM units through the reference input and reference output interfaces to achieve eight-channels of phase synchronous outputs. (\*MFG-2220HM only)



# 25MHz True Dual Channel Arbitrary Function Generator



## AFG-2225



### FEATURES

- \* Wide Frequency Ranges From 1μHz ~ 25MHz (sine wave)
- \* 1μHz Resolution in Full Range
- \* Built-in Standard 120MSa/s, 10bit, 4k Points Arbitrary Function for Both Channels
- \* True Dual-Channel Output, CH2 Provides the Same Characteristics as Ch1
- \* Dual-Channel Supports Couple, Tracking, Phase Operations
- \* 1% ~ 99% Adjustable Duty Cycle for Square Waveform
- \* User Friendly for Easy Parameter Setting and Parameters Display
- \* Multiple Editing Methods to Edit Arbitrary Waveform Easily
- \* Built-in Standard AM/FM/PM/FSK/SUM/Sweep/Burst and Frequency Counter
- \* USB Host/Device Interface for Remote Control and Waveform Editing

AFG-2225 is the first basic level dual-channel arbitrary function generator, which provides superior features in its class. Both channels are equipped with same characteristics to adapt dual-signal applications such as differential signaling or IQ modulation. The outstanding cost-performance value makes the AFG-2225 a practical instrument to accelerate the development process.

The major features for both channels include 10Vpp output amplitude; 25MHz frequency bandwidth with 1μHz resolution; built-in waveforms of Sine, Square, Ramp (Triangle) and Noise. As to the 1%~99% adjustable duty cycle of Square waveform can be used as pulse signal sources. For the arbitrary waveform, user can edit the 66 built-in waveforms or create a whole new one. Moreover, AFG-2225 carries features of AM/FM/PM/FSK/SUM Modulation, Sweep, Burst and Frequency Counter, which can be applied to various communication fields.

In addition to the intuitive and user friendly, the 3.5-inch color LCD displays the comprehensive operation information including the true waveform presented at the output. USB Host and Device interfaces are equipped to link the AFG-2225 with other devices, which provide the flexibility of waveform generation for more practical usages. With link to GW Instek GDS-series Digital Storage Oscilloscopes (DSOs), the waveforms of interest can be captured and reconstructed. User can also use the arbitrary waveform PC software to edit the waveform and then send to AFG-2225 directly, or save the waveform into flash drive and then transfer to AFG-2225.

### SPECIFICATIONS

		CH1	CH2
<b>WAVEFORMS</b>		Sine, Square, Ramp, Pulse, Noise, ARB	
<b>ARBITRARY FUNCTION</b>			
Sample Rate		120MSa/s	
Repetition Rate		60MHz	
Waveform Length		4k points	
Amplitude Resolution		10 bits	
Non-Volatile Memory		4k points	
<b>FREQUENCY CHARACTERISTICS</b>			
Range	Sine/Square Ramp	1μHz ~ 25MHz	
Resolution		1MHz	
Accuracy	Stability Aging Tolerance	±20ppm ±1ppm, per 1 year ≤1mHz	
<b>OUTPUT CHARACTERISTICS</b>			
Amplitude	Range	1mVpp~10Vpp(into 50Ω), 2mVpp~20Vpp(open-circuit) 1mVpp~5Vpp(into 50Ω) for 20MHz~25MHz 2mVpp~10 Vpp(open-circuit) for 20MHz~25MHz	
	Accuracy	±2% of setting ±1mVpp(at 1kHz/into 50Ω without DC offset)	
	Resolution	1mV or 3digits	
	Flatness	±1% (0.1dB) ≤100kHz, ±3% (0.3 dB) ≤5MHz, ±5% (0.4 dB) ≤12MHz, ±10% (0.9dB) ≤25MHz (sine wave relative to 1kHz/into 50Ω) Vpp, Vrms, dBm	
Offset	Units Range	±5Vpk ac+dc(into 50Ω); ±10Vpk ac+dc(open circuit) ±2.5Vpk ac+dc(into 50Ω) for 20MHz~25MHz ±5Vpk ac+dc(open circuit) for 20MHz~25MHz	
	Accuracy	2% of setting+20mV+0.5% of amplitude	
Waveform Output	Impedance Protection	50Ω typical (fixed); >10MΩ (output disabled) Short-circuit protected; Overload relay automatically disables main output	
<b>SINE WAVE CHARACTERISTICS</b>			
Harmonic Distortion		-55 dBc DC~200kHz, Ampl > 0.1Vpp; -50 dBc 200kHz~1MHz, Ampl > 0.1Vpp -35 dBc 1MHz~5MHz, Ampl > 0.1Vpp; -30 dBc 5MHz~25MHz, Ampl > 0.1Vpp	
<b>SQUARE WAVE CHARACTERISTICS</b>			
Rise/Fall Time		≤ 25ns at maximum output (into 50Ω load)	
Overshoot		5%	
Asymmetry		1% of period + 5 ns	
Variable Duty Cycle		1.0%~99%≤100kHz ; 10.0%~90.0%≤1MHz ; 50.0%≤25MHz	
<b>RAMP CHARACTERISTICS</b>			
Linearity		< 0.1% of peak output	
Variable Symmetry		0%~100%(0.1% Resolution)	
<b>PULSE CHARACTERISTICS</b>			
Period		40ns ~ 2000s	
Pulse Width		20ns ~ 1999.9s	
Overshoot		<5%	
Jitter		20ppm + 5ns	
<b>AM MODULATION</b>			
Carrier Waveforms		Sine, Square, Ramp, Pulse, Arb	Sine, Square, Ramp, Pulse, Arb
Modulating Waveforms		Sine, Square, Triangle, Upramp, Dnrmpr	Sine, Square, Triangle, Upramp, Dnrmpr
Modulating Frequency		2mHz ~ 20kHz (INT); DC ~ 20kHz (EXT) 0% ~ 120.0%	2mHz ~ 20kHz (INT); DC ~ 20kHz (EXT) 0% ~ 120.0%
Depth			
Source		Internal / External	Internal / External



## AFG-2225

SPECIFICATIONS		
	CH1	CH2
<b>FM MODULATION</b>		
Carrier Waveforms	Sine, Square, Ramp	Sine, Square, Ramp
Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp	Sine, Square, Triangle, Upramp, Dnramp
Modulating Frequency	2mHz ~ 20kHz (INT); DC ~ 20kHz (EXT)	2mHz ~ 20kHz (INT); DC ~ 20kHz (EXT)
Peak Deviation	DC ~ Max Frequency	DC ~ Max Frequency
Source	Internal / External	Internal / External
<b>PM</b>		
Carrier Waveforms	Sine, Square, Ramp	Sine, Square, Ramp
Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp	Sine, Square, Triangle, Upramp, Dnramp
Modulating Frequency	2mHz ~ 20kHz (INT); DC ~ 20kHz (EXT)	2mHz ~ 20kHz (INT); DC ~ 20kHz (EXT)
Phase Deviation	0° ~ 360°	0° ~ 360°
Source	Internal / External	Internal / External
<b>FSK</b>		
Carrier Waveforms	Sine, Square, Ramp, Pulse	Sine, Square, Ramp, Pulse
Modulating Waveforms	50% duty cycle square	50% duty cycle square
Modulating Frequency	2mHz ~ 100 kHz (INT); DC ~ 100 kHz(EXT)	2mHz ~ 100 kHz (INT); DC ~ 100 kHz(EXT)
Phase Deviation	1μHz ~ Max Frequency	1μHz ~ Max Frequency
Source	Internal / External	Internal / External
<b>SUM</b>		
Carrier Waveforms	Sine, Square, Ramp, Pulse, Noise	Sine, Square, Ramp, Pulse, Noise
Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnramp	Sine, Square, Triangle, Upramp, Dnramp
Modulating Frequency	2mHz ~ 20kHz (INT); DC ~ 20kHz (EXT)	2mHz ~ 20kHz (INT); DC ~ 20kHz (EXT)
Phase Deviation	0% ~ 100.0%	0% ~ 100.0%
Source	Internal / External	Internal / External
<b>SWEEP</b>		
Waveforms	Sine, Square, Ramp	Sine, Square, Ramp
Type	Linear or Logarithmic	Linear or Logarithmic
Start/Stop Freq	1μHz to Max Frequency	1μHz to Max Frequency
Sweep Time	1ms ~ 500s	1ms ~ 500s
Source	Internal / External/Manual	Internal / External/Manual
<b>BURST</b>		
Waveforms	Sine, Square, Ramp	Sine, Square, Ramp
Frequency	1μHz ~ 25MHz	1μHz ~ 25MHz
Burst Count	1 ~ 65535 cycles or Infinite	1 ~ 65535 cycles or Infinite
Start/Stop Phase	-360 ~ +360	-360 ~ +360
Internal Period	1ms ~ 500s	1ms ~ 500s
Gate Source	External Trigger	External Trigger
Trigger Source	Single, External or Internal Rate	Single, External or Internal Rate
N-Cycle, Infinite	0s ~ 655350ns	0s ~ 655350ns
<b>FREQUENCY COUNTER</b>		
Range	5Hz ~ 150MHz	
Accuracy	Time Base accuracy±1count	
Time Base	±20ppm (23°C ± 5°C) after 30 minutes warm up	
Resolution	The maximum resolution is : 100nHz for 1Hz, 0.1Hz for 100MHz	
Input Impedance	1kΩ/1pf	
Sensitivity	35mVrms ~ 30Vrms (5Hz ~ 150MHz)	
<b>DUAL CHANNEL FUNCTION</b>		
Phase	-180° ~ 180°, Synchronize phase	-180° ~ 180°, Synchronize phase
Tracking	CH2=CH1	CH1=CH2
Coupling	Frequency(Ratio or Difference)Amplitude & DC Offset	Frequency(Ratio or Difference)Amplitude & DC Offset
DSOLink	✓	✓



# 25MHz True Dual Channel Arbitrary Function Generator

Rear Panel



SPECIFICATIONS		
	CH1	CH2
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	For AM, FM, PM, SUM	
Voltage Range	±5V full scale	
Input Impedance	10kΩ	
Frequency	DC ~ 20kHz	
TRIGGER OUTPUT		
Type	For Burst, Sweep, Arb	
Level	TTL Compatible into 50Ω	
Pulse Width	>450ns	
Maximum Rate	1MHz	
Fan-out	≥4 TTL Load	
Impedance	50Ω Typical	
SAVE/RECALL		
10 Groups of Setting Memories		
INTERFACE		
USB (Host & Device)		
DISPLAY		
3.5" TFT LCD		
POWER SOURCE		
AC100~240V , 50~60Hz		
POWER CONSUMPTION		
25W (Max.)		
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		
STORAGE TEMPERATURE		
-10~70°C, Humidity: ≤70%		
DIMENSIONS & WEIGHT		
266(W)×107(H)×293(D) mm ; Approx. 2.5 kg		

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

## ORDERING INFORMATION

**AFG-2225** 25MHz True Dual Channel Arbitrary Function Generator

### ACCESSORIES :

User Manual CD x 1, Quick Start Manual x 1, GTL-101 Test Lead x 2, Power Cord x 1

### OPTIONAL ASSESSORIES

**GTL-110** BNC Cable, BNC(P/M)-BNC(P/M), 1000mm

**GTL-246** USB Cable, USB 2.0 Type A – Type B, 4P

### FREE DOWNLOAD

**PC Software** Arbitrary Waveform Editing Software

# 25MHz/12MHz/5MHz Arbitrary Function Generator



AFG-2105/2112/2125



AFG-2005/2012/2025



## FEATURES

- \* 0.1Hz ~ 5/12/25 MHz with in 0.1Hz Resolution
- \* Sine, Square, Ramp, Noise and Arbitrary Waveform
- \* 20MSa/s Sampling Rate, 10 bit Vertical Resolution and 4k point Memory for Arbitrary Waveform
- \* 1% ~ 99% Adjustable Duty Cycle for Square Waveform
- \* Waveform Parameter Setting Through Numeric Keypad Entry & Knob Selection
- \* Amplitude, DC Offset and Other Key Setting Information Shown on the 3.5" LCD Screen Simultaneously
- \* AM/FM/FSK Modulation, Sweep, and Frequency Counter Functions (AFG-2100 only)
- \* USB Device Interface for Remote Control and Waveform Editing
- \* PC Arbitrary Waveform Editing Software

The AFG-2100/2000 Series Arbitrary Function Generator is a DDS (Direct Digital Synthesized) based signal generator designed to accommodate the educational and basic industrial requirements for an accurate and affordable signal source covering the output of Sine, Square (Pulse), Ramp (Triangle), Noise and Arbitrary waveforms. The 20MSa/s sampling rate, 10 bit vertical resolution and 4k point memory of the AFG-2100/2000 Series provide users with a flexible environment for creating the specific waveform output as needed. The 0.1 Hz resolution of Sine, Square and Triangle waveforms and the 1% ~ 99% adjustable duty cycle of Square (Pulse) waveform are the remarkable features to greatly extend its application range in various fields. The AFG-2100/2000 Series includes 6 models in three frequency bands of 5MHz, 12MHz and 25MHz. Besides the basic features of the whole AFG-2100/2000 Series, AFG-2100 carries additional features of AM/FM/FSK Modulation, Sweep, and Frequency Counter. The friendly human interface of AFG-2100/2000 Series allows users to set waveform parameters, including waveform type, frequency, amplitude, DC offset, modulation type, and duty cycle, through keypad entry and/or the knob selection, and display the set parameters on the 3.5" LCD screen. The AFG-2100/2000 Series is equipped with a USB Device interface for remote control and waveform editing through a PC. A waveform editing software is provided to facilitate the waveform creation on the PC. After the waveform editing is done, the user is able to download the waveform data from PC to the AFG-2100/2000 Series for signal output.

SPECIFICATIONS							
Models	AFG-2105	AFG-2112	AFG-2125	AFG-2005	AFG-2012	AFG-2025	
WAVEFORMS							
		Sine, Square, Ramp, Noise, Arbitrary Waveform					
ARITRARY FUNCTION							
Sample Rate		20MSa/s					
Repetition Rate		10MHz					
Waveform Length		4k point					
Amplitude Resolution		10 bit					
FREQUENCY CHARACTERISTICS							
Range	Sine/Square	0.1Hz~5MHz	0.1Hz~12MHz	0.1Hz~25MHz	0.1Hz~5MHz	0.1Hz~12MHz	0.1Hz~25MHz
	Ramp	0.1Hz ~ 1MHz					
Resolution	Sine,Square,Ramp	0.1 Hz					
Accuracy	Stability	±20ppm					
	Aging	±1ppm, per 1 year					
	Tolerance	≤10mHz					
OUTPUT CHARACTERISTICS							
Amplitude							
	Range	≤ 20MHz : 1mVpp~10Vpp(50Ω); 2mVpp~20Vpp(open-circuit) ≤ 25MHz : 1mVpp~5Vpp(50Ω); 2mVpp~10Vpp(open-circuit)					
	Accuracy	±2% of setting ±1mVpp;(at 1kHz/into 50Ω without DC offset)					
	Resolution	1mV or 3digits					
	Flatness	±1%(0.1dB)≤100kHz; ±3%(0.3dB)≤5MHz; ±4%(0.4dB)≤12MHz; ±20%(2dB)≤20MHz; ±5%(0.4dB)≤25MHz; (sine wave relative to 1 kHz/into 50Ω)					
	Units	Vpp, Vrms, dBm					
Offset							
	Range	±5Vpk ac+dc(into 50Ω); ±10Vpk ac+dc(open circuit); ±2.5Vpk ac+dc(into 50Ω) for 20MHz~25MHz; ±5Vpk ac+dc(open circuit) for 20MHz~25MHz					
	Accuracy	2% of setting+10mV+0.5% of amplitude					
Waveform Output							
	Impedance	50Ω typical (fixed); >300kΩ (output disabled)					
	Protection(main output)	Short-circuit protected; Overload relay auto matically disables main output					
SYNC Output							
	Level	TTL-compatible into >1kΩ					
	Impedance	50Ω nominal					
	Rise or Fall Time	≤25ns					
SINE WAVE CHARACTERISTICS							
Harmonic Distortion		-55 dBc DC ~ 200kHz, Ampl > 0.1Vpp; -50 dBc 200kHz ~ 1MHz, Ampl > 0.1Vpp -35 dBc 1MHz ~ 5MHz, Ampl > 0.1Vpp; -30 dBc 5MHz ~ 25MHz, Ampl > 0.1Vpp					
SQUAREWAVE CHARACTERISTICS							
Rise/Fall Time		≤25ns at maximum output (into 50Ωload)					
Overshoot		< 5%					
Asymmetry		1% of period+1 ns					
Variable Duty Cycle		1%~99%≤100kHz; 20.0%~80.0%≤5MHz; 40.0%~60.0%≤10MHz; 50%≤25MHz (1% Resolution for full Frequency Range)					
RAMP CHARACTERISTICS							
Linearity		< 0.1% of peak output					
Variable Symmetry		0%~100%(0.1% Resolution)					
AM MODULATION							
Carrier Waveforms		Sine, Square, Triangle					
Modulating Waveforms		Sine, Square, Triangle					
Modulating Frequency		2 mHz~20 kHz (Int); DC~20kHz (Ext)			—		
Depth		0%~120.0%					
Source		Internal/External					
FM MODULATION							
Carrier Waveforms		Sine, Square, Triangle					
Modulating Waveforms		Sine, Square, Triangle					
Modulating Frequency		2 mHz~20 kHz (Int); DC~20kHz (Ext)			—		
Deviation		DC to Max Frequency					
Source		Internal/External					



# 25MHz/12MHz/5MHz Arbitrary Function Generator

AFG-2000 Series Rear Panel



AFG-2100 Series Rear Panel



SPECIFICATIONS						
Models	AFG-2105	AFG-2112	AFG-2125	AFG-2005	AFG-2012	AFG-2025
SWEEP						
Waveforms Type Start/Stop Frequency Sweep Time Source	Sine, Square, Triangle Linear or Logarithmic 0.1Hz to Max Frequency 1ms~500s Internal/External			—		
FSK						
Carrier Waveforms Modulating Waveforms Modulation Rate Frequency Range Source	Sine, Square, Triangle 50% duty cycle square 2mHz~100kHz(Int); DC~100kHz(Ext) 0.1Hz~Max Frequency Internal/External			—		
FREQUENCY COUNTER						
Range Accuracy Time base Resolution Input Impedance Sensitivity	5Hz~150MHz Time Base accuracy $\pm 1$ count $\pm 20$ ppm (23°C $\pm 5^{\circ}$ C) after 30minutes warm up 100nHz for 1Hz, 0.1Hz for 100MHz 1k $\Omega$ /1pf 35mVrms~30Vrms (5Hz~150MHz)			—		
STORE/RECALL						
10 Groups of Setting Memories						
INTERFACE						
USB(Device)						
Display						
LCD						
POWER SOURCE						
AC100~240V, 50~60Hz						
POWER CONSUMPTION						
25 VA						
OPERATING ENVIRONMENT						
Temperature to satisfy the specification: 18~28°C; Operating temperature: 0~40°C Relative Humidity: $\leq 80\%$ , 0~40°C; $\leq 70\%$ , 35~40°C; Installation category: CAT II						
OPERATING ALTITUDE						
2000 meters						
STORAGE TEMPERATURE						
-10~70°C, Humidity: $\leq 70\%$						
DIMENSIONS & WEIGHT						
266(W)×107(H)×293(D) mm ; Approx. 2.5 kg						

ORDERING INFORMATION	
AFG-2005	5MHz Arbitrary Function Generator
AFG-2105	5MHz Arbitrary Function Generator
AFG-2012	12MHz Arbitrary Function Generator
AFG-2112	12MHz Arbitrary Function Generator
AFG-2025	25MHz Arbitrary Function Generator
AFG-2125	25MHz Arbitrary Function Generator
ACCESSORIES :	
CD (user manual + software) $\times$ 1, Quick Start Guide $\times$ 1, Power cord $\times$ 1	
AFG-2100 Series - GTL-101 Test Lead $\times$ 2, Instruction Manual $\times$ 1, Power cord $\times$ 1	
AFG-2000 Series - GTL-101 Test Lead $\times$ 1, Instruction Manual $\times$ 1, Power cord $\times$ 1	
OPTIONAL ASSESSORIES	
GTL-246	USB Cable, USB 2.0 Type A - Type B, 4P
GTL-110	BNC Cable, BNC(P/M)-BNC(P/M), 1000mm
FREE DOWNLOAD	
PC Software	Arbitrary Waveform Editing Software
Driver	USB driver

## SELECTION GUIDE

MODEL	AFG-2005	AFG-2105	AFG-2012	AFG-2112	AFG-2025	AFG-2125
FREQUENCY RANGE	5MHz	5MHz	12MHz	12MHz	25MHz	25MHz
ARBITRARY WAVEFORM	✓	✓	✓	✓	✓	✓
DUTY	✓	✓	✓	✓	✓	✓
TTL	✓	✓	✓	✓	✓	✓
DC OFFSET	✓	✓	✓	✓	✓	✓
USB INTERFACE	✓	✓	✓	✓	✓	✓
LIN/LOG SWEEP		✓		✓		✓
AM/FM/FSK MODULATION		✓		✓		✓
EXT COUNTER		✓		✓		✓

# 25MHz USB Modular Arbitrary Function Generator



## AFG-125/125P/225/225P



### FEATURES

- \* Output Amplitude Range From 1mVpp ~ 2.5Vpp (into 50Ω)
- \* Wide Frequency Ranges From 1μHz ~ 25MHz (sine wave)
- \* 1μHz Resolution in Full Range
- \* Built-in Standard 120MSa/s, 10bit, 4k Points Arbitrary Function for Both Channels
- \* True Dual-Channel Output, CH2 Provides the Same Characteristics as CH1
- \* Dual-Channel Supports Couple, Tracking, Phase Operations
- \* 1% ~ 99% Adjustable Duty Cycle for Square Waveform
- \* User Friendly for Easy Parameter Setting and Parameters Display
- \* Multiple Editing Methods to Edit Arbitrary Waveform Easily
- \* Built-in Standard AM/FM/PM/FSK/SUM/ Sweep/Burst
- \* USB Device Interface for Remote Control and Waveform Editing

The AFG-100/200 Series 25MHz USB modular arbitrary function generator has four models for selections. The AFG-100/200 Series arbitrary function generator with many unique features such as light weight, handy, and USB interface compatible is an ideal choice for the applications at the general laboratories in applying stand-alone operation or collocation with the GDS-2000A Series digital oscilloscope.

The main features of the AFG-100/200 Series are output amplitude of 2.5Vpp (connecting with a load of 50 ohms), frequency range reaching 25MHz, frequency resolution of 1μHz, and built-in sine waveform, square waveform, triangle waveform, and noise signal. Square waveform can adjust the duty cycle from 1% to 99% and it can be utilized as pulse signal. Users, via the GDS-2000A FG APP, can select from the 66 built-in function waveforms to conduct arbitrary waveform editing. The AFG-100/200 Series, with functions of AM/FM/PM/FSK/SUM modulation, frequency sweep, burst and coupling, is suitable for various communications applications.

The AFG-100/200 Series collocates with the FG APP of GDS-2000A digital oscilloscope through USB interface. While conducting stand-alone operation, the AFG-100/200 Series utilizes USB interface, which allows users to quickly set up their required tests by the simple connection feature. AWES (arbitrary waveform editing software) PC software is provided to enter settings speedily and easily for measurement. Users can select required waveforms from arbitrary waveform editor.

SPECIFICATIONS			
MODEL		AFG-125/AFG-125P	AFG-225/AFG-225P
OUTPUT CHANNELS WAVEFORMS			
		1	2
		Sine, Square, Ramp, Pulse, Noise, ARB	
ARBITRARY FUNCTIONS			
Sample Rate		120 MSa/s	
Repetition Rate		60MHz	
Waveform Length		4k points	
Amplitude Resolution		10 bits	
Non-Volatile Memory		4k points	
FREQUENCY CHARACTERISTICS			
Range	Sine/Square	1μHz ~ 25MHz	
Ramp		1μHz ~ 1MHz	
Resolution		1μHz	
Accuracy	Stability	±20 ppm	
	Aging	±1 ppm, per 1 year	
	Tolerance	≤1 Mhz	
OUTPUT CHARACTERISTICS			
Amplitude	Range	GPA-501 power supply: 1mVpp to 2.5Vpp (into 50Ω), 2mVpp to 5Vpp (open-circuit)	
	Accuracy	USB power supply : 1mVpp to 2Vpp (into 50Ω), 2mVpp to 4Vpp (open-circuit)	
	Resolution	±2% of setting ±1 mVpp (at 1 kHz)	
	Flatness	1mV or 3 digits	
		±1% (0.1dB) ≤ 100kHz, ±3% (0.3 dB) ≤ 5MHz, ±5% (0.4 dB) ≤ 12MHz, ±10% (0.9dB) ≤ 25MHz (sine wave relative to 1kHz)	
Offset	Units	Vpp, Vrms, dBm	
	Range	GPA-501 power supply: ±1.25 Vpk ac +dc (into 50Ω), ±2.5Vpk ac +dc (Open circuit)	
		USB power supply: ±1 Vpk ac +dc (into 50Ω), ±2 Vpk ac +dc (Open circuit)	
	Accuracy	2% of setting + 10mV+ 0.5% of amplitude	
WAVEFORM OUTPUT			
Impedance		50Ω typical (fixed), > 10MΩ (output disabled)	
Protection		Short-circuit protected, Overload relay automatically disables main output	
SINE WAVE CHARACTERISTICS			
Harmonic Distortion		≤ -50 dBc DC ~ 1MHz, Ampl > 1Vpp	
		≤ -35 dBc 1MHz ~ 5MHz, Ampl > 1Vpp	
		≤ -30 dBc 5MHz ~ 25MHz, Ampl > 1Vpp	
SQUARE WAVE CHARACTERISTICS			
Rise/Fall Time		≤ 10ns at maximum output (into 50 Ω load)	
Overshoot		<2%	
Asymmetry		1% of period +5 ns	
Variable duty Cycle		1.0% ~ 99.0% ≤ 100kHz; 10% ~ 90% ≤ 1MHz, 50% ≤ 25MHz	
RAMP CHARACTERISTICS			
Linearity		< 0.1% of peak output	
Variable Symmetry		0% ~ 100% (0.1% Resolution)	
PULSE CHARACTERISTICS			
Period		40ns ~ 2000s	
Pulse Width		20ns ~ 1999.9s	
Overshoot		<2%	
Accuracy		0.1%+20ns	
Jitter		20ppm +10ns	
AM MODULATION			
Carrier Waveforms		Sine, Square, Ramp, Pulse, Arb	
Modulating Waveforms		Sine, Square, Triangle, Upramp, Dnram	
Modulating Frequency		2mHz ~ 20kHz	
Depth		0% ~ 120.0%	
Source		Internal	
FM MODULATION			
Carrier Waveforms		Sine, Square, Ramp,	
Modulating Waveforms		Sine, Square, Triangle, Upramp, Dnram	
Modulating Frequency		2mHz ~ 20kHz	
Peak Deviation		DC to Max Frequency	
Source		Internal	



# 25MHz USB Modular Arbitrary Function Generator



**AFG-125**



**AFG-125P**



**AFG-225**



**AFG-225P**

## Rear Panel



## DS2-FH1 Module Extension Bay & USB Type A to Type A/B cable

For : GDS-2000A Series, AFG-100/200 Series



## GPA-501 Power Adapter

For : AFG-100/200 Series



## GPA-502 Universal Power Adaptor

For : AFG-100/200 Series

5V/3A, 2Ø



## SPECIFICATIONS

SWEEP	
Waveforms Type	Sine, Square, Ramp, Linear or Logarithmic
Start/Stop Freq	1μHz to Max Frequency
Sweep Time	1ms ~ 500s
Source	Internal / Manual
FSK	
Carrier Waveforms	Sine, Square, Ramp, Pulse
Modulating Waveforms	50% duty cycle square
Modulation Rate	2mHz ~ 100 kHz
Frequency Range	1μHz to Max Frequency
Source	Internal
PM	
Carrier Waveforms	Sine, Square, Ramp
Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnrmpr
Modulation Frequency	2mHz ~ 20kHz
Phase deviation	0° ~ 360°
Source	Internal
SUM	
Carrier Waveforms	Sine, Square, Ramp, Pulse, Noise
Modulating Waveforms	Sine, Square, Triangle, Upramp, Dnrmpr
Modulation Frequency	2mHz ~ 20kHz
SUM Depth	0% ~ 100.0%
Source	Internal
SYNC OUTPUT	
Type	Sync, Sweep Marker, Burst Marker or Arbitrary Waveform Marker
Level	TTL Compatible into 50Ω
Assignment	Channel 1 or Channel 2
Polarity	Normal or Inverted
Fan-out	> 4 TTL Load
Impedance	50Ω Typical
DUAL CHANNEL FUNCTION	
Phase	-180° ~ 180° (Square and Pulse can not be change, Phase is 0°), Synchronize phase
Track	CH2=CH1 OR CH1=CH2
Coupling	Frequency(Ratio or Difference), Amplitude & DC Offset
BURST	
Waveforms	Sine, Square, Ramp, Arb
Frequency	1μHz ~ 15 MHz(sine), 1μHz ~ 15 MHz(Square), 1μHz ~ 1 MHz (Ramp)
Burst Count	1 ~ 65535 cycles or Infinite
Start/Stop Phase	-360 ~ +360
Internal Period	1ms ~ 500s
Gate Source	External Trigger
Trigger Source	Single or Internal Rate
TRIGGER DELAY	
N-Cycle, Infinite	0s ~ 655350ns
SAVE/RECALL	
	10 Groups of Setting Memories
POWER OUTPUT	
Only AFG-125P/AFG-225P	Output Voltage : (2.5V/3.3V/5V)±5%, Output Current : 0.6A
INTERFACE	
	USB (Device)
GENERAL SPECIFICATIONS	
Power Source	DC 5V
Power Consumption	10 W (Max)
Operating Environment	Temperature to satisfy the specification : 18 ~ 28°C , Operating temperature : 0 ~ 40°C Relative Humidity : < 80%, 0 ~ 40°C, Installation category : CAT II
Operating Altitude	2000 Meters
Storage Temperature	-10 ~ 70°C, Humidity : < 70%
DIMENSIONS & WEIGHT	
	215(W) x 35 (H) x 107(D) mm, Approx. 1kg

## ORDERING INFORMATION

AFG-125	25MHz Single Channel USB Modular Arbitrary Function Generator
AFG-225	25MHz Dual Channel USB Modular Arbitrary Function Generator
AFG-125P	25MHz Single Channel USB Modular Arbitrary Function Generator Plus Power Supply
AFG-225P	25MHz Dual Channel USB Modular Arbitrary Function Generator Plus Power Supply

### Accessories

Quick Start Guide x 1, CD-ROM with AFG Software and User Manual x 1

GTL-101	BNC-Alligator Test Lead x 1 (only AFG-125/125P)
GTL-101	BNC-Alligator Test Lead x 2 (only AFG-225/225P)
GTL-105A	Test Lead x 1 (only AFG-125P/225P)

### OPTIONAL ACCESSORIES

DS2-FH1	Module extension bay & USB Type A to Type A/B cable
GPA-501	Power Adapter
GPA-502	Universal Power Adaptor
GTL-246	USB Type A to Type B cable
GTL-201A	Ground lead
GTL-110	BNC Cable, BNC(P/M)-BNC(P/M), 1000mm

# DDS FUNCTION GENERATORS

## DIRECT DIGITAL SYNTHESIZED (DDS) FUNCTION GENERATOR OVERVIEW

DDS type Function Generator has become the main stream in signal generation. This technique brings the advantages of simplicity, stable frequency and low distortion. The basic principle of how DDS works is as follows.

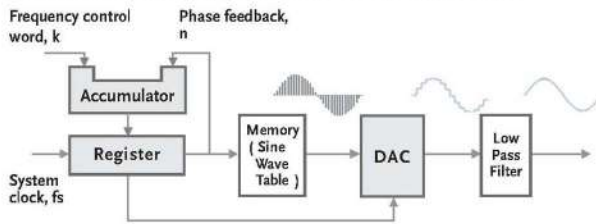


Figure 1 Block Diagram of DDS

The block diagram of DDS is illustrated in Figure 1 above. A digitized sine wave data is stored in a memory. The data is picked and sent out to a DAC, where step-shape sine wave is formed. A pure sine wave is then generated by a low pass filter.

The sine wave data is picked by accumulating the frequency control word,  $K$ . The whole sequence is as follows. At the very beginning,  $K$  is loaded into the accumulator. In a register, an address  $n$  in the memory selects the  $K_n$  data. Meanwhile the address  $n$  is fed back as part of the phase feedback to be added with  $K$ . Repeat the above steps, the  $2K_n$ ,  $3K_n$ , and eventually a wave data is sent to construct a complete sine wave. The time base is the system clock  $fs$ . Compared with the conventional function generator (introduced in the later section), there is no toggle between positive and negative current sources, therefore no spike noise occurs on the peak of the generated sine wave. Besides, the frequency stability follows the time base  $fs$ . As a result, the frequency stability is much better than that of a conventional function generator.

The extended product of DDS function generators is the arbitrary waveform generator. In the DDS unit, a sine wave data is stored in the memory. If the waveform data is loaded into the memory as demanded, an arbitrary waveform generator is constructed accordingly.

## DDS FUNCTION GENERATOR

MODEL	SFG-1003	SFG-1013
Technology	DDS	DDS
Analog Channel	1	1
Frequency Range	0.1Hz ~ 3MHz	0.1Hz ~ 3MHz
Frequency Resolution	0.1Hz	0.1Hz
Sample Rate	-	-
Repetition Rate	-	-
Vertical Resolution	-	-
Memory Length	-	-
Amplitude Range (@50Ω)	10Vpp	10Vpp
DC Offset (@50Ω)	±5Vpk (AC+DC)	±5Vpk (AC+DC)
Attenuator	-40dBx1	-40dBx1
Amplitude Unit	-	Vpp
Impedance Switch	50Ω	50Ω
Square Rise/Fall Time	25ns	25ns
Square Duty Cycle	25% ~ 75%	25% ~ 75%
Sine	V	V
Square	V	V
Triangle/Ramp	V	V
Pulse	-	-
Noise	-	-
Burst	-	-
CMOS Output	-	-
TTL Output/Sync Output	-	-
Sweep	-	-
AM/Modulation	-	-
FM	-	-
PM	-	-
FSK	-	-
PWM	-	-
SUM	-	-
GCV Function	-	-
VCF Function	-	-
Counter Function	-	-
Ext. Trigger Input	-	-
Ext. Modulation Input	-	-
Trigger Output	-	-
Modulation Output	-	-
Marker Output	-	-
GPIB	-	-
USB Host	-	-
USB Device	-	-
RS-232C	-	-
Display	6 digits LED	6 digits LED
Voltage Display	-	V
DSO Link	-	-
Internal Storage Memory	-	-
LabView Driver	-	-
Power Source	AC110/120/220/240V±10%	AC110/120/220/240V±10%
Power Consumption	-	-
Page	C32	C32



The block diagram of a conventional analog function generator is illustrated in Figure 2. Two current sources are toggled to charge/discharge the integrator, generating a triangle wave.



Since the frequency depends on the current source and components of the integrator, the generated frequency is not as stable as DDS or PLL (Phase Locked Loop).

## FUNCTION GENERATOR

MODEL	GFG-8255A	GFG-8250A	GFG-8219A	GFG-8216A	GFG-8215A
Technology	Analog	Analog	Analog	Analog	Analog
Analog Channel	1	1	1	1	1
Frequency Range	0.5Hz ~ 5MHz	0.5Hz ~ 5MHz	0.3Hz ~ 3MHz	0.3Hz ~ 3MHz	0.3Hz ~ 3MHz
Frequency Resolution	0.1Hz	0.1Hz	0.1Hz	0.1Hz	0.1Hz
Sample Rate	-	-	-	-	-
Repetition Rate	-	-	-	-	-
Vertical Resolution	-	-	-	-	-
Memory Length	-	-	-	-	-
Amplitude Range (@50Ω)	10Vpp	10Vpp	10Vpp	10Vpp	10Vpp
DC Offset (@50Ω)	±6Vpk (AC+DC)	±7Vpk (AC+DC)	±8Vpk (AC+DC)	±10Vpk (AC+DC)	±10Vpk (AC+DC)
Attenuator	-20dBx2	-20dBx2	-20dBx2	-20dBx2	-20dBx2
Amplitude Unit	-	-	-	-	-
Impedance Switch	50Ω	50Ω	50Ω	50Ω	50Ω
Square Rise/Fall Time	50ns	50ns	100ns	100ns	100ns
Square Duty Cycle	20% ~ 80%	20% ~ 80%	20% ~ 80%	20% ~ 80%	20% ~ 80%
Sine	V	V	V	V	V
Square	V	V	V	V	V
Triangle	V	V	V	V	V
Triangle/Ramp	V	V	V	V	V
Pulse	-	-	-	-	-
Noise	-	-	-	-	-
Burst	-	-	-	-	-
TTL Output	V	V	V	V	V
CMOS Output	V	V	V	V	V
Sync Output	-	-	-	-	-
Sweep	V	-	V	-	-
AM/Modulation	V	-	V	-	-
FM	V	-	V	-	-
PM	-	-	-	-	-
FSK	-	-	-	-	-
PWM	-	-	-	-	-
SUM	-	-	-	-	-
GCV Function	V	-	V	-	-
VCF Function	V	V	V	V	V
Counter Function	Int./Ext.	Int./Ext.	Int./Ext.	Int./Ext.	Int./Ext.
Ext. Trigger Input	-	-	-	-	-
Ext. Modulation Input	-	-	-	-	-
Trigger Output	-	-	-	-	-
Modulation Output	-	-	-	-	-
Marker Output	-	-	-	-	-
GPIB	-	-	-	-	-
USB Host	-	-	-	-	-
USB Device	-	-	-	-	-
RS-232C	-	-	-	-	-
Display	6 digits LED	6 digits LED	6 digits LED	6 digits LED	6 digits LED
Voltage Display	-	-	-	-	-
DSO Link	-	-	-	-	-
Internal Storage Memory	-	-	-	-	-
LabView Driver	-	-	-	-	-
Power Source	AC115V/230V±15%	AC115V/230V±15%	AC115V/230V±15%	AC115V/230V±15%	AC115V/230V±15%
Power Consumption	-	-	-	-	-
Page	C33-34	C33-34	C33-34	C33-34	C33-34

## 3 MHz DDS Function Generator



### SFG-1003/1013 (3MHz)



#### FEATURES

- \* DDS Technology and FPGA Design
- \* Frequency Range : 0.1Hz ~ 3MHz
- \* High Frequency Accuracy : 20ppm
- \* High Frequency Stability : 20ppm
- \* Max. Frequency Resolution : 100 mHz
- \* Low Distortion Sine Wave : -55dBc, 0.1Hz~200 kHz
- \* Voltage Display ( Only SFG-1013)

#### SELECTION GUIDE

MAIN FUNCTION	MODEL	SFG-1003	SFG-1013
Frequency		3 MHz	3 MHz
Offset		✓	✓
TTL Output		✓	✓
-40dB Attenuation		✓	✓
Voltage display		—	✓

For educational institutions, the SFG-1003/1013 series direct digital synthesis (DDS) signal generator is the most affordable option for accurate waveform generation. It supports outputs of up to 3MHz and includes a voltage display. Using DDS technology embedded in an FPGA chip, the SFG-1003/1013 series generates waveforms with high precision and high stability for customers who need accurate signals.

#### SPECIFICATIONS

MAIN	
Output Function	Sine, Square, Triangle, TTL
Frequency Range(For Sine, Square)	0.1Hz ~ 3MHz
Frequency Range(For Triangle)	0.1Hz ~ 1MHz
Frequency Resolution	0.1Hz maximum
Frequency Stability	±20ppm
Frequency Accuracy	±20ppm
Aging	±5ppm/year
Amplitude Range	2mVp-p ~ 10Vp-p (into 50Ω load)
Amplitude Accuracy	±20% at maximum position (only SFG-1013)
Impedance	50Ω±10%
Attenuator	-40dB±1dBx1
DC Offset	<-5V ~ >5V (into 50Ω load)
Duty Control Range	25% ~ 75% below 1MHz (for square wave only)
Display	6 digits LED display
Output Control	ON/OFF selector
SINE WAVE	
Harmonics Distortion	Maximum Amplitude attenuation to 1/10 of any panel settings, TTL OFF
	≥ -55dBc, 0.1Hz ~ 200kHz
	≥ -40dBc, 0.2MHz ~ 2MHz
	≥ -35dBc, 2MHz ~ 3MHz
Flatness (at maximum amplitude relative to 1kHz)	< ±0.3dB, 0.1Hz ~ 1MHz
	< ±0.5dB, 1MHz ~ 2MHz
	< ±1dB, 2MHz ~ 3MHz
TRIANGLE WAVE	
Linear	≥98%, 0.1Hz ~ 100kHz ; ≥95%, 100kHz ~ 1MHz
SQUARE WAVE	
Symmetry	5% of period+4ns, 0.1Hz ~ 100kHz
Rise or Fall Time	≤ 100ns at maximum output (into 50Ω load)
TTL OUTPUT	
Level	≥ 3Vp-p
Fan Out	20 TTL load
Rise or Fall Time	≤ 25ns
GENERAL	
Operation Environment	Indoor use, altitude < 2000m Ambient Temperature : 0°C ~ 40°C Relative Humidity: < 80% at 0°C ~ 40°C Up to 70% at 35°C ~ 40°C Installation category II Pollution Degree 2
POWER SOURCE	
	AC 100V/120V/220V/240V±10%, 50/60Hz
STORAGE CONDITION	
Temperature	-10°C ~ 70°C
Humidity	70% (Maximum).
DIMENSION & WEIGHT	
	251(W) x 91(H) x 291(D) mm, Approx. 2.1kg

#### ORDERING INFORMATION

SFG-1003 3 MHz DDS Function Generator  
SFG-1013 3 MHz DDS Function Generator with Voltage Display

#### ACCESSORIES :

User manualx1, Power cord x 1, Test lead GTL-101 x 1

#### OPTIONAL ACCESSORIES

GTL-110 BNC Cable, BNC(P/M)-BNC(P/M), 1000mm



# 5MHz/3MHz Function Generator



**GFG-8255A (5MHz)**  
**GFG-8219A (3MHz)**



**GFG-8250A (5MHz)**  
**GFG-8216A (3MHz)**



## FEATURES

- \* Frequency Range: 0.3Hz ~ 3MHz (GFG-8215A/8216A/8219A)
- \* Frequency Range: 0.5Hz ~ 5MHz (GFG-8250A/8255A)
- \* Waveforms: Sine, Triangle, Square, Ramp, TTL and CMOS Output
- \* External Voltage Controlled Frequency (VCF) Function
- \* Duty Cycle Control with Signal Inversion Capability
- \* Variable DC Offset Control
- \* Two-Steps (-20dBx2) and Variable attenuator
- \* Built-in 6 Digits Counter with INT/EXT Function up to 150MHz (Except GFG-8215A)
- \* LIN/LOG Sweep Mode (GFG-8217A/8219A/8255A)
- \* INT/EXT AM/FM Modulation (GFG-8219A/8255A)
- \* GCV Output for Synchronization (GFG-8219A/8255A)

The GFG-8200A Series Function Generators are embedded with standard functions such as TTL, CMOS and RAMP outputs, VCF (external voltage control frequency) and a 6-digit frequency counter (excluding GFG-8215A). All these integrated functions and the user-friendly operation are made to accommodate applications in audio response testing, vibration testing, servo system evaluations, and ultrasound applications.

In addition, the GFG-8255A and 8219A models include logarithmic and linear sweep, GCV (Generator Controlled Frequency) output and AM/FM modulation. The GFG-8200A Series' models span two frequency bandwidths; the GFG-8215A/8216A/8219A at 0.3Hz ~ 3MHz and the GFG-8250A/8255A at 0.5Hz ~ 5MHz.

## SPECIFICATIONS

MODEL	GFG-8215A/8216A/8219A	GFG-8250A/8255A
<b>MAIN</b>		
Frequency Range	0.3Hz ~ 3MHz (7 Range)	0.5Hz ~ 5MHz (7 Range)
Amplitude	> 10Vpp (into 50Ω load)	> 10Vpp (into 50Ω load)
Impedance	50Ω ± 10%	50Ω ± 10%
Attenuator	-20dB ± 1dB x 2	-20dB ± 1dB x 2
DC Offset	<-5V ~ >5V (into 50Ω load)	<-5V ~ >5V (into 50Ω load)
Duty Control	20% ~ 80%, maximum to 1MHz (continuously adjustable)	20% ~ 80%, maximum to 1MHz (continuously adjustable)
Display	6 digits LED display *GFG-8215A does not have a display	6 digits LED display
Range Accuracy	±5%+1Hz (at 3 positions) *only for GFG-8215A	
<b>SINE WAVE</b>		
Distortion	≤ 1%, 0.3Hz ~ 200kHz	≤ 1%, 0.5Hz ~ 100kHz
THD	≤ -35dB below fundamental in all range (MAX. to 1/10 level)	≤ -30dB below fundamental in all range (MAX. to 1/10 level)
Flatness	< 0.3dB, 0.3Hz ~ 300kHz < 0.5dB, 300kHz ~ 3MHz	≤ 0.3dB, below 500kHz ≤ 1dB, below 5MHz
<b>TRIANGLE WAVE</b>		
Linear	≥ 98%, 0.3Hz ~ 100kHz ≥ 95%, 100kHz ~ 3MHz	≥ 98%, 0.5Hz ~ 100kHz ≥ 95%, 100kHz ~ 5MHz
<b>SQUARE WAVE</b>		
Symmetry	± 2%, 0.3Hz ~ 100kHz	± 2%, 1Hz ~ 100kHz
Rise or Fall Time	≤ 100ns at maximum output (into 50Ω load)	≤ 50ns at maximum output (into 50Ω load)
<b>CMOS OUTPUT</b>		
Level	4Vpp ± 1Vpp ~ 14.5Vpp ± 0.5Vpp adjustable	4Vpp ± 1Vpp ~ 14.5Vpp ± 0.5Vpp adjustable
Rise or Fall Time	≤ 120ns	≤ 120ns
<b>TTL OUTPUT</b>		
Level	≥ 3Vpp	≥ 3Vpp
Fan Out	20 TTL load	20 TTL load
Rise or Fall Time	≤ 25ns	≤ 25ns
<b>VCF (Voltage Controlled Frequency)</b>		
Input Voltage	0V ~ 10V ± 1V (100 : 1)	0V ~ 10V ± 1V (100 : 1)
Input Impedance	10kΩ ± 10%	10kΩ ± 10%
<b>GCV (Generator Controlled Voltage) (GFG-8219A/8255A)</b>		
Output Voltage	sets the voltage between 0V ~ 2V	Sets the voltage between 0V ~ 2V
<b>SWEEP OPERATION (GFG-8217A/8219A/8255A)</b>		
Selection	Switch selector	Switch selector
Sweep/Rate	100 : 1 max, adjustable	100 : 1 max, adjustable
Sweep/Time	0.5sec. ~ 30sec. adjustable	0.5sec. ~ 30sec. adjustable
Sweep/Mode	Lin./Log. switch selector	Lin./Log. switch selector
<b>AMPLITUDE MODULATION (GFG-8219A/8255A)</b>		
Depth	0 ~ 100%	0 ~ 100%
MOD. Frequency	400Hz (INT), DC ~ 1MHz EXT	400Hz (INT), DC ~ 1MHz EXT
Carrier BW	100Hz ~ 3MHz (-3dB)	100Hz ~ 5MHz (-3dB)
EXT Sensitivity	≤ 10Vpp for 100% modulation	≤ 10Vpp for 100% modulation

SPECIFICATIONS		
MODEL	GFG-8215A/8216A/8219A	GFG-8250A/8255A
FREQUENCY MODULATION (GFG-8219A/8255A)		
Deviation	0 ~ ±5%	0 ~ ±5%
MOD. Frequency	400Hz(INT), DC ~ 20kHz(EXT)	400Hz (INT), DC ~ 20kHz(EXT)
EXT. Sensitivity	≤ 10Vpp for 10% modulation	≤ 10Vpp for 10% modulation
FREQUENCY COUNTER (GFG-8216A/8219A/8250A/8255A)		
INT/EXT	Switch selector	Switch selector
Range	0.3Hz ~ 3MHz (5Hz ~ 150MHz EXT)	0.5Hz ~ 5MHz (5Hz ~ 150MHz EXT)
Accuracy	Time base accuracy ±1 count	Time base accuracy ±1 count
Time Base	± 20ppm (23 °C ± 5 °C) after 30 minutes warm up	± 20ppm (23 °C ± 5 °C) after 30 minutes warm up
Resolution	100nHz for 1Hz 1Hz for 100MHz	100nHz for 1Hz 1Hz for 100MHz
Input Impedance	1MΩ // 150pF	1MΩ // 150pF
Sensitivity	≤ 35mVrms (5Hz ~ 100MHz) ≤ 45mVrms (100MHz ~ 150MHz)	≤ 35mVrms (5Hz ~ 100MHz) ≤ 45mVrms (100MHz ~ 150MHz)
POWER SOURCE		
	AC115V, 230V ± 15%, 50 / 60Hz	AC115V, 230V ± 15%, 50 / 60Hz
DIMENSION & WEIGHT		
	251(W) x 91(H) x 291(D)mm Approx. 2.0 kg (GFG-8215A) Approx. 2.1 kg (GFG-8216A) Approx. 2.15 kg (GFG-8217A) Approx. 2.2 kg (GFG-8219A)	251(W) x 91(H) x 291(D)mm Approx. 2.3 kg (GFG-8250A) Approx. 2.4 kg (GFG-8255A)



**GFG-8215A (3MHz)**



ORDERING INFORMATION	
GFG-8255A	5MHz Function Generator With Counter, Sweep Mode & AM/FM Modulation
GFG-8250A	5MHz Function Generator With Counter
GFG-8219A	3MHz Function Generator With Counter, Sweep Mode & AM/FM Modulation
GFG-8216A	3MHz Function Generator With Counter
GFG-8215A	3MHz Function Generator
ACCESSORIES :	
User manual x 1	
Test lead GTL-101 x 2	
Test lead GTL-101 x 1 ( GFG-8215A)	
OPTIONAL ACCESSORIES	
GTL-110	BNC Cable, BNC(P/M)-BNC(P/M), 1000mm

### SELECTION GUIDE

MODEL	GFG-8255A	GFG-8250A	GFG-8219A	GFG-8216A	GFG-8215A
DISPLAY	6 Digits LED Display				—
WAVEFORM	Sing , Square , Triangle				
FREQUENCY RANGE	5MHz	5MHz	3MHz	3MHz	3MHz
LIN/LOG SWEEP	✓		✓		
AM/FM MODULATION	✓		✓		
FREQUENCY COUNTER	✓	✓	✓	✓	
VOLTAGE CONTROL FREQUENCY	✓	✓	✓	✓	✓
GCV OUTPUT	✓		✓		
TTL/CMOS OUTPUT	✓	✓	✓	✓	✓



# SPECIFIC APPLICATION SIGNAL SOURCES

## SPECIFIC APPLICATION SIGNAL SOURCE OVERVIEW

GAG-809/810 provide a convenient solution for low frequency (< 1MHz) signal generation, specifically for audio bandwidth. Intuitive and simple panel interface provides quick frequency and amplitude adjustment, with dial/key shortcuts to different ranges. Square wave generation covers digital application in addition to the traditional analog using sine wave. Distortion is kept at minimum level, especially at the audible frequency range : 0.02% or less distortion factor for 500Hz~20kHz. The external synchronization signal input helps collaborate with other measurement devices.

The GWInstek USG-Series RF signal generator is a pocket-sized and USB interface compatible RF signal generator. It covers the frequency range from 35MHz ~ 4400MHz. The USG-Series provides continuous wave (CW) signal outputs without any signal modulation function.

The built-in electronic attenuator of the USG-Series allows an adjustable power range between -30dBm to 0dBm. The USG-Series has several operational modes including fixed frequency, frequency sweep, frequency hopping, and power sweep.

### AUDIO GENERATOR

MODEL	GAG-810
Application	Audio Signal
Analog Channel	1
Frequency Range	10Hz ~ 1MHz
Output Range	5Vrms
Impedance	600Ω
Power Source	AC100/120/220/230V±10%
Page	C36

### RF SIGNAL GENERATOR

MODEL	USG-LF44	USG-0103	USG-0818	USG-2030	USG-3044
Application	RF signal generator	RF signal generator	RF signal generator	RF signal generator	RF signal generator
Analog Channel	1	1	1	1	1
Frequency Range	34.5MHz ~ 4400MHz	100MHz ~ 300MHz	800MHz ~ 1800MHz	2000MHz ~ 3000MHz	3000MHz ~ 4400MHz
Output Range	-30dBm ~ 0dBm	-30dBm ~ 0dBm	-30dBm ~ 0dBm	-30dBm ~ 0dBm	-30dBm ~ 0dBm
Impedance	50Ω	50Ω	50Ω	50Ω	50Ω
Modulation	Sine Wave	Sine Wave	Sine Wave	Sine Wave	Sine Wave
Display	-	-	-	-	-
Interface	USB	USB	USB	USB	USB
Power Source	DC 5V	DC 5V	DC 5V	DC 5V	DC 5V
Page	C38-39	C38-39	C38-39	C38-39	C38-39

# Audio Generator



GAG-810 provides a convenient solution for low frequency (< 1MHz) signal generation, specifically for audio bandwidth. Intuitive and simple panel interface provides quick frequency and amplitude adjustment, with dial/key shortcuts to different ranges. Square wave generation covers digital application in addition to the traditional analog using sine wave. Distortion is kept at minimum level, especially at the audible frequency range: 0.02% or less distortion factor for 500Hz~20kHz. The external synchronization signal input helps collaborate with other measurement devices.

## GAG-810 (1MHz)



### FEATURES

- \* Frequency from 10Hz ~ 1MHz
- \* 0.02% Low Sine wave Distortion (GAG-810 Only)
- \* 6 Steps Output Attenuator
- \* EXT SYNC Function

SPECIFICATIONS	
SINE WAVE CHARACTERISTIC	
Frequency Range	10Hz ~ 1MHz, 5 Ranges
Frequency Indicator	Dial Scale
Frequency Accuracy	± 5% + 1Hz (at x10, x100)
Output Voltage	5 Vrms (600Ω load)
Frequency Response	10Hz ~ 1MHz ± 0.5dB (at 600Ω load) Reference Frequency (1kHz)
Distortion Factor	500Hz ~ 20kHz : ≤ 0.02% (GAG-809 : ≤ 0.1%) 100Hz ~ 100kHz : ≤ 0.05% (GAG-809 : ≤ 0.3%) (x 10 range for 100Hz, x 1k range for 100kHz) 50Hz ~ 200kHz : ≤ 0.3% 20Hz ~ 500kHz : ≤ 0.5% 10Hz ~ 1MHz : ≤ 1.5%
SQUARE WAVE	
Output Voltage	≥ 10Vpp (no load)
Overshoot	≤ 2% (at 1kHz, max output)
Rise & Fall Time	< 200ns
Duty Ratio	50% ± 5%
EXT. SYNCHRONIZATION	
Synchronizing Range	± 1%/Vrms
Max. Allowable Input	15V (DC + AC peak)
Input Impedance	150k Ω
OUTPUT	
Output Impedance	600Ω
Output Attenuator	0, -10, -20, -30, -40, -50dB 6 ranges (accuracy ± 1dB at 600Ω load)
POWER SOURCE	
AC 100/120/220/230V ± 10% , 50/60Hz	
DIMENSIONS & WEIGHT	
130(W) x 210(H) x 292(D) mm , Approx 3 kg	

### ORDERING INFORMATION

<b>GAG-810</b>	1MHz Audio Generator with 0.02% Low Sine Wave Distortion
ACCESSORIES :	
User Manual x 1, Power cord x 1, Test lead GTL-103 x 1	



# RF Signal Generator



## USG-Series



### FEATURES

- \* Frequency Range : 34.5MHz ~ 4400MHz
- \* Output Power Range : -30dBm ~ 0dBm
- \* Continuous Wave Signal Without any Modulation
- \* Support Fixed Frequency, Frequency Sweep, Frequency Hopping & Power Sweep Mode
- \* -107dBc/Hz Phase Noise@100kHz Offset
- \* Frequency Resolution : 10kHz
- \* PC USB Interface Powered and Controlled
- \* External PC Software Support Different Operating System

The USG-Series RF signal generator is a pocket-sized and USB interface compatible RF signal generator. It covers the frequency range from 35MHz ~ 4400MHz. The USG-Series provides continuous wave (CW) signal outputs without any signal modulation function. The built-in electronic attenuator of the USG-Series allows an adjustable power range between -30dBm to 0dBm. The USG-Series has several operational modes including fixed frequency, frequency sweep, frequency hopping, and power sweep.

A USG CD-ROM provides dedicated PC application programs, which were developed under JAVA software structure. This USG PC application program supports operating systems such as Windows 2000 /XP/Vista/7/8, Linux & Mac OS X through the USB interface.

Users can download USG APP to smart phone or tablet with Android 4.0 or above. To operate USG, use USB-OTG connecting cable to connect tablet (or smart phone) and USG. The Android APP application software for the USG signal generator is available on Google Play Store.

The USG signal generator can be designated as the tracking generator for GSP-730 spectrum analyzer to conduct measurement functions of scalar network analyzer. A USG CD-ROM provides PC application programs for the GSP-730 Primary RF software. Users can, using a Windows OS computer, control USG and GSP-730 via the Primary RF software.

SPECIFICATIONS				
USG-LF44	USG-0103	USG-0818	USG-2030	USG-3044
<b>FREQUENCY RANGE</b>				
34.5 MHz ~ 4.4 GHz	100 MHz ~ 300 MHz	800 MHz ~ 1.8 GHz	2.0 GHz ~ 3.0 GHz	3.0 GHz ~ 4.4 GHz
<b>OUTPUT POWER</b>				
-30 dBm ~ 0 dBm, in 1 dB steps				
<b>INTERNAL REFERENCE FREQUENCY</b>				
25 MHz, aging $\pm 1$ ppm at first year				
<b>FREQUENCY ACCURACY (0 dBm Output Level)</b>				
$\pm 100$ Hz at 100MHz	$\pm 100$ Hz at 100MHz	$\pm 800$ Hz at 800MHz	$\pm 2$ kHz at 2GHz	$\pm 3$ kHz at 3GHz
<b>FREQUENCY RESOLUTION</b>				
10 kHz				
<b>OUTPUT ISOLATION</b>				
$\leq -75$ dBc, Output Control On/Off				
<b>MODE CONTROL</b>				
Fixed Frequency / Single Sweep / CW Sweep / Hopping / Power Sweep				
<b>STEP DWELL</b>				
$\leq 1000$ ms in 1 ms steps				
<b>FREQUENCY OFFSET</b>				
-50 kHz ~ 50 kHz in 10 kHz steps				
<b>OUTPUT FLATNESS (0 dBm Output Level)</b>				
-1 dBm ~ 3.5 dBm, typical	-1 dBm ~ -2 dBm, typical	-1 dBm ~ -0.5 dBm, typical	-1 dBm ~ -0.5 dBm, typical	-1 dBm ~ 3.5 dBm, typical
<b>PHASE NOISE</b>				
<b>Carrier Frequency</b>				
$f_c = 1.0$ GHz	$f_c = 200$ MHz	$f_c = 1.3$ GHz	$f_c = 1.5$ GHz	$f_c = 3.7$ GHz
<b>at 10kHz Offset Frequency</b>				
$< -97$ dBc/Hz, typical -100 dBc/Hz	$< -100$ dBc/Hz, typical	$< -97$ dBc/Hz, typical	$< -93$ dBc/Hz, typical	$< -88$ dBc/Hz, typical
<b>at 100kHz Offset Frequency</b>				
$< -107$ dBc/Hz, typical -110 dBc/Hz	$< -110$ dBc/Hz, typical	$< -102$ dBc/Hz, typical	$< -100$ dBc/Hz, typical	$< -94$ dBc/Hz, typical
<b>2ND HARMONICS (0 dB Attenuation)</b>				
$\leq -15$ dBc, typical 34.5 MHz ~ 2.0 GHz $\leq -10$ dBc, typical 2.0 GHz ~ 3.0 GHz $\leq -25$ dBc, typical 3.0 GHz ~ 4.4 GHz	$\leq -45$ dBc, typical > 100 MHz	$\leq -25$ dBc, typical > 800 MHz	$\leq -30$ dBc, typical 2.0 GHz ~ 3.0 GHz	$\leq -25$ dBc, typical 3.0 GHz ~ 4.4 GHz
<b>3rd HARMONICS (0 dB Attenuation)</b>				
$\leq -5$ dBc, typical 34.5 MHz ~ 2 GHz $\leq -20$ dBc, typical 2.0 GHz ~ 3.0 GHz $\leq -40$ dBc, typical 3.0 GHz ~ 4.4 GHz	$\leq -7$ dBc typical $\leq 150$ MHz $\leq -35$ dBc, typical > 150 MHz	$\leq -25$ dBc, typical $\leq 900$ MHz $\leq -35$ dBc, typical > 900 MHz	$\leq -55$ dBc, typical 2.0 GHz ~ 3.0 GHz	$\leq -40$ dBc, typical 3.0 GHz ~ 4.4 GHz
<b>SPURIOUS RELATED TO RESOLUTION SETTINGS</b>				
$\leq -30$ dBc, typical, Resolution < 1MHz $\leq -65$ dBc, typical, Resolution $\geq 1$ MHz				
<b>SPURIOUS RELATED TO THE FUNDAMENTAL OUTPUT</b>				
$\leq -60$ dBc, typical	$\leq -60$ dBc, typical	$\leq -65$ dBc, typical	$\leq -65$ dBc, typical	$\leq -65$ dBc, typical

# RF Signal Generator

SPECIFICATIONS				
USG-LF44	USG-0103	USG-0818	USG-2030	USG-3044
<b>SUPPORTED OS</b>				
Windows/Linux/Mac/Android				
<b>INTERFACE</b>				
USB 2.0				
<b>USB CONNECTOR TYPE</b>				
Mini B				
<b>SUPPLY VOLTAGE</b>				
5V nominal				
<b>CURRENT CONSUMPTION</b>				
200 mA				
<b>RF CONNECTOR TYPE</b>				
N-type male				
<b>IMPEDANCE</b>				
50 $\Omega$ nominal				
<b>OUTPUT VSWR</b>				
< 1.5 : 1, Output Level @ -30 dBm				
<b>MAXIMUM PERMISSIBLE DC VOLTAGE</b>				
$\pm 25V$				
<b>MAXIMUM REVERSE POWER</b>				
+30dBm (1W)				
<b>ELECTROMAGNETIC COMPATIBILITY</b>				
EN 55011 class A, EN 61326-1(industrial environment), EN 61326-2-1, EN 61000-4-2, EN 61000-4-3, EN 61000-4-11				
<b>DIMENSIONS &amp; WEIGHT</b>				
30(W) x 103(H) x 30(D)mm; Approx. 100g				

**USG-LF44** 35MHz ~ 4400MHz RF Signal Generator  
**USG-0103** 100MHz ~ 300MHz RF Signal Generator  
**USG-0818** 800MHz ~ 1800MHz RF Signal Generator  
**USG-2030** 2000MHz ~ 3000MHz RF Signal Generator  
**USG-3044** 3000MHz ~ 4400MHz RF Signal Generator

## ACCESSORIES

USB cable, CD-ROM with USG software, GSP-730 PrimaryRF software and User manual

**GTL-253** USB Cable, USB 2.0, A-mini B Type, 1400mm

## OPTIONAL ACCESSORIES

**ADP-003** 50 $\Omega$  N type (female) to SMA (female) Adapter

**GTL-303** 50 $\Omega$  SMA RF cable (600mm)

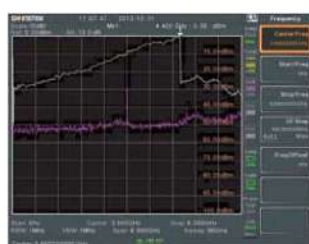
## ADP-003

50 $\Omega$  N type (female) to SMA (female) Adapter  
For: USG-Series



## GTL-303

50 $\Omega$  SMA RF cable (600mm)  
For: USG-Series



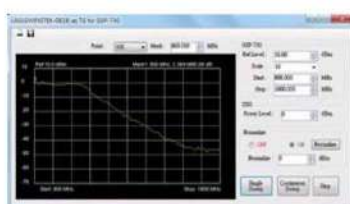
Test Result of Simultaneous Power Sweep and Frequency Sweep



Easy to Use Graphical Interface with Numeric Setting



USG Android APP



Test Result of Low Pass Filter with PrimaryRF Software



## ACCESSORIES

MODEL	DESCRIPTION	APPLICABLE DEVICE
AFG-125	USB Arbitrary Function Generator, 1CH/25MHz	GDS-2000A Series
AFG-225	USB Arbitrary Function Generator, 2CH/25MHz	GDS-2000A Series
ADP-003	Adaptor, 50Ω, N(J/F) - SMA(J/F)	USG-Series
DS2-FH1	Module extension bay & USB Type A to Type A/B cable	GDS-2000A Series, AFG-100/200 Series
GPA-501	Power Adapter, DC Output: 5V/2A	AFG-200/100 Series
GPA-502	Universal Power Adapter, DC Output: 5V/2A	AFG-200/100 Series
GRA-432	Rack Mount Kit	AFG-3000 Series
GTL-101	Test Lead, BNC(P/M) to Alligator Test Lead, 1100mm	AFG-Series, SFG-Series, GFG-Series, GFC-Series
GTL-105A	Test Lead, Alligator to Banana Test Lead, Max. Current 3A, 1000mm	AFG-200/100 Series
GTL-110	BNC Cable, BNC(P/M)-BNC(P/M), 1000mm	AFG-Series, SFG-Series, GFG-Series, GFC-Series
GTL-201A	Ground Lead, Banana to Banana, European Terminal, 200mm	AFG-200/100 Series
GTL-232	RS-232C Cable, 9-pin, F-F Type, null modem, 2000mm	AFG-3081/3051, GFG-3015
GTL-246	USB Cable, USB 2.0, A-B Type, 1200mm	MFG-2000 Series, AFG-Series,
GTL-248	GPIB Cable, Double Shielded, 2000mm	AFG-3000 Series
GTL-250	GPIB Cable, Double Shielded, 600mm	AFG-3000 Series
GTL-253	USB Cable, USB 2.0, A-mini B Type, 1400mm	USG-Series
GTL-303	RF Cable, RG316 Assembly, 600mm, SMA(P/M)	USG-Series

GTL-101



GTL-103



GTL-105A



GTL-107A



GTL-110



GTL-246



GTL-248



GTL-250

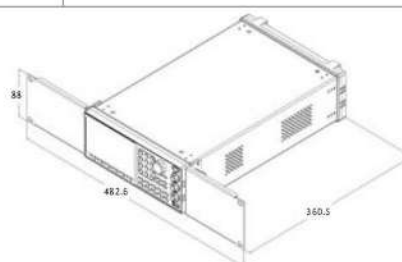


GTL-253



GRA-432 Rack Mount Kit

For: AFG-3000 Series



## NOTE

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## DC POWER SUPPLIES

Stemming from the design and manufacture demands of electronic industries, GW Instek offers diverse power supply product lines to meet user's demand for a variety of applications. Based on different needs, the product lines can be divided into several categories including DC Power Supply, AC Power Source and DC Electronic Load.

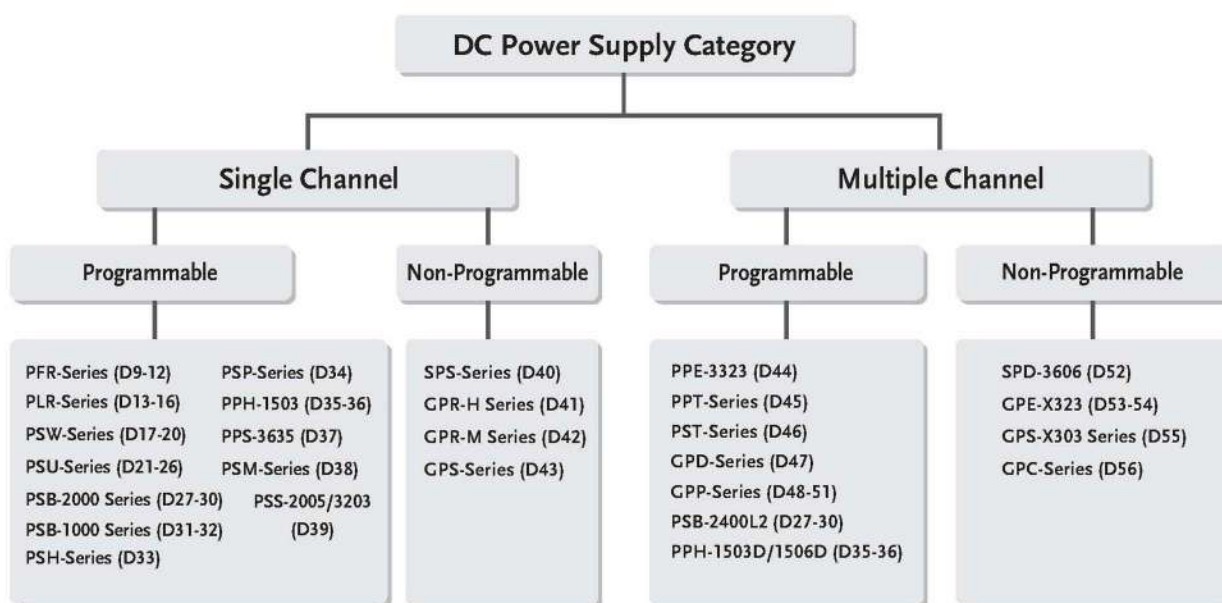
For DC Power Supply, the products can be briefly categorized by the following types, Programmable or Non-programmable, Single or Multiple Outputs, High Precision or Affordable Price, Dual Range and Wide Combinations of Voltage and Current, which can be selected to meet the application requirements.

GW Instek offers more than 100 power supply products, Which are suitable for the requirements of Electronic Assembly Testing, Education, Component Testing, Wireless Product Testing, Burn-in, Battery-Power Product Testing Automotive, Aerospace industries and so on.

### PRODUCTS

- Programmable & Single Channel DC Power Supply
- Non-Programmable & Single Channel DC Power Supply
- Programmable & Multiple Channel DC Power Supply
- Non-Programmable & Multiple Channel DC Power Supply

## GENERAL SELECTION GUIDE OF POWER SUPPLY BY APPLICATION



Series	Education	R&D/ Research Lab	Production Testing	ATE for Production	Burn-IN	Page
PFR-Series		✓		✓		D9-12
PLR-Series		✓		✓		D13-16
PSW-Series		✓	✓	✓	✓	D17-20
PSU-Series		✓	✓	✓	✓	D21-26
PSB-2000 Series		✓	✓	✓	✓	D27-30
PSB-1000 Series		✓	✓	✓	✓	D31-32
PSH-Series		✓	✓	✓	✓	D33
PSP-Series	✓	✓		✓		D34
PPH-1503/1503D/1506D		✓	✓		✓	D35-36
PPS-3635	✓	✓	✓	✓		D37
PSM-Series		✓	✓		✓	D38
PSS-Series		✓	✓	✓		D39
SPS-Series			✓	✓	✓	D40
GPR-H Series		✓	✓		✓	D41
GPR-M Series		✓	✓		✓	D42
GPS-Series	✓	✓	✓			D43
PPE-3323	✓	✓	✓	✓		D44
PPT-Series	✓	✓	✓	✓		D45
PST-Series	✓	✓	✓	✓		D46
GPD-Series	✓	✓	✓			D47
GPP-Series	✓	✓	✓			D48-51
SPD-3606	✓	✓	✓		✓	D52
GPE-X323	✓	✓	✓			D53-54
GPS-x303 Series	✓	✓	✓			D55
GPC-Series	✓	✓	✓			D56



## GENERAL SELECTION GUIDE OF DC POWER SUPPLY BY FUNCTION

	Programmability	Display		Technic	Model	Page
Single Channel	Programmable	LED		Switching	PFR-Series	D9-12
		LED		Switching	PLR-Series	D13-16
		LED		Switching	PSW-Series	D17-20
		LED		Switching	PSU-Series	D21-26
		LCD		Switching	PSH-Series	D33
		LED		Switching	PSB-2400L/2400H/2800L/2800LS/2800H	D27-30
		LCD		Switching	PSB-1400L/1400M/1800L/1800M	D31-32
		LCD		Switching	PSP-603/405/2010	D34
		LCD		Linear	PPH-1503	D35-36
		LED		Linear	PPS-3635	D37
		VFD		Linear	PSM-Series	D38
		LCD		Linear	PSS-Series	D39
		LCD		Linear	GPP-1326	D48-51
		Non-Programmable	LED		Switching	SPS-1230/1820/2415/3610/606
	LED		Dual	Linear	GPR-H Series	D41
	LED		Dual	Linear	GPR-M Series	D42
	LED		Linear	GPS-1830D/1850D/3030D/3030DD	D43	
	Analog		Linear	GPS-3030	D43	
	LED		Linear	GPP-1326	D53-54	
Multiple Channel	Programmable	LED		Switching	PSB-2400L2	D27-30
		LED		Linear	PPE-3323	D44
		LED		Linear	PPT-1830/3615	D45
		LCD		Linear	PST-3201/3202	D46
		LED		Linear	GPD-2303S/3303S/4303S/3303D	D47
		LCD		Linear	GPP-2323/3323/4323	D48-51
		LCD		Linear	PPH-1503D	D35-36
	Non-Programmable	LED		Switching	SPD-3606	D52
		LED	Dual	Linear	GPC-3060D/6030D	D56
		LED	Quad	Linear	GPS-2303/3303/4303	D55
LED		Linear	GPE-2303/3303/4303	D53-54		

## GENERAL SELECTION GUIDE OF DC POWER SUPPLY BY TECHNIC

Technic	Channel	Programmability	Display		Model	Page	
Switching	Single Channel	Programmable	LED		PFR-Series	D9-12	
			LED		PLR-Series	D13-16	
			LED		PSW-Series	D17-20	
			LED		PSU-Series	D21-26	
			LCD		PSH-Series	D33	
			LED		PSB-2400L/2400H/2800L/2800LS/2800H	D27-30	
			LED		PSB-1400L/1400M/1800L/1800M	D31-32	
			LCD		PSP-603/405/2010	D34	
		Non-Programmable	LED		SPS-1230/1820/2415/3610/606	D40	
Multiple Channel	Programmable	LED		PSB-2400L2	D27-30		
	Non-Programmable	LED		SPD-3606	D52		
Linear	Single Channel	Programmable	LCD		PPH-1503	D35-36	
			LED		PPS-3635	D37	
			VFD		PSM-Series	D38	
			LCD		PSS-Series	D39	
			LCD		GPP-1326	D48-51	
		Non-Programmable	LED	Dual	GPR-H Series		D41
			LED	Dual	GPR-M Series		D42
			LED		GPS-1830D/1850D/3030D/3030DD		D43
			Analog		GPS-3030		D43
			LED		GPE-1326		D49-50
	Multiple Channel	Programmable	LED		PPE-3323	D44	
			LED		PPT-1830/3615	D45	
			LCD		PPH-1503D/1506D	D35-36	
			LCD		PST-3201/3202	D46	
			LED		GPD-2303S/3303S/4303S/3303D	D47	
			LCD		GPP-2323/3323/4323	D48-51	
		Non-Programmable	LED	Dual	GPC-3060D/6030D		D56
			LED	Quad	GPS-2303/3303/4303		D55
			LED		GPE-2303/3303/4303		D53-54



# DC POWER SUPPLIES

## PROGRAMMABLE & SINGLE CHENNEL DC POWER SUPPLY

Voltage(V)	Current(A)	Power(W)	Model	Display	Technic	Remark	Page
6	200	1200	PSU 6-200	LED	Switching	USB/LAN/RS-232/RS-485/GPIB(Opt)	D21-26
8	20	200	PSM-2010	VFD	Linear	DUAL RANGE, RS-232/GPIB	D38
12.5	120	1500	PSU 12.5-120	LED	Switching	USB/LAN/RS-232/RS-485/GPIB(Opt)	D21-26
15	3	45	PPH-1503	LCD	Linear	9V/5A or 15V/3A, USB/LAN/GPIB	D35-36
15	7	120	PSM-3004	VFD	Linear	DUAL RANGE, RS-232/GPIB	D38
20	18	360	PLR 20-18	LED	Switching	RS-232/LAN(Opt)/USB(Opt)/GPIB(Opt)	D13-16
20	36	720	PLR 20-36	LED	Switching	RS-232/LAN(Opt)/USB(Opt)/GPIB(Opt)	D13-16
20	76	1520	PSU 20-76	LED	Switching	USB/LAN/RS-232/RS-485/GPIB(Opt)	D21-26
20	18	360	PSH-2018A	LCD	Switching	RS-232/GPIB(Opt)	D33
20	10	200	PSP-2010	LCD	Switching	RS-232	D34
20	10	200	PSM-2010	VFD	Linear	DUAL RANGE, RS-232/GPIB	D38
20	5	100	PSS-2005	LCD	Linear	RS-232/GPIB(Opt)	D39
30	36	360	PSW 30-36	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
30	72	720	PSW 30-72	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
30	108	1080	PSW 30-108	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
30	4	120	PSM-3004	VFD	Linear	DUAL RANGE, RS-232/GPIB	D38
30	6	200	PSM-6003	VFD	Linear	DUAL RANGE, RS-232/GPIB	D38
32	3	96	PSS-3203	LCD	Linear	RS-232/GPIB(Opt)	D39
32	6	192	GPP-1326	LCD	Linear	RS-232/USB(CDC)/LAN(Opt)/GPIB(Opt)	D48-51
36	10	360	PLR 36-10	LED	Switching	RS-232/LAN(Opt)/USB(Opt)/GPIB(Opt)	D13-16
36	20	720	PLR 36-20	LED	Switching	RS-232/LAN(Opt)/USB(Opt)/GPIB(Opt)	D13-16
36	10	360	PSH-3610A	LCD	Switching	RS-232/GPIB(Opt)	D33
36	20	720	PSH-3620A	LCD	Switching	RS-232/GPIB(Opt)	D33
36	30	1080	PSH-3630A	LCD	Switching	RS-232/GPIB(Opt)	D33
36	3.5	126	PPS-3635	LED	Linear	36V/3.5A, GPIB	D37
40	38	1520	PSU 40-38	LED	Switching	USB/LAN/RS-232/RS-485/GPIB(Opt)	D21-26
40	5	200	PSP405	LCD	Switching	RS-232	D34
60	6	360	PLR 60-6	LED	Switching	RS-232/LAN(Opt)/USB(Opt)/GPIB(Opt)	D13-16
60	12	720	PLR 60-12	LED	Switching	RS-232/LAN(Opt)/USB(Opt)/GPIB(Opt)	D13-16
60	3.5	200	PSP-603	LCD	Switching	RS-232	D34
50	10	100	PFR-100L	LED	Switching	USB/RS-232/RS-485/LAN(Opt)/GPIB(Opt)	D9-12
60	3.3	200	PSM-6003	VFD	Linear	DUAL RANGE, RS-232/GPIB	D38
60	25	1500	PSU 60-25	LED	Switching	USB/LAN/RS-232/RS-485/GPIB(Opt)	D21-26
80	13.5	360	PSW 80-13.5	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
80	27	720	PSW 80-27	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
80	40.5	1080	PSW 80-40.5	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
80	40	400	PSB-2400L	LED	Switching	RS-232/USB/GPIB(Opt)	D27-30
80	80	800	PSB-2800L	LED	Switching	RS-232/USB/GPIB(Opt)	D27-30
80	80	800	PSB-2800LS	LED	Switching	RS-232/USB/GPIB(Opt)	D27-30
100	15	1500	PSU 100-15	LED	Switching	USB/LAN/USB-GPIB(Opt)	D21-26
150	10	1500	PSU 150-10	LED	Switching	USB/LAN/USB-GPIB(Opt)	D21-26

## DC POWER SUPPLIES

Voltage(V)	Current(A)	Power(W)	Model	Display	Technic	Remark	Page
160	7.2	360	PSW 160-7.2	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
160	14.4	720	PSW 160-14.4	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
160	21.6	1080	PSW 160-21.6	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
250	2	100	PFR-100M	LED	Switching	USB/RS-232/RS-485/LAN(Opt)/GPIB(Opt)	D9-12
250	4.5	360	PSW 250-4.5	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
250	9	720	PSW 250-9	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
250	13.5	1080	PSW 250-13.5	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
300	5	1500	PSU 300-5	LED	Switching	RS-232/USB/LAN/USB-GPIB(Opt)	D21-26
400	3.8	1520	PSU 400-3.8	LED	Switching	RS-232/USB/LAN/USB-GPIB(Opt)	D21-26
600	2.6	1560	PSU 600-2.6	LED	Switching	RS-232/USB/LAN/USB-GPIB(Opt)	D21-26
800	1.44	360	PSW 800-1.44	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
800	2.88	720	PSW 800-2.88	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
800	4.32	1080	PSW 800-4.32	LED	Switching	USB/LAN/USB-GPIB(Opt)	D17-20
800	3	400	PSB-2400H	LED	Switching	RS-232/USB/GPIB(Opt)	D31-32
800	6	800	PSB-2800H	LED	Switching	RS-232/USB/GPIB(Opt)	D31-32



## DC POWER SUPPLIES

### NON-PROGRAMMABLE & SINGLE CHENNEL DC POWER SUPPLY

Voltage(V)	Current(A)	Power(W)	Model	Display	Technic	Remark	Page
8	30	240	GPR-0830HD	LED	Linear	Rear-Panel Output	D41
12	30	360	SPS-1230	LED	Switching	Rear-Panel Output	D40
18	3	54	GPS-1830D	LED	Linear	Rear-Panel Output	D43
18	5	90	GPS-1850D	LED	Linear		D43
18	10	180	GPR-1810HD	LED	Linear	Rear-Panel Output	D42
18	20	360	SPS-1820	LED	Switching	Rear-Panel Output	D40
18	20	360	GPR-1820HD	LED	Linear	Rear-Panel Output	D41
24	15	360	SPS-2415	LED	Switching		D40
30	3	90	GPS-3030D	LED	Linear	Rear-Panel Output	D43
30	3	90	GPS-3030DD	LED	Linear		D43
30	3	90	GPS-3030	Analog	Linear		D43
30	6	180	GPR-3060D	LED	Linear	Rear-Panel Output	D42
32	6	192	GPE-1326	LED	Linear	Front-Panel Output	D53-S4
35	10	350	GPR-3510HD	LED	Linear	Rear-Panel Output	D41
36	10	360	SPS-3610	LED	Switching	Rear-Panel Output	D40
60	3	180	GPR-6030D	LED	Linear	Rear-Panel Output	D42
60	6	360	SPS-606	LED	Switching	Rear-Panel Output	D40
60	6	360	GPR-6060D	LED	Linear	Rear-Panel Output	D41
75	5	375	GPR-7550D	LED	Linear	Rear-Panel Output	D41
110	3	330	GPR-11H30D	LED	Linear	Rear-Panel Output	D41
300	1	300	GPR-30H10D	LED	Linear	Rear-Panel Output	D41

# DC POWER SUPPLIES

## PROGRAMMABLE & MULTIPLE CHENNEL DC POWER SUPPLY

Voltage(V)	Current(A)	Power (W)	Model	CH	Display	Technic	Remark	Page
15	3	63	PPH-1503D	2	LCD	Linear	15V/3A or 9V/5A x 1, 12V/1.5A x 1 GPIB/LAN/GPIB	D35-36
15	3	81	PPH-1506D	2	LCD	Linear	15V/3A or 9V/5A x 1, 12V/3A x 1 GPIB/LAN/GPIB	D35-36
18	3	138	PPT-1830	3	LED	Linear	18V/3A x 2, 6V/5A x 1 GPIB	D45
30	3	180	GPD-2303S	2	LED	Linear	30V/3A x 2 USB	D47
30	3	195	GPD-3303S	3	LED	Linear	30V/3A x 2 (2.5/3.3/5V)/3A x 1, USB	D47
30	3	195	GPD-4303S	4	LED	Linear	30V/3A x 2; (5V/3A) or (5.0V~10V/1A) x 1; 5V/1A, USB	D47
30	3	195	GPD-3303D	3	LED	Linear	30V/3A x 2 (2.5/3.3/5V)/3A x 1, USB	D47
32	3	207	PPE-3323	3	LED	Linear	±32V/3A; -32V/-3A 3.3V(5V)/3A FIXED; RS-232	D44
32	1	96	PST-3201	3	LCD	Linear	32V/1A x 3 RS-232/GPIB (Opt)	D46
32	2	158	PST-3202	3	LCD	Linear	32V/2A x 2, 6V/5A x 1 RS-232/GPIB (Opt)	D46
32	3	192	GPP-2323	2	LCD	Linear	32V/3A x 2, RS-232/USB(CDC)/ LAN(Opt)/GPIB(Opt)	D48-51
32	3	217	GPP-3323	3	LCD	Linear	32V/3A x 2, (1.8/2.5/3.3/5.0V)/5A x 1 RS-232/USB(CDC)/LAN(Opt)/GPIB(Opt)	D48-51
32	3	212	GPP-4323	4	LCD	Linear	32V/3A x 2, 5V/1A x 1, 15V/1A x 1 RS-232/USB(CDC)/LAN(Opt)/GPIB(Opt)	D48-51
36	1.5	126	PPT-3615	3	LED	Linear	36V/1.5A x 2 6V/3A x1; GPIB	D45
80	40	800	PSB-2400L2	2	LED	Switching	80V/40A x 2 RS-232/USB/GPIB (Opt)	D27-30

## NON-PROGRAMMABLE & MULTIPLE CHENNEL DC POWER SUPPLY

Voltage(V)	Current(A)	Power (W)	Model	CH	Display	Technic	Remark	Page
30	6	375	SPD-3606	3	LED	Switching	30V/6A x 2; 5V/3A x 1	D52
30	6	375	GPC-3060D	3	LED	Linear	30V/6A x 2; 5V/3A x 1	D56
30	3	180	GPS-2303	3	LED	Linear	30V/3A x 2	D55
30	3	195	GPS-3303	3	LED	Linear	30V/3A x 2; 5V/3A x 1	D55
30	3	200	GPS-4303	4	LED	Linear	30V/3A x 2; 5V/1A x 1; 15V/1A x 1	D55
32	3	192	GPE-2323	2	LED	Linear	32V/3A x 2	D53-54
32	3	217	GPE-3323	3	LED	Linear	32V/3A x 2; 5V/5A x 1	D53-54
32	3	212	GPE-4323	4	LED	Linear	32V/3A x 2; 5V/1A x 1; 15V/1A x 1	D53-54
60	3	375	SPD-3606	3	LED	Switching	60V/3A x 2; 5V/3A x 1	D52
60	3	375	GPC-6030D	3	LED	Linear	60V/3A x 2; 5V/3A x 1	D56



# Fanless Multi-Range D.C. Power Supply



NEW

PFR-100L



NEW

PFR-100M



## FEATURES

- \* Constant Power Output for Fivefold Multi-Range(V&I) Operation
- \* Natural Convection Cooling Design (Fanless Structure)
- \* Preset Memory Function
- \* Output ON/OFF Delay Function
- \* CV, CC Priority Mode
- \* Adjustable Slew Rate For Voltage and Current
- \* Bleeder Circuit Control
- \* Protection : OVP, OCP, AC FAIL and OTP
- \* Support Front Panel and Rear Panel Output
- \* Built-in USB and RS-232/485 Interface
- Optional LAN+GPIB
- \* Web Server Monitoring and Control
- \* External Analog Control and Monitor Function
- \* Remote Sensing Function

Model	PFR-100L	PFR-100M
Output Channel	1	1
Output Voltage	0~ 50V	0~ 250V
Output Current	0~ 10A	0~ 2A
Rated Power	100W	100W

The PFR-100 series, a small and high-performance programmable D.C. power supply, adopts natural convection design to dissipate heat. The fanless structure allows users to focus on their experiments and tests in a quiet environment. Fanless power supply will not suck in dust and foreign objects, therefore, PFR-100 series has a longer life cycle compared with that of power supplies with fan.

The PFR-100 series is a power supply with a five-fold rated power that allows users to self-define voltage and current under rated power conditions so as to satisfy them with wider voltage and current operational ranges. PFR-100 series, with rated 100W, provides two models: PFR-100L- maximum output voltage of 50V (at 2A) or maximum output current of 10A (at 10V); PFR-100M- maximum output voltage of 250V (at 0.4A) or maximum output current of 2A (at 50V).

The PFR-100 series provides front and rear panel output terminals. The front panel output terminal helps users shorten test lead replacement time while conducting adjustment on front panel's function keys. The rear panel output terminal facilitates an easy wiring operation for rackmount assembly. 3U height, 70mm width and 2.5KG in weight have greatly elevated PFR-100 series portability. Furthermore, the multi-drop mode allows users to control up to 31 PFR-100 series without using switch/Hub that help users save the equipment cost.

The LAN interface for PFR-100 is Ethernet port. PFR-100 also has a built-in web server and intuitive user interface. Users, via general browsers including Internet Explorer, Mozilla Firefox or Android cellular phones, can monitor PFR-100's test and measurement anywhere. Users not only can remotely monitor PFR-100 via internet, but also remotely observe and adjust their operating PFR-100s in the lab from your home. The outputs of PFR-100 series can be monitored including OVP, OCP, UVL; and the system information can be checked such as unit's serial number, firmware edition and internet setting. Users can remotely adjust PFR-100 settings, including output voltage/current, the slew rate for voltage/current, Bleeder circuit control, OCP, delayed time for output voltage and Buzzer settings.

The PFR-100 series provides special functionalities to meet test requirements for different load's characteristics. The CC priority mode can be applied for DUTs with diode characteristics to prevent DUT from being damaged by inrush current. A slow rise time for voltage can also protect DUT from inrush current, especially for tests on capacitive load. When power is off or load is disconnected, the activation of Bleeder circuit control will allow the bleeder resistor to consume filter capacitor's electricity. Without the bleed resistor, power supply's filter capacitor may still have electricity that is a potential hazard. For automatic testing equipment systems, the bleeder resistor allows PFR-100 series to rapidly discharge to prepare itself for the next operation.

## SPECIFICATIONS

Model		PFR-100L	PFR-100M
<b>OUTPUT RATING</b>			
Rated Output Voltage		50V	250V
Rated Output Current		10A	2A
Rated Output Power		100W	100W
<b>REGULATION(CV)</b>			
Load Regulation (*2)		10mV	33mV
Line Regulation (*1)		3mV	5mV
<b>REGULATION(CC)</b>			
Load Regulation (*9)		10mA	3.2mA
Line Regulation (*1)		8mA	1.2mA
<b>RIPPLE &amp; NOISE (*3)</b>			
Vp-p (*4)		50mV	150mV
Vr.m.s. (*5)		4mV	15mV
A r.m.s.		10mA	2mA
<b>PROGRAMMING ACCURACY</b>			
Voltage	0.1% of setting +	40mV	200mV
Current	0.2% of setting +	20mA	2mA
<b>MEASUREMENT ACCURACY</b>			
Voltage	0.1% of reading +	40mV	200mV
Current	0.2% of reading +	20mA	2mA
<b>RESPONSE TIME</b>			
Rise Time (*6)	Rated load	50ms	100ms
Fall Time (*7)	Rated load	100ms	200ms
	No load	500ms	1000ms
Transient Response Time (*8)		1.5ms	2ms
<b>PROGRAMMING RESOLUTION</b>			
Voltage		2mV	10mV
Current		1mA	0.1mA
<b>MEASUREMENT RESOLUTION</b>			
Voltage		2mV	10mV
Current		1mA	0.1mA
<b>PROTECTION FUNCTION</b>			
Over Voltage Protection (OVP)	Setting range	5~55V	5~275V
Over Current Protection (OCP)	Setting range	1~11A	0.2~2.2A
Under Voltage Limit (UVL)	Setting range	0~52.5V	0~262.5V
Over Temperature Protection (OTP)	Operation	Turn the output off.	Turn the output off.
Low AC Input Protection (AC-Fail)	Operation	Turn the output off.	Turn the output off.
Power Limit (Power Limit)	Operation	Turn the output off.	Turn the output off.





## PFR-Series

### SPECIFICATIONS

Model		PFR-100L	PFR-100M
FRONT PANEL DISPLAY ACCURACY, 4 DIGITS			
Voltage	0.1% of reading +	40mV	200mV
Current	0.2% of reading +	20mA	2mA
ENVIRONMENT CONDITION			
Operaing Temperature		0 °C to 40 °C	
Storage Temperature		-20 °C to 70 °C	
Operating Humidity		20% to 80% RH; No condensation	
Storage Humidity		20% to 85% RH; No condensation	
REDBACK TEMP. COEFFICIENT(After A 30 Minute Warm-up)			
Voltage		100ppm/°C	
Current		200ppm/°C	
OTHER			
Analog Control		Yes	
Interface		USB, RS-232/RS-485; Factory option: LAN/GPIB	
AC Input		85~265VAC, 47~63Hz, single pahse	
DIMENSIONS & WEIGHT			
		70(W)x124(H)x300(D)mm; Approx. 2.5kg	

Note: \*1: At 85 ~ 132Vac or 170 ~ 265Vac, constant load.  
 \*2: From No-load to Full-load, constant input voltage. Measured at the sensing point in Remote Sense.  
 \*3: Measure with JEITA RC-9131B (1:1) probe  
 \*4: Measurement frequency bandwidth is 10Hz to 20MHz.  
 \*5: Measurement frequency bandwidth is 5Hz to 1MHz.  
 \*6: From 10%~90% of rated output voltage, with rated resistive load.  
 \*7: From 90%~10% of rated output voltage, with rated resistive load.  
 \*8: Time for output voltage to recover within 0.1% + 10mV of its rated output for a load change from 50 to 100% of its rated output current.  
 \*9: For load voltage change, equal to the unit voltage rating, constant input voltage.

### ORDERING INFORMATION

**PFR-100L** Fanless Multi-Range D.C. Power Supply  
**PFR-100M** Fanless Multi-Range D.C. Power Supply (European terminals provided only)

#### ACCESSORIES :

CD(User Manual, Programming manual) x 1, Power cord, GTL-134 test lead, Accessory Packages  
 GTL-104A test lead (for PFR-100L only), GTL-105A test lead (for PFR-100M only),  
 GTL-204A test lead (for PFR-100L European Type Jack Terminal)

#### OPTIONAL ACCESSORIES

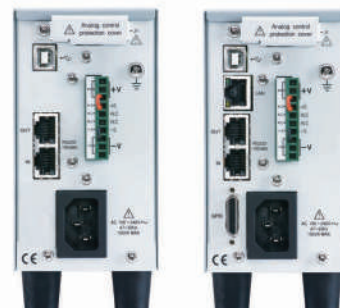
**GTL-258** GPIB Cable, 2000mm  
**PSU-232** RS-232 Cable with DB9 Connector Kit  
**PSU-485** RS-485 Cable with DB9 Connector Kit  
**GTL-246** USB Cable (USB 2.0 Type A-TypeB Cable)  
**GRA-431-J-100/200** Rack mount Kit(JIS)with AC 100V/200V  
**GRA-431-E-100/200** Rack mount Kit(EIA)with AC 100V/200V  
**PFR-GL** LAN+GPIB interface

PFR-100 Series Fanless Multi-Range D.C. Power Supply

**PFR-100□ - GL - GTL-258**

Model: L : 0-50V/10A/100W  
 M : 0-250V/2A/100W  
 Cable Options:  
 GTL-258 : A GPIB cable including 25 pins Micro-D connector  
 PSU-232 : An RS-232 cable including RJ-45 connector  
 PSU-485 : An RS-485 cable including RJ-45 connector  
 GTL-246 : A USB cable for TypeA-TypeB connectors  
 Interface Options:  
 □ : USB(Type B)& RS-232/RS-485(RJ-45 connector) as default  
 GL : LAN & GPIB(25 pins Micro-D connector)

### Rear Panel



### GRA-431-J/E Rack Mount Kit(JIS/EIA)

For : PFR-Series



### PSU-232 RS-232 Cable with DB9 Connector Kit



### PSU-485 RS-485 Cable with DB9 Connector Kit



### GTL-258 GPIB Cable, 2000mm



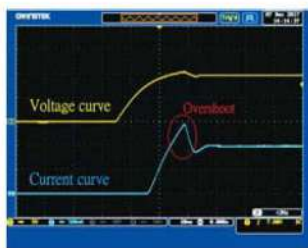
### GTL-134 Test Lead



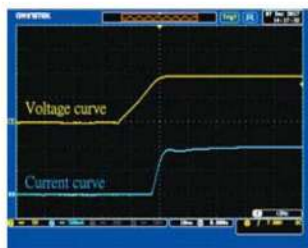


# Fanless Multi-Range D.C. Power Supply

## A. C.V/C.C PRIORITY MODE



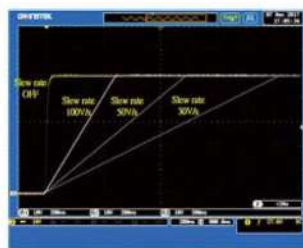
Under the conventional C.V mode, inrush current and surge voltage appeared at forward voltage ( $V_f$ ) of LED



Under C.C priority mode, inrush and surge voltage are effectively restrained.

Under the application conditions of diode load, conventional power supplies under the C.V priority mode will produce inrush current and surge voltage at turn-on. The PFR-100 series has C.V and C.C priority modes. The C.C priority mode can prevent inrush current and surge voltage from occurring at turn-on to protect DUT.

## B. ADJUSTABLE SLEW RATE



Adjustable Voltage Slew Rate

Voltage Slew Rate  
0.1V~100.0V/sec (PFR-100L)  
0.1V~500.0V/sec (PFR-100M)

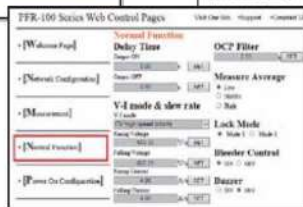
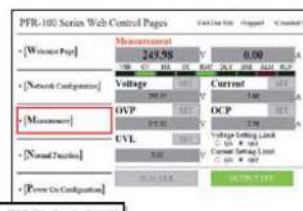


Adjustable Current Slew Rate

Current Slew Rate  
0.01A~20.00A/sec (PFR-100L)  
0.001A~4.000A/sec (PFR-100M)

The PFR-100 series can adjust slew rate for current and voltage. Via setting the rise and fall time of voltage and current, users can verify DUT's characteristics during voltage and current variation. Additionally, slew rate adjustment can mitigate voltage shift to effectively prevent DUT from being damaged by inrush current. This function is ideal for tests such as capacitive load and motor.

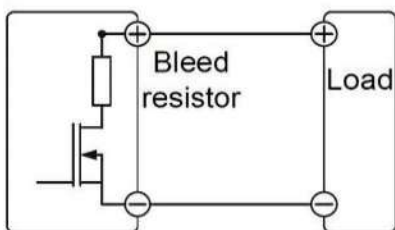
## C. WEB SERVER REMOTE CONTROL FUNCTION



Users, via general browsers including Internet Explorer, Mozilla Firefox or Android cellular phones, can monitor PFR-100's test and measurement anywhere. Users not only can remotely monitor PFR-100 via internet, but also remotely observe and adjust your operating PFR-100 in the lab from your home. The outputs of PFR-100 can be monitored including OVP, OCP, UVL; and system

information can be checked such as unit's serial number, firmware edition and internet setting. Users can remotely adjust PFR-100 settings, including output voltage/current, the slew rate for voltage/current, Bleed circuit control, OCP, delayed time for output voltage and Buzzer settings.

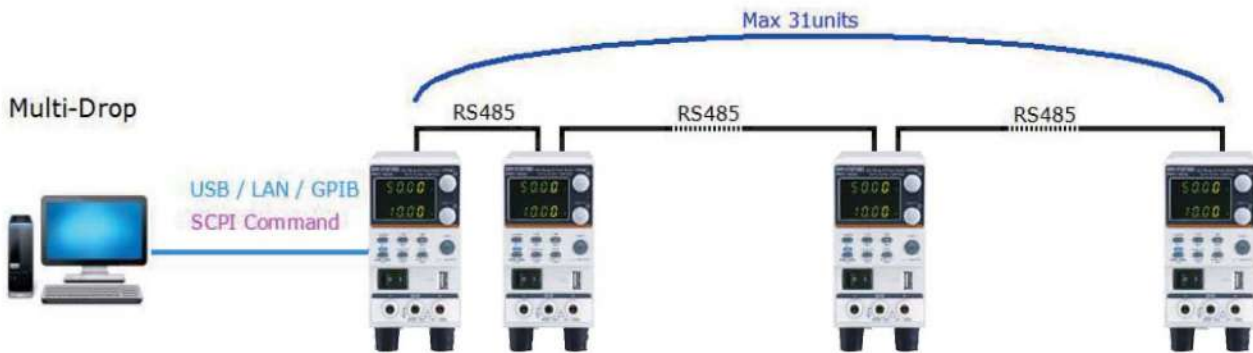
## D. BLEEDER CIRCUIT CONTROL



PFR-100 Series Bleeder Circuit

The PFR-100 series power supply has a bleeder circuit control which is in parallel with the output terminal. When power is off or load is disconnected, the bleed resistor will consume electricity from the filter capacitor. Without a bleed resistor, the filter capacitor of power could still be charged with electricity that poses a potential danger. In addition, for ATE system, bleed resistor allows the PFR-100 series to bleed current rapidly so as to prepare itself for the next operation.

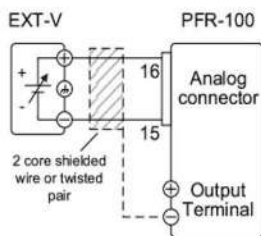
## E REMOTE PROGRAM CONTROL (UP TO 31 UNITS CONNECTION)



Provide USB, GPIB and LAN for PC to remote control Master PFR-100. RJ-45 connector on the rear panel can connect up to 31 units. LAN or USB remote control and augmenting slave

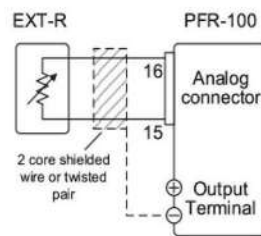
units by using the multi-drop mode will no longer need any switch/hub that can help customers save equipment costs.

## F EXTERNAL ANALOG CONTROL FUNCTION



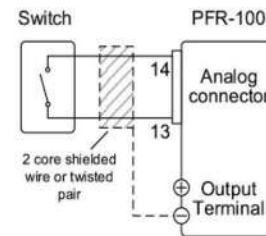
Pin16 → EXT-V (+)  
Pin15 → EXT-V (-)  
Wire shield → negative (-) output terminal

### External Voltage Controls Voltage Range



Pin16 → EXT-R  
Pin15 → EXT-R  
Wire shield → negative (-) output terminal

### External Resistance Controls Voltage Range



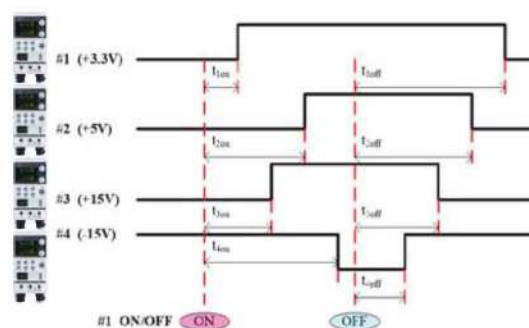
Pin14 → Switch  
Pin13 → Switch  
Wire shield → negative (-) output terminal

### External ON-OFF To Control Output, ON or OFF

The rear panel of the PFR-100 series has an analog control terminal. The external analog control interface allows external voltage or resistance to control voltage and current output; and allows power supply to output or to be turned on and off.

The diagram above shows typical connection methods for external control applications. For more detailed connection information please refer to user manual.

## G OUTPUT ON/OFF DELAY



### An Example of Output On/Off Delay Control Among Multiple Outputs of the PFR-100 units

The Output On/Off delay feature enables the setting of a specific time delay for output on after the power supply output is turned on, and a specific time delay for output off after the power supply output is turned off. When multiple PFR-100 units are used, the

On/Off delay time of each unit can be set respectively referring to fix time points. This multiple-output control can be done through the analog control terminal at rear panel or through the PC programming with standard commands.



# Low Noise D.C. Power Supply



PLR 20-18/36-10/60-6



PLR 20-36/36-20/60-12



## FEATURES

- \* Output Voltage Rating : 20V/36V/60V
- \* Output Power : 360W/720W
- \* Low Ripple and Noise(0.5mVrms/10mArms)
- \* Fast Transition Recovery Time(100μs)
- \* Equipped Power Factor Correction Circuit for AC-input 100~240VAC
- \* Maximum 2 units in Series Connections or 3 units in Parallel Connections
- \* Select the Setting Digits for Voltage and Current(Coarse/Fine Volume Control)
- \* Panel Lock Function/3 set of Preset Function
- \* Output Off Timer Function(Range : 1 min to 1000 hours & 59mins)
- \* CC Priority Function(Prevent Overshoot & Inrush Current)
- \* Sequence Function of PC Editing (Max. : 1000 steps/Min. step Period : 50ms)
- \* Protection : OVP, UVP, OCP, Remote Sensing(Terminal Open)
- \* External Analog Control Function
- \* PC Remote Interface : Standard : RS-232 ; Optional : GPIB/USB/LAN

GW Instek launches the new generation PLR-series programmable switching D.C. power supply. The single power output ranges are 360W and 720W. The series comprises 6 models and the voltage ranges are 20V, 36V and 60V. The PLR-series is a hybrid circuit design which incorporates front stage switching and rear stage linear architectures. The unique advantages of this design benefit from the combination of both switching and linear structures. The front stage switching structure can effectively reduce size and weight, and the rear stage linear structure can maintain lower ripple voltage, lower ripple current, and faster transient response.

The PLR-series features many functions, including three sets of user-defined Preset function; programmable automatic Output off timer function; programmable Sequence function; CV, CC priority activation functions (prevent overshoot and inrush current while output is turned on); External voltage and current output control and OVP, OCP and UVP functions. The above functions are built-in. Users do not have to pay for any extra costs.

The flexible allocation is one of the advantages of the PLR-series. For users require large output power, the PLR-series allows maximum 3 same model units in parallel connection to obtain larger output current, and maximum 2 same model units in series connection to obtain larger output voltage.

The PLR-series takes the consideration of the integration between its rack and other systems. Hence, the heat dissipation design adopts front air inlet and rear air outlet (there is no air outlet on the top, bottom, and on the both sides). The optional dedicated rack mount adapter (GRA-427) is for PLR-series to be rack mounted. Other equipment can be directly placed on top or under PLR-series to save rack space.

The PLR-series is equipped with RS-232 interface and also provides optional GPIB&USB (PLR-GU) and USB&LAN (PLR-LU). The program control of maximum 32 units can be realized by Local Bus no matter which interface is utilized. Additionally, the PLR-ARC interface not only provides external voltage and external resistance control but also meets the requirement of PLC control.

The PLR-series genuinely meets users' requirements of the new generation DC power supplies. The series, completely simplifying and expediting system development processes, is suitable for the R&D, design verification, and manufacturing of the semi-conductor equipment, automobile, component and communications industries.

## SPECIFICATIONS

	PLR 20-18	PLR 20-36	PLR 36-10	PLR 36-20	PLR 60-6	PLR 60-12
OUTPUT RATING						
Voltage	0V ~ 20V	0V ~ 20V	0V ~ 36V	0V ~ 36V	0V ~ 60V	0V ~ 60V
Current	0 ~ 18A	0 ~ 36A	0 ~ 10A	0 ~ 20A	0 ~ 6A	0 ~ 12A
Power	360W	720W	360W	720W	360W	720W
REGULATION (CV)						
Load	3mA	3mA	3.8mA	3.8mA	5mA	5mA
Line	2mA	2mA	2.8mA	2.8mA	4mA	4mA
REGULATION (CC)						
Load	5mA	5mA	5mA	5mA	5mA	5mA
Line	5mA	10mA	1mA	5mA	1mA	5mA
RIPPLE & NOISE (Noise Bandwidth=20MHz ; Ripple Bandwidth = 1MHz)						
CV p-p	30mVp-p	30mVp-p	30mVp-p	30mVp-p	30mVp-p	30mVp-p
CV rms	0.5mVrms	0.5mVrms	0.5mVrms	0.5mVrms	0.5mVrms	0.5mVrms
CC rms	10mA <sub>rms</sub>	10mA <sub>rms</sub>	5mA <sub>rms</sub>	10mA <sub>rms</sub>	5mA <sub>rms</sub>	10mA <sub>rms</sub>
READBACK ACCURACY (23°C±5°C, after 30 mins warm-up)						
Voltage	± (0.1%rdg+2digits)		± (0.1%rdg+2digits)		± (0.1%rdg+2digits)	
Current	± (0.5%rdg+2digits)		± (0.5%rdg+2digits)		± (0.5%rdg+2digits)	
Power	± (0.7%rdg+1.5%F.S.)		± (0.7%rdg+1.5%F.S.)		± (0.7%rdg+1.5%F.S.)	
SETTING ACCURACY (23°C±5°C, after 30 mins warm-up)						
Voltage	± (0.5%SET+0.5%F.S.)		± (0.5%SET+0.5%F.S.)		± (0.5%SET+0.5%F.S.)	
Current	± (1%SET+1%F.S.)		± (1%SET+1%F.S.)		± (1%SET+1%F.S.)	
RESPONSE TIME						
Raise Time (Output voltage: 10%→90%FS)	50ms/50ms: No load/ Rated load		50ms/50ms: No load/ Rated load		50ms/50ms: No load/ Rated load	
Fall Time(Full load) (Output voltage: 90%→10%FS)	50ms		50ms		150ms	
Fall Time(No load) (Output voltage: 90%→10%FS)	250ms		250ms		600ms	
Load Transient Recover Time (Load change from 50 to 100%)	100 μs		100 μs		100 μs	
SETTING RESOLUTION						
Voltage	10mV		10mV		10mV	
Current	10mA		10mA		10mA	
MEASUREMENT RESOLUTION						
Voltage	10mV		10mV		10mV	
Current	10mA		10mA		10mA	
SERIES AND PARALLEL CAPABILITY						
Parallel Operation	Up to 3 units		Up to 3 units		Up to 3 units	
Series Operation	Up to 2 units		Up to 2 units		Up to 2 units	



## PLR-Series

Rear Panel



### SPECIFICATIONS

	PLR 20-18	PLR 20-36	PLR 36-10	PLR 36-20	PLR 60-6	PLR 60-12
PPROTECTION FUNCTION						
OVP	Set range : 10% to 110% F.S. Set resolution: 10 times the minimum display resolution Activated when the output voltage exceeds the set OVP value : Hardware detection					
OCP	Set range : 5% to 110% F.S. Set resolution: 10 times of minimum display resolution Activated when the output current exceeds set OCP value : Software detection					
UVP	Set range : -1V to 110% F.S. Set resolution: 10 times the minimum display resolution Activated when the output voltage falls below the set UVP value : Software detection					
ENVIRONMENT CONDITION						
Operation Temp.	0℃ ~ 40℃					
Storage Temp.	- 20℃ ~ 60℃					
Operating Humidity	30% ~ 85% RH (No dew condensation)					
Storage Humidity	20% ~ 85% RH (No dew condensation)					
READ BACK TEMP. COEFFICIENT						
Voltage	±100ppm/℃					
Current	±100ppm/℃					
OTHER						
Power Consumption	570VA	1100VA	520VA	1050VA	510VA	1000VA
Power Factor	0.99	0.99	0.99	0.99	0.99	0.99
Cooling Method	Forced cooling : Fan speed proportionate to the temperature of the internal heat sink					
Power Source	Single-phase 100VAC to 240VAC, 50Hz to 60Hz					
Interface	Standard : RS-232C ; Optional : LAN/USB, GPIB/USB, External Analog Control					
Analog Control	Yes					
Dimension & Weight	PLR 20-18/PLR 36-10/PLR 60-6 : 139.5 (H) x 140(W) x 415.5(D); Approx. 5.2kg PLR 20-36/PLR 36-20/PLR 60-12 : 139.5 (H) x 210(W) x 415.5(D); Approx. 7.5kg					

### ORDERING INFORMATION

PLR 20-18	0~20V/0~18A/360W Low Noise DC Power Supply
PLR 20-36	0~20V/0~36A/720W Low Noise DC Power Supply
PLR 36-10	0~36V/0~10A/360W Low Noise DC Power Supply
PLR 36-20	0~36V/0~20A/720W Low Noise DC Power Supply
PLR 60-6	0~60V/0~6A/360W Low Noise DC Power Supply
PLR 60-12	0~60V/0~12A/720W Low Noise DC Power Supply

#### ACCESSORIES :

User Manual(CD) x 1, Power Cable x 1, Rear Output Terminal Cover x 1, Bolt set x 1(Hexagon head bolt P-3 x 2, Flat washer x 2, Hexagon nut x 2), Output grounding cable x 1, M4 Small Screw Washer x 1, M3 Small Screw Washer x 1, M3 Large Screw Washer x 2

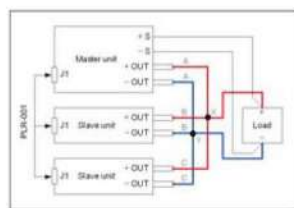
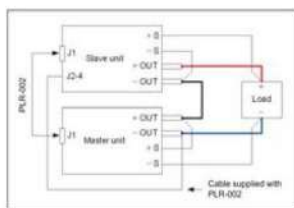
#### OPTIONAL ACCESSORIES

PLR-GU	GPIB/USB Interface Card
PLR-LU	LAN/USB Interface Card
PLR-ARC	External Analog Control Interface Card
PLR-001	Parallel Connection Signal Cable(2~3 units)
PLR-002	Series Connection Signal Cable
GRA-427	Rack Mount Kit (EIA+JIS)
GTL-246	USB Cable (1.2m)
GTL-248	GPIB Cable (2.0m)
GRJ-1101	Modular Cable (0.5m)
GRJ-1102	Modular Cable (1.5m)



# Low Noise D.C. Power Supply

## A. SERIES AND PARALLEL CONNECTIONS (Voltage and Current Allocation Chart for Series and Parallel Operation)



Series Connection Diagram

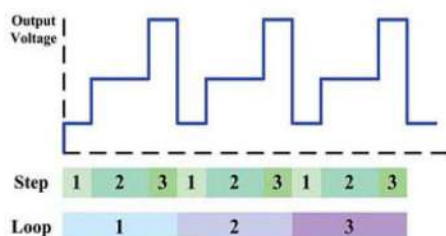
Parallel Connection Diagram

To bring up the overall output power, the PLR-series supports same model units to be arranged in series operation for the maximum 2 units or in parallel operation for maximum 3 units.

Unit	Model	PLR 20-18	PLR 20-36	PLR 36-10	PLR 36-20	PLR 60-6	PLR 60-12
Single Unit Voltage/Current Allocation		20V/18A	20V/36A	36V/10A	36V/20A	60V/6A	60V/12A
2 units in Series Operation Voltage/Current Allocation		40V/18A	40V/36A	72V/10A	72V/20A	120V/6A	120V/12A
2 units in Parallel Operation Voltage/Current Allocation		20V/36A	20V/72A	36V/20A	36V/40A	60V/12A	60V/24A
3 units in Parallel Operation Voltage/Current Allocation		20V/54A	20V/108A	36V/30A	36V/60A	60V/18A	60V/36A

The series is very suitable for the power supply applications on D.C. power supply modules, electronic parts and components, and wafer plating equipment.

## B. SEQUENCE FUNCTION



Example for the Sequence Operation

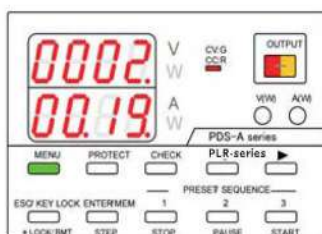
Before applying the sequence function, a series of different voltage, current and duration steps must be edited by a PC to make a sequence. CSV format, through RS-232C, LAN/USB (option) or GPIB/USB (option) interface, is transmitted to the memory of the PLR-series to sequentially execute steps consisting of voltage, current, and duration settings of the sequence. The shortest time for each step is 50ms and the maximum steps are 1000. The sequence function is to test DUT's response to the fast changing power supply that is one of the crucial verification items for electronic products' reliability tests.

## C. PRESET FUNCTION



The PLR-series provides three parameter preset function keys on the front panel and each preset memory consists of parameters of output voltage and output current settings. Users via storing frequently used voltage and current parameters from the front panel to quickly save and recall parameters.

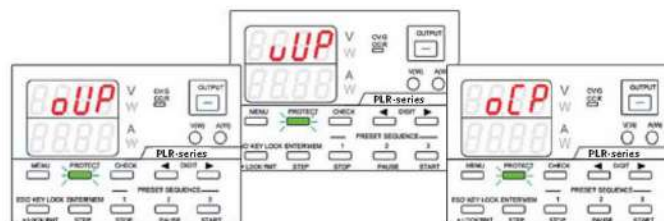
## D. OUTPUT OFF TIMER FUNCTION



Counting Down From 2hr and 20mins

The output off timer function is to set the PLR-series to automatically turn off its output after a certain period of time. The shortest time setting is 1 minute. The setting range is from 1 minute to the maximum 1000 hours and 59 minutes. This function can only be activated when power supply output is being turned on.

## E. OVP, OCP AND UVP FUNCTIONS

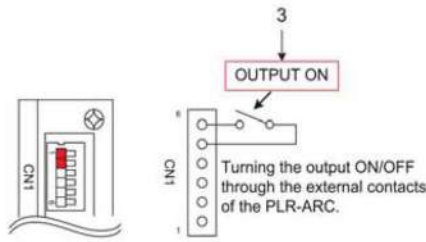


OVP (Over Voltage Protection) UVP (Under Voltage Protection) OCP (Over Current Protection)

When the voltage and current outputs exceed the preset conditions of OVP and OCP, the PLR-series will be shut down so as to prevent DUT from any damages.

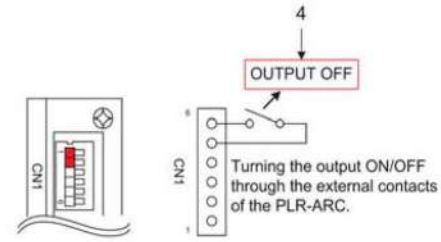
OCP : the setting range is 5%~110% of the rated output  
OVP : the setting range is 10%~110% of the rated output  
UVP : the setting range is 1V ~ 110% of the rated output

## F. EXTERNAL ANALOG CONTROL FUNCTION



Turning the Output on by External Analog Control Interface

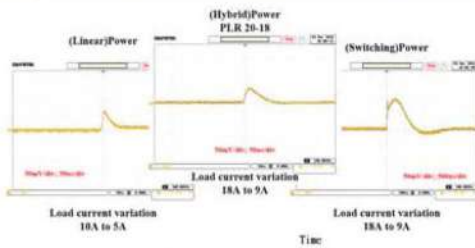
The rear panel of the PLR-series features analog control terminal which controls output voltage and current values through external voltage or resistance. The on and off of power supply output or main power disconnection can also



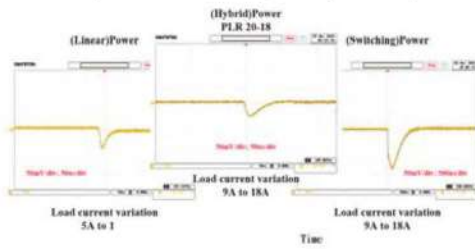
Turning the Output Off by External Analog Control Interface

be executed via external analog control interface. The above diagrams show the typical external analog control connection methods. For more connection information, please refer to the user manual.

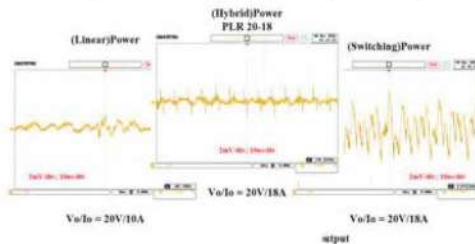
## G. COMPARISONS ON TRANSIENT RECOVERY TIME CHARACTERISTICS



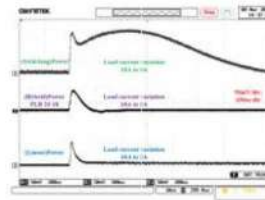
Comparison for Recovery Time ( $V_o = 20V$ )



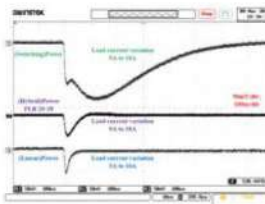
Comparison for Recovery Time ( $V_o = 20V$ )



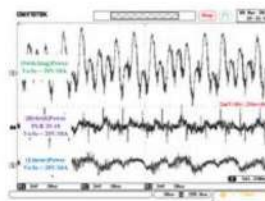
Ripple Comparison for Rating Power Output (Bandwidth : 1MHz)



Current Falling Comparison



Current Rising Comparison



The PLR-series has a fast transient recovery capability, which is ideal for applications of large load current changes. The above diagrams show the actual comparative results of transient response time under different techniques.

## H. FEATURE COMPARISONS

Operation	Linear Type Power Supply	PLR-series (Hybrid)	Switching Type Power Supply
Ripple & Noise for CV	0.35mVrms(Typ.)	$\leq 0.5mVrms$	7mVrms(Typ.)
Ripple & Noise for CC	< 2mArms(Typ.)	5mArms	72mArms(Typ.)
Recovery Time	< 50 $\mu s$ (Typ.)	$\leq 100\mu s$	1ms(Typ.)
Series & Parallel Operation	—	✓	✓
External Analog Control Interface	—	Opt.	Std.
Interfaces	Std. : RS-232/GPIB	Std. : RS-232/Local bus Opt. : LAN/USB or GPIB/USB	Std. : USB/LAN Opt. : USB to GPIB, USB to RS-232
Power	200W	360W	360W
Dimensions (mm)	230(W) × 140(H) × 380(D) △	140(W) × 124(H) × 364(D) ○	71(W) × 124(H) × 350(D) ◎
Weight	10 kg △	5.2 kg ○	3 kg ◎
CE Certificate	✓	✓	✓

◎ : Excellent  
○ : Good  
△ : Bad



# Programmable Switching D.C. Power Supply (Multi-Range D.C. Power Supply)



## PSW-Series



### FEATURES

- \* Voltage Rating : 30V/80V/160V/250V/800V, Output Power Rating : 360W~1080W
- \* Multi-range Voltage & Current Combinations in One Power Supply
- \* C.V/C.C Priority ; Particularly Suitable for the Battery and LED Industry
- \* Adjustable Slew Rate
- \* Series Operation(2 units in Series)for(30V/80V/160V), Parallel Operation(3 units in Parallel) for (30V/80V/160V/250V/800V)
- \* High Efficiency and High Power Density
- \* 1/2, 1/3, 1/6 Rack Mount Size Design ( EIA/JIS Standard ) for 360W, 720W, 1080W
- \* Standard Interface : LAN, USB, Analog Control Interface
- \* Optional Interface : GPIB-USB Adaptor, RS232-USB Cable
- \* LabVIEW Driver



**PSW 80-40.5** (0~80V, 0~40.5A, 1080W)



**PSW 160-7.2** (0~160V, 0~7.2A, 360W)



**PSW 80-13.5** (0~80V, 0~13.5A, 360W)

The PSW-Series is a single-output multi-range programmable switching DC Power Supply covering a power range up to 1080W. This series of products include fifteen models with the combination of 30V, 80V, 160V, 250V and 800V rated voltages and 360W, 720W and 1080W maximum output powers. The multi-range feature allows the flexible and efficient configuration of voltage and current within the rated power range. As the PSW-Series can be connected in series for maximum 2 units or in parallel for maximum 3 units, the capability of connecting multiple PSW-Series units for higher voltage or higher current output provides a broad coverage of applications. With the flexibility of multi-range power utilization and series/parallel connection, the PSW-Series significantly reduces the users' cost for various power supply products to accommodate the projects with different power requirements.

The C.V/C.C priority selection of the PSW-Series is a very useful feature for DUT protection. The conventional power supply normally operates under C.V mode when the power output is turned on. This could bring a high inrush current to the capacitive load or current-intensive load at the power output-on stage. Taking the I-V curve verification of LED as an example, it becomes a very challenging task to perform this measurement using a conventional power supply. With LED connected to a power supply under C.V mode as the initial setting, when the power output is turned on and the voltage rises to the LED forward voltage, the current will suddenly peak up and exceed the preset value of current limit. Upon detecting this high current, the power supply starts the transition from C.V mode to C.C mode. Though the current becomes stable after the C.C mode being activated, the current spike occurred at the C.V and C.C crossover point may possibly damage the DUT. At the power output-on stage, the PSW-Series is able to operate under C.C priority to limit the current spike occurred at the threshold voltage and therefore protects DUT from the inrush current damage.

The adjustable slew rate of the PSW-Series allows users to set for either output voltage or output current, a specific rise time from low to high level transition, and a specific fall time from high to low level transition. This facilitates the characteristic verification of a DUT during voltage or current level changes with controllable slew rates. Most manufacturing tests of lighting device or large capacitor during power output-on are associated with the occurrence of high surge current, which can greatly reduce the life time of the DUT. To prevent inrush current from damaging current-intensive devices, a smooth and slow voltage transition during power On-Off can significantly reduce the spike current and protect the device from high current damage.

The OVP and OCP are provided with the PSW-Series. Both OVP and OCP levels can be selected, with default level set at 110%, of the rated voltage/current of the power supply. When any of the protection levels is tripped, the power output will be switched off to protect the DUT. The PSW-Series provides USB Host/Device and LAN interfaces as standard, GPIB-USB adapter and RS232-USB cable as optional. The LabView driver and the Data Logging PC software are supported on all the available interfaces. An analog control/monitoring connector is also available on the rear panel for external control of power On/Off and external monitoring of power output Voltage and Current.

### PARALLEL OPERATION ( 3 UNITS )

MODEL	SINGLE UNIT	2 UNITS	3 UNITS
PSW 30-36	30V/36A	30V/72A	30V/108A
PSW 30-72	30V/72A	30V/144A	30V/216A
PSW 30-108	30V/108A	30V/216A	30V/324A
PSW 80-13.5	80V/13.5A	80V/27A	80V/40.5A
PSW 80-27	80V/27A	80V/54A	80V/81A
PSW 80-40.5	80V/40.5A	80V/81A	80V/121.5A
PSW 160-7.2	160V/7.2A	160V/14.4A	160V/21.6A
PSW 160-14.4	160V/14.4A	160V/28.8A	160V/43.2A
PSW 160-21.6	160V/21.6A	160V/43.2A	160V/64.8A
PSW 250-4.5	250V/4.5A	250V/9A	250V/13.5A
PSW 250-9	250V/9A	250V/18A	250V/27A
PSW 250-13.5	250V/13.5A	250V/27A	250V/40.5A
PSW 800-1.44	800V/1.44A	800V/2.88A	800V/4.32A
PSW 800-2.88	800V/2.88A	800V/5.76A	800V/8.64A
PSW 800-4.32	800V/4.32A	800V/8.64A	800V/12.96A

### SERIES OPERATION ( 2 UNITS )

MODEL	SINGLE UNIT	2 UNITS
PSW 30-36	30V/36A	60V/36A
PSW 30-72	30V/72A	60V/72A
PSW 30-108	30V/108A	60V/108A
PSW 80-13.5	80V/13.5A	160V/13.5A
PSW 80-27	80V/27A	160V/27A
PSW 80-40.5	80V/40.5A	160V/40.5A
PSW 160-7.2	160V/7.2A	320V/7.2A
PSW 160-14.4	160V/14.4A	320V/14.4A
PSW 160-21.6	160V/21.6A	320V/21.6A
PSW 250-4.5	N/A	N/A
PSW 250-9	N/A	N/A
PSW 250-13.5	N/A	N/A
PSW 800-1.44	N/A	N/A
PSW 800-2.88	N/A	N/A
PSW 800-4.32	N/A	N/A



SPECIFICATIONS									
	PSW 30-36	PSW 30-72	PSW 30-108	PSW 80-13.5	PSW 80-27	PSW 80-40.5	PSW 160-7.2	PSW 160-14.4	PSW 160-21.6
OUTPUT RATING									
Voltage	0 ~ 30V	0 ~ 30V	0 ~ 30V	0 ~ 80V	0 ~ 80V	0 ~ 80V	0 ~ 160V	0 ~ 160V	0 ~ 160V
Current	0 ~ 36A	0 ~ 72A	0 ~ 108A	0 ~ 13.5A	0 ~ 27A	0 ~ 40.5A	0 ~ 7.2A	0 ~ 14.4A	0 ~ 21.6A
Power	360W	720W	1080W	360W	720W	1080W	360W	720W	1080W
REGULATION(CV)									
Load	20mV	20mV	20mV	45mV	45mV	45mV	85mV	85mV	85mV
Line	18mV	18mV	18mV	43mV	43mV	43mV	83mV	83mV	83mV
REGULATION(CC)									
Load	41mA	77mA	113mA	18.5mA	32mA	45.5mA	12.2mA	19.4mA	26.6mA
Line	41mA	77mA	113mA	18.5mA	32mA	45.5mA	12.2mA	19.4mA	26.6mA
RIPPLE & NOISE (Noise Bandwidth 20MHz; Ripple Bandwidth=1MHz)									
CV p-p	60mV	80mV	100mV	60mV	80mV	100mV	60mV	80mV	100mV
CV rms	7mV	11mV	14mV	7mV	11mV	14mV	12mV	15mV	20mV
CC rms	72mA	144mA	216mA	27mA	54mA	81mA	15mA	30mA	45mA
PROGRAMMING ACCURACY									
Voltage	0.1% +10mV	0.1% +10mV	0.1% +10mV	0.1% +10mV	0.1% +10mV	0.1% +10mV	0.1% +100mV	0.1% +100mV	0.1% +100mV
Current	0.1% +30mA	0.1% +60mA	0.1% +100mA	0.1% +10mA	0.1% +30mA	0.1% +40mA	0.1% +5mA	0.1% +15mA	0.1% +20mA
MEASUREMENT ACCURACY									
Voltage	0.1% +10mV	0.1% +10mV	0.1% +10mV	0.1% +10mV	0.1% +10mV	0.1% +10mV	0.1% +100mV	0.1% +100mV	0.1% +100mV
Current	0.1% +30mA	0.1% +60mA	0.1% +100mA	0.1% +10mA	0.1% +30mA	0.1% +40mA	0.1% +5mA	0.1% +15mA	0.1% +20mA
RESPONSE TIME									
Raise Time	50ms	50ms	50ms	50ms	50ms	50ms	100ms	100ms	100ms
Fall Time(Full Load)	50ms	50ms	50ms	50ms	50ms	50ms	100ms	100ms	100ms
Fall Time(No Load)	500ms	500ms	500ms	500ms	500ms	500ms	1000ms	1000ms	1000ms
Load Transient Recover Time (Load change from 50~100%)	1ms	1ms	1ms	1ms	1ms	1ms	2ms	2ms	2ms
PROGRAMMING RESOLUTION (By PC Remote Control Mode)									
Voltage	1mV	1mV	1mV	2mV	2mV	2mV	3mV	3mV	3mV
Current	1mA	2mA	3mA	1mA	2mA	3mA	1mA	2mA	3mA
MEASUREMENT RESOLUTION (By PC Remote Control Mode)									
Voltage	1mV	1mV	1mV	2mV	2mV	2mV	3mV	3mV	3mV
Current	1mA	2mA	3mA	1mA	2mA	3mA	1mA	2mA	3mA
SERIES AND PARALLEL CAPABILITY									
Parallel Operation	Up to 3 units including the master unit								
Series Operation	Up to 2 units including the master unit								
PROTECTION FUNCTION									
OVP	3 ~ 33V	3 ~ 33V	3 ~ 33V	8 ~ 88V	8 ~ 88V	8 ~ 88V	16~ 176V	16 ~ 176V	16 ~ 176V
OCP	3.6 ~ 39.6A	5 ~ 79.2A	5 ~ 118.8A	1.35 ~ 14.85A	2.7 ~ 29.7A	4.05 ~ 44.55A	0.72 ~ 7.92A	1.44 ~ 15.84A	2.16 ~ 23.76A
OHP	Activated by elevated internal temperatures								
FRONT PANEL DISPLAY ACCURACY, 4 digits									
Voltage	0.1%±20mV	0.1%±20mV	0.1%±20mV	0.1%±20mV	0.1%±20mV	0.1%±20mV	0.1%±100mV	0.1%±100mV	0.1%±100mV
Current	0.1%±40mA	0.1%±70mA	0.1%±100mA	0.1%±20mA	0.1%±40mA	0.1%±50mA	0.1%±5mA	0.1%±30mA	0.1%±30mA
ENVIRONMENT CONDITION									
Operation Temp	0℃ ~ 50℃								
Storage Temp	-25℃ ~ 70℃								
Operating Humidity	20% ~ 85% RH; No condensation								
Storage Humidity	90% RH or Less; No condensation								
READ BACK TEMP COEFFICIENT									
Voltage	100ppm/℃ of rated output voltage : after a 30 minute warm-up								
Current	200ppm/℃ of rated output current : after a 30 minute warm-up								
OTHER									
Analog Control	Yes								
Interface	USB/LAN/GPIB-USB(Optional)/RS232-USB(Optional)								
Fan	With thermal sensing control								
POWER SOURCE	85VAC~265VAC, 47~63Hz, single phase								
DIMENSIONS & WEIGHT	71(W)x124(H)	142(W)x124(H)	214(W)x124(H)	71(W)x124(H)	142(W)x124(H)	214(W)x124(H)	71(W)x124(H)	142(W)x124(H)	214(W)x124(H)
	x350(D) mm ; Approx. 3kg	x350(D) mm ; Approx. 5.3kg	x350(D) mm ; Approx. 7.5kg	x350(D) mm ; Approx. 3kg	x350(D) mm ; Approx. 5.3kg	x350(D) mm ; Approx. 7.5kg	x350(D) mm ; Approx. 3kg	x350(D) mm ; Approx. 5.3kg	x350(D) mm ; Approx. 7.5kg

PSW-001 Accessory Kit



PSW-002 Simple IDC Tool



PSW-003 Contact Removal Tool



PSW-004 Basic Accessories Kit x 1 (for PSW 30V/80V/160V)





# Programmable Switching D.C. Power Supply (Multi-Range D.C. Power Supply)

SPECIFICATIONS						
	PSW 250-4.5	PSW 250-9	PSW 250-13.5	PSW 800-1.44	PSW 800-2.88	PSW 800-4.32
OUTPUT RATING						
Voltage	0 ~ 250V	0 ~ 250V	0 ~ 250V	0 ~ 800V	0 ~ 800V	0 ~ 800V
Current	0 ~ 4.5A	0 ~ 9A	0 ~ 13.5A	0 ~ 1.44A	0 ~ 2.88A	0 ~ 4.32A
Power	360W	720W	1080W	360W	720W	1080W
REGULATION(CV)						
Load	130mV	130mV	130mV	405mV	405mV	405mV
Line	128mV	128mV	128mV	403mV	403mV	403mV
REGULATION(CC)						
Load	9.5mA	14mA	18.5mA	6.44mA	7.88mA	9.32mA
Line	9.5mA	14mA	18.5mA	6.44mA	7.88mA	9.32mA
RIPPLE & NOISE (Noise Bandwidth 20MHz; Ripple Bandwidth=1MHz)						
CV p-p	80mV	100mV	120mV	150mV	200mV	200mV
CV rms	15mV	15mV	15mV	30mV	30mV	30mV
CC rms	10mA	20mA	30mA	5mA	10mA	15mA
PROGRAMMING ACCURACY						
Voltage	0.1%+200mV	0.1%+200mV	0.1%+200mV	0.1%+400mV	0.1%+400mV	0.1%+400mV
Current	0.1%+5mA	0.1%+10mA	0.1%+15mA	0.1%+2mA	0.1%+4mA	0.1%+6mA
MEASUREMENT ACCURACY						
Voltage	0.1%+200mV	0.1%+200mV	0.1%+200mV	0.1%+400mV	0.1%+400mV	0.1%+400mV
Current	0.1%+5mA	0.1%+10mA	0.1%+15mA	0.1%+2mA	0.1%+4mA	0.1%+6mA
RESPONSE TIME						
Raise Time	100ms	100ms	100ms	150ms	150ms	150ms
Fall Time(Full Load)	150ms	150ms	150ms	300ms	300ms	300ms
Fall Time(No Load)	1200ms	1200ms	1200ms	2000ms	2000ms	2000ms
Load Transient Recover Time (Load change from 50~100%)	2ms	2ms	2ms	2ms	2ms	2ms
PROGRAMMING RESOLUTION (By PC Remote Control Mode)						
Voltage	5mV	5mV	5mV	14mV	14mV	14mV
Current	1mA	1mA	1mA	1mA	1mA	1mA
MEASUREMENT RESOLUTION (By PC Remote Control Mode)						
Voltage	5mV	5mV	5mV	14mV	14mV	14mV
Current	1mA	1mA	1mA	1mA	1mA	1mA
SERIES AND PARALLEL CAPABILITY						
Parallel Operation	3	3	3	3	3	3
Series Operation	N/A	N/A	N/A	N/A	N/A	N/A
PROTECTION FUNCTION						
OVP	20 ~ 275V	20 ~ 275V	20 ~ 275V	20 ~ 880V	20 ~ 880V	20 ~ 880V
OCP	0.45 ~ 4.95A	0.9 ~ 9.9A	1.35 ~ 14.85A	0.144 ~ 1.584A	0.288 ~ 3.168A	0.432 ~ 4.752
OHP	Activated by elevated internal temperatures					
FRONT PANEL DISPLAY ACCURACY (4 digits)						
Voltage	0.1%±200mV	0.1%±200mV	0.1%±200mV	0.1%±400mV	0.1%±400mV	0.1%±400mV
Current	0.1%±5mA	0.1%±10mA	0.1%±20mA	0.1%±2mA	0.1%±4mA	0.1%±6mA
ENVIRONMENT CONDITION						
Operation Temp	0℃ ~ 50℃					
Storage Temp	-25℃ ~ 70℃					
Operating Humidity	20% ~ 85% RH; No condensation					
Storage Humidity	90% RH or Less; No condensation					
READ BACK TEMP COEFFICIENT						
Voltage	100ppm/℃ of rated output voltage : after a 30 minute warm-up					
Current	200ppm/℃ of rated output current : after a 30 minute warm-up					
OTHER						
Analog Control Interface	Yes					
Fan	USB/LAN/GPIB(Optional)					
POWER SOURCE	With thermal sensing control					
	85VAC~265VAC, 47~63Hz, single phase					
DIMENSIONS & WEIGHT	71(W)x124(H) x350(D) mm ; Approx. 3kg	142(W)x124(H) x350(D)mm ; Approx. 5.3kg	214(W)x124(H) x350(D) mm ; Approx. 7.5kg	71(W)x124(H) x350(D) mm ; Approx. 3kg	142(W)x124(H) x350(D) mm ; Approx. 5.3kg	214(W)x124(H) x350(D) mm ; Approx. 7.5kg

**PSW-005** Cable for 2 Units of PSW-Series in Series Mode Connection (for PSW 30V/80V/160V)



**PSW-006** Cable for 2 Units of PSW-Series in Parallel Mode Connection



**PSW-007** Cable for 3 Units of PSW-Series in Parallel Mode Connection



**PSW-008** Basic Accessories Kit (for PSW 250V/800V)





## PSW-Series

### ORDERING INFORMATION

PSW 30-36	(0~30V/0~36A/360W) Multi-Range DC Power Supply
PSW 30-72	(0~30V/0~72A/720W) Multi-Range DC Power Supply
PSW 30-108	(0~30V/0~108A/1080W) Multi-Range DC Power Supply
PSW 80-13.5	(0~80V/0~13.5A/360W) Multi-Range DC Power Supply
PSW 80-27	(0~80V/0~27A/720W) Multi-Range DC Power Supply
PSW 80-40.5	(0~80V/0~40.5A/1080W) Multi-Range DC Power Supply
PSW 160-7.2	(0~160V/0~7.2A/360W) Multi-Range DC Power Supply
PSW 160-14.4	(0~160V/0~14.4A/720W) Multi-Range DC Power Supply
PSW 160-21.6	(0~160V/0~21.6A/1080W) Multi-Range DC Power Supply
PSW 250-4.5	(0~250V/0~4.5A/360W) Multi-Range DC Power Supply
PSW 250-9	(0~250V/0~9A/720W) Multi-Range DC Power Supply
PSW 250-13.5	(0~250V/0~13.5A/1080W) Multi-Range DC Power Supply
PSW 800-1.44	(0~800V/0~1.44A/360W) Multi-Range DC Power Supply
PSW 800-2.88	(0~800V/0~2.88A/720W) Multi-Range DC Power Supply
PSW 800-4.32	(0~800V/0~4.32A/1080W) Multi-Range DC Power Supply

### ACCESSORIES

CD-ROM x 1 (Programming Manual, User Manual), GTL-123 Test Lead x 1 (for PSW 30V/80V/160V), Power Cord x 1 (Region dependent), GTL-240 USB Cable " L " Type x 1, PSW-004 Basic Accessories Kit x 1 (for PSW 30V/80V/160V), Includes : M4 Terminal screws and washers x 2, Air Filter x 1, Analog control protection dummy x 1, Analog control lock lever x 1, M8 terminal bolts, nuts and washers x 2,

PSW-008	Basic Accessories kit for PSW 250V/800V models
PSW-009	Output terminal cover for 30V/80V/160V models
PSW-011	Output terminal cover for 250V/800V models
PSW-012	High voltage output terminal for 250V/800V model

### OPTIONAL ACCESSORIES

PSW-001	Accessory Kit
PSW-002	Simple IDC Tool
PSW-003	Contact Removal Tool
PSW-005	Cable for 2 Units of PSW-Series in Series Mode Connection (for PSW 30V/80V/160V)
PSW-006	Cable for 2 Units of PSW-Series in Parallel Mode Connection
PSW-007	Cable for 3 Units of PSW-Series in Parallel Mode Connection
GUG-001	GPIO to USB Adaptor
GRA-410-J	Rack Mount Kit (JIS)
GRA-410-E	Rack Mount Kit (EIA)
GET-001	Extended Terminal with max. 30A (for PSW 30V/80V/160V)
GET-002	Extended Terminal with max. 10A (for PSW 250V/800V)
GET-005	Extended European Terminal with max. 20A (for PSW 30V/80V/160V)
GTL-130	Test lead : 2 x red, 2 x black (for PSW 250V/800V)
PSW-010	Large filter (Type II/III)
GTL-248	GPIO Cable, Double Shielded, 2000mm
GTL-250	GPIO Cable, Double Shielded, 600mm
CUR-001A	USB to RS-232 Cable, 300mm

### PSW-Series (LV) Rear Panel



### PSW-Series (HV) Rear Panel



### GRA-410-J/E Rack Mount Kit (JIS/EIA)

For : PSW-Series



### GTL-130 Test lead, 1200mm, 18AWG, UL 3239 (for PSW 250V/800V)



### GUR-001A USB to RS-232 Cable (for PSW-Series, 300mm)



### GUG-001 GPIO to USB Adaptor (for GDS-3000Series, PSW-Series)



### GET-001 Extended Terminal (for PSW 30V/80V/160V)



### GET-002 Extended Terminal (for PSW 250V/800V)



### GET-005 Extended European Terminal (for PSW 30V/80V/160V)





# Programmable Switching D.C. Power Supply



## PSU-Series



### FEATURES

- \* Voltage Output : 6V/12.5V/20V/40V/60V/100V/150V/300V/400V/600V
- \* Power Output : 1200W ~ 1560W
- \* C.V/C.C Priority Mode
- \* Adjustable Voltage/Current Rise and Fall Time
- \* Series/Parallel Connection : Max. 2 units (Models Under 300V)/4 units of The Same Model
- \* High Efficiency and High Power Density
- \* 1U Height and 19" Rack Mount Size
- \* Three sets of Preset Function
- \* Bleeder Control Function
- \* Internal Resistance Function
- \* Panel Lock Function
- \* Protection : OVP, OCP, OHP, UVL, AC Fail, FAN Fail
- \* Standard : USB, LAN, RS-232, RS-485, Analog Control
- \* Option : GPIB, Isolated Analog Interface (Voltage Control/Current Control)

GW Instek PSU-HV series has five models, including PSU 100-15, PSU 150-10, PSU 300-5, PSU 400-3.8, and PSU 600-2.6. The launch of PSU-HV is to complete the existing PSU series so as to satisfy high voltage application demands, allowing the augmented PSU-series to cover a voltage range from 6V to 600V. PSU-HV inherits the functional design and maintains the high power density characteristic and 1U height appearance of the PSU-LV series (PSU 6-200, PSU 12.5-120, PSU 20-76, PSU 40-38 and PSU 60-25). Furthermore, the original maximum output voltage of 60V is expanded to the maximum voltage of 600V and the maximum power of 1560 watts. The launch of the PSU-HV series augments the existing PSU-series to fully satisfy the extensive voltage demands of 1U power supply market and provides system integrators with more flexibilities and selections to conduct system integration. The introduction of the PSU-HV series has perfected the PSU product line, which satisfies the application requirements ranging from low voltage and large current to high voltage.

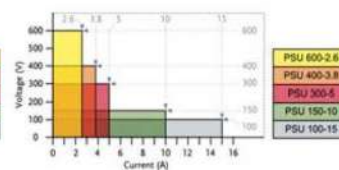
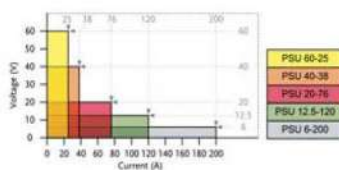
Utilizing same model units of the PSU-series to conduct series and parallel connections can increase total output power, total current or total voltage. The wide voltage and current output ranges of the PSU-series can fully satisfy various voltage and current measurement requirements. The PSU-series is a single power output DC programmable power supply, which outputs 1200W to 1560W. The PSU-series provides maximum 2 units in series connection (models under 300V) to achieve maximum 600V or 4 units in parallel connection to obtain maximum 800A and the maximum output power of 6.24 kilowatts.

The PSU-series allows settings for CC priority or CV priority. Under CC or CV mode, users can adjust slew rate for output voltage or current based upon test requirements. There are two kinds of slew rate settings: high speed priority and slew rate priority. High speed priority sets slew rate at the maximum speed to reach CC or CV mode. Slew rate priority allows users to set slew rate for CC or CV mode in order to control rise or fall slew rate. Slew rate priority mode is ideal for motor tests by adjusting the rise time of output voltage to protect DUT from being damaged by inrush current occurred at turn-on.

Comparing with other 1U power supplies available in the market, PSU supports a most complete array of interfaces, including USB, LAN, RS-232, RS-485, analog control interface, GPIB (option), isolated analog interface (voltage control), and isolated analog interface (current control). Via the multi-drop mode, PSU will not need any switch/hub and GPIB cable for remote control and slave unit augmentation when using LAN, USB or GPIB. This feature can help users save costs on augmentation equipment for connecting slave while using LAN or USB.

The new PSU-HV series is ideal for the primary input of DC/DC converter and servomotor production application. PSU is often integrated into component test systems such as aging test equipment for capacitors; 600V DC bias applications; aging test equipment for diode; semiconductor production equipment; automotive electronics; and ECU for V8 engine or V12 engine, etc.

The PSU-series provides users with flexible settings of High/Low Level or Trigger input /Trigger output signals with pulse width of 1 ~ 60ms. Trigger input controls PSU to output or upload preset voltage, current and memory parameters. While outputting or uploading preset voltage, current and memory parameters PSU can produce corresponding Trigger output signals.



Model name	Voltage Rating <sup>1</sup>	Current Rating <sup>2</sup>	Power
PSU 6-200	6V	200A	1200W
PSU 12.5-120	12.5V	120A	1500W
PSU 20-76	20V	76A	1520W
PSU 40-38	40V	38A	1520W
PSU 60-25	60V	25A	1500W
PSU 100-15	100V	15A	1500W
PSU 150-10	150V	10A	1500W
PSU 300-5	300V	5A	1500W
PSU 400-3.8	400V	3.8A	1520W
PSU 600-2.6	600V	2.6A	1560W

### 1U Handle & Bracket



- Note :
- \*1. Minimum voltage is guaranteed to maximum 0.2% of the rated output voltage.
  - \*2. Minimum current is guaranteed to maximum 0.4% of the rated output current.
  - \*3. At 85~132Vac or 170~265Vac, constant load.
  - \*4. From No-load to Full-load, constant input voltage.  
Measured at the sensing point in Remote Sense.
  - \*5. Measure with JEITA RC-9131B (1:1) probe.
  - \*6. Measurement frequency bandwidth is 10Hz~20MHz.
  - \*7. Measurement frequency bandwidth is 5Hz~1MHz.
  - \*8. From 10%~90% of rated output voltage, with rated resistive load.
  - \*9. From 90%~10% of rated output voltage, with rated resistive load.
  - \*10. Time for output voltage to recover within 0.5% of its rated output for a load change from 10~90% of its rated output current. Voltage set point from 10%~100% of rated output.
  - \*11. For load voltage change, equal to the unit voltage rating, constant input voltage.
  - \*12. For 6V model the ripple is measured at 2~6V output voltage and full output current.  
For other models, the ripple is measured at 10~100% output voltage and full output current.
  - \*13. At rated output power.



SPECIFICATIONS										
MODEL	PSU 6-200	PSU 12.5-120	PSU 20-76	PSU 40-38	PSU 60-25	PSU 100-15	PSU 150-10	PSU 300-5	PSU 400-3.8	PSU 600-2.6
OUTPUT RATINGS										
Rated Output Voltage (*1)	6V	12.5V	20V	40V	60V	100V	150V	300V	400V	600V
Rated Output Current (*2)	200A	120A	76A	38A	25A	15A	10A	5A	3.8A	2.6A
Rated Output Power	1200W	1500W	1520W	1520W	1500W	1500W	1500W	1500W	1520W	1560W
RIPPLE AND NOISE(*5)										
CVp-p( 10 ~ 20MHz) p-p (*6)	60mV	60mV	60mV	60mV	60mV	80mV	100mV	150mV	200mV	300mV
CVrms(5Hz ~ 1MHz) r.m.s. (*7)	8mV	8mV	8mV	8mV	8mV	8mV	10mV	25mV	40mV	60mV
CCrms(5Hz ~ 1MHz) r.m.s. (*12)	400mA	240mA	152mA	95mA	75mA	45mA	35mA	25mA	17mA	12mA
LOAD REGULATION										
Voltage(*4)	2.6mV	3.25mV	4mV	6mV	8mV	12mV	17mV	32mV	42mV	62mV
Current(*11)	45mA	29mA	20.2mA	12.6mA	10mA	8mA	7mA	6mA	5.76mA	5.52mA
LINE REGULATION										
Voltage(*3)	2.6mV	3.25mV	4mV	6mV	8mV	12mV	17mV	32mV	42mV	62mV
Current(*3)	22mA	14mA	9.6mA	5.8mA	4.5mA	3.5mA	3mA	2.5mA	2.38mA	2.26mA
ANALOG PROGRAMMING AND MONITORING										
External Voltage Control Output Voltage	Accuracy and linearity: ±0.5% of rated output voltage									
External Voltage Control Output Current	Accuracy and linearity: ±1% of rated output current									
External Resistor Control Output Voltage	Accuracy and linearity: ±1% of rated output voltage									
External Resistor Control Output Current	Accuracy and linearity: ±1.5% of rated output current									
Output Voltage Monitor	Accuracy: ±1%									
Output Current Monitor	Accuracy: ±1%									
Shutdown Control	Turns the output off with a LOW (0V to 0.5V) or short-circuit									
Output On/Off Control	Possible logic selections: Turn the output on using a LOW (0V to 0.5V) or short-circuit, turn the output off using a HIGH (4.5V to 5V) or open-circuit; Turn the output on using a HIGH (4.5V to 5V) or open-circuit, turn the output off using a LOW (0V to 0.5V) or short-circuit									
Alarm Clear Control	Clear alarms with a LOW (0V to 0.5V) or short-circuit									
CV/CC/ALM/PWR ON/OUT ON Indicator	Photocoupler open collector output; Maximum voltage 30V, maximum sink current 8mA									
Trigger Out	Maximum low level output = 0.8V; minimum high level output = 2V; Maximum source current = 8mA									
Trigger In	Maximum low level input voltage = 0.8V; minimum high level input vottage = 2V, Maximum sink current = 8mA									
FRONT PANEL										
Display, 4 digits, Voltage Accuracy 0.1%+ Current Accuracy 0.2%+	12mV 600mA	25mV 360mA	40mV 228mA	80mV 114mA	120mV 75mA	200mV 45mA	300mV 30mA	600mV 15mA	800mV 11.4mA	1200mV 7.8mA
Indications	GREEN LED's: CV, CC, V, A, VSR, ISR, DLY, RMT, LAN, M1, M2, M3, RUN, Output ON; RED LED's: ALM, ERR									
Buttons	Lock/Local(Unlock), PROT(ALM_CLR), Function(M1), Test(M2), Set(M3), Shift, Output									
Knobs	Voltage, Current									
USB Port	Type A USB connector									
Transient Response Time	1.5ms	1ms	1ms	1ms	1ms	1ms	2ms	2ms	2ms	2ms
OUTPUT RESPONSE TIME										
Rise Time(*8)	Rated load	80ms	80ms	80ms	80ms	80ms	150ms	150ms	150ms	200ms
	No load	80ms	80ms	80ms	80ms	80ms	150ms	150ms	150ms	250ms
Fall Time(*9)	Rated load	10ms	50ms	50ms	80ms	80ms	150ms	150ms	150ms	200ms
	No load	500ms	700ms	800ms	1000ms	1100ms	1500ms	2000ms	2500ms	3000ms
PROGRAMMING AND MEASUREMENTS (RS-232/485, USB, LAN, GPIB)										
Output Voltage Programming Accuracy	0.05%+	3mV	6.25mV	10mV	20mV	30mV	50mV	75mV	150mV	300mV
Output Current Programming Accuracy	0.2%+	200mA	120mA	76mA	38mA	25mA	15mA	10mA	5mA	3.8mA
Output Voltage Programming Resolution		0.2mV	0.4mV	0.7mV	1.3mV	2mV	3.4mV	5.2mV	10.2mV	20.4mV
Output Current Programming Resolution		6mA	4mA	2.5mA	1.2mA	0.8mA	0.5mA	0.34mA	0.19mA	0.09mA
Output Voltage Measurement Accuracy	0.1%+	6mV	12.5mV	20mV	40mV	60mV	100mV	150mV	300mV	600mV
Output Current Measurement Accuracy	0.2%+	400mA	240mA	152mA	76mA	50mA	30mA	20mA	10mA	7.6mA
Output Voltage Measurement Resolution		0.2mV	0.4mV	0.7mV	1.3mV	2mV	3.4mV	5.2mV	10.2mV	20.4mV
Output Current Measurement Resolution		6mA	4mA	2.5mA	1.2mA	0.8mA	0.5mA	0.34mA	0.19mA	0.09mA
TEMPERATURE COEFFICIENCE										
Voltage & Current	100ppm/°C after a 30 minute warm-up									
REMOTE SENSE COMPENSATION VOLTAGE(SINGLE WIRE)										
Voltage	1V	1V	1V	2V	3V	5V	5V	5V	5V	5V
PROTECTION FUNCTION										
Over Voltage Protection(OVP)	Setting Range	0.6~6.6V	1.25~13.75V	2~22V	4~44V	5~66V	5~110V	5~165V	5~330V	5~440V
	Setting Accuracy	60mV	125mV	200mV	400mV	600mV	1000mV	1500mV	3000mV	4000mV
Over Current Protection(OC)	Setting Range	5~220A	5~132A	5~83.6A	3.8~41.8A	2.5~27.5A	1.5~16.5A	1~11A	0.5~5.5A	0.38~4.18A
	Setting Accuracy	4000mA	2400mA	1520mA	760mA	500mA	300mA	200mA	100mA	76mA
Under Voltage Limit(UVL)	Setting Range	0~6.3V	0~13.12V	0~21V	0~42V	0~63V	0~105V	0~157.5V	0~315V	0~420V
Over Temperature Protection(OHP)	Operation	Turn the output off.								
Incorrect Sensing Connection Protection(SENSE)	Operation	Turn the output off.								
Low AC Input Protection (AC-FAIL)	Operation	Turn the output off.								
Shutdown (SD)	Operation	Turn the output off.								
Power Limit (POWER LIMIT)	Operation	Over power limit								
	Value (Fixed)	Approx. 105% of rated output power								
INTERFACE CAPABILITIES										
USB	TypeA: Host, TypeB: Slave, Speed: 1.1/2.0, USB Class: CDC(Communications Device Class)									
LAN	MAC Address, DNS IP Address, User Password, Gateway IP Address, Instrument IP Address, Subnet Mask									
RS-232 / RS-485	Complies with the EIA232D / EIA485 Specifications									
GPIB (Factory Option)	SCPI - 1993, IEEE 488.2 compliant interface									
ISOLATED ANALOG CONTROL INTERFACE (FACTORY OPTION)										
Voltage Control	Using 0-5V or 0-10V signals for programming and measurement									
Current Control	Using 4-20mA current signals for programming and measurement									
ENVIRONMENTAL CONDITIONS										
Operating Temperature	0°C ~ 50°C									
Storage Temperature	-25°C ~ 70°C									
Operating Humidity	20% ~ 85% RH; No condensation									
Storage Humidity	90% RH or less; No condensation									
Altitude	Maximum 2000m									
INPUT CHARACTERISTICS										
Nominal Input Rating	100Vac to 240Vac, 50Hz to 60Hz, single phase									
Input Voltage Range	85Vac ~ 265Vac									
Input Frequency Range	47Hz ~ 63Hz									
Maximum Input Current	100Vac/200Vac(A)	21/11								
Inrush Current		Less than 50A								
Maximum Input Power		2000VA								
Power Factor	100Vac/200Vac	0.99/0.98								
Hold-up Time		20ms or greater								
Efficiency (*13)	100Vac/200Vac(%)	76.5/78.5	82.0/85.0	83.0/86.0	84.0/87.0	84.0/87.0	84.0/87.0	84.0/87.0	84.0/87.0	84.0/87.0
DIMENSIONS & WEIGHT										
	423(W) × 43.6(H) × 447.2(D)mm, Approx. 8.7kg									



# Programmable Switching D.C. Power Supply

## Rear Panel



## PSU-Series

### ORDERING INFORMATION

<b>PSU 6-200</b>	1200W Programmable Switching DC Power Supply
<b>PSU 12.5-120</b>	1500W Programmable Switching DC Power Supply
<b>PSU 20-76</b>	1520W Programmable Switching DC Power Supply
<b>PSU 40-38</b>	1520W Programmable Switching DC Power Supply
<b>PSU 60-25</b>	1500W Programmable Switching DC Power Supply
<b>PSU 100-15</b>	1500W Programmable Switching DC Power Supply
<b>PSU 150-10</b>	1500W Programmable Switching DC Power Supply
<b>PSU 300-5</b>	1500W Programmable Switching DC Power Supply
<b>PSU 400-3.8</b>	1520W Programmable Switching DC Power Supply
<b>PSU 600-2.6</b>	1560W Programmable Switching DC Power Supply

#### ACCESSORIES :

CD-ROM x 1 (User Manual, Programming Manual), Output terminal cover x 1, Analog connector plug kit x 1, Output terminal M8 bolt set(6V~60V model), Input terminal cover x 1, 1U Handle(RoHS), 1U Bracket(LEFT, RoHS), 1U Bracket (RIGHT,RoHS), Power Cord(10A) provided for certain regions only

#### OPTIONAL ACCESSORIES

<b>PSU-01B</b>	Bus bar for 2 units in parallel connection	<b>GTL-246</b>	USB Cable, USB 2.0A-B Type Cable, 4P
<b>PSU-01C</b>	Cable for 2 units in parallel connection	<b>GRM-001</b>	Slide bracket 2pcs/set ,PSU option
<b>PSU-02B</b>	Bus bar for 3 units in parallel connection	<b>PSU-GPIB</b>	GPIB Interface card (factory option)
<b>PSU-02C</b>	Cable for 3 units in parallel connection	<b>GPW-001</b>	UL/CSA power cord 3m ,PSU option
<b>PSU-03B</b>	Bus bar for 4 units in parallel connection	<b>GPW-002</b>	VDE power cord 3m ,PSU option
<b>PSU-03C</b>	Cable for 4 units in parallel connection	<b>GPW-003</b>	PSE power cord 3m ,PSU option
<b>PSU-232</b>	RS232 Cable with DB9 connector kit	<b>PSU-ISO-I</b>	Isolate current remote control card(factory option)
<b>PSU-485</b>	RS485 Cable with DB9 connector kit	<b>PSU-ISO-V</b>	Isolate voltage remote control card(factory option)
<b>PSU-01A</b>	Joins a vertical stack of 2 PSU units together. 2U-sized handles x2, joining plates x2		
<b>PSU-02A</b>	Joins a vertical stack of 3 PSU units together. 3U-sized handles x2, joining plates x2		
<b>PSU-03A</b>	Joins a vertical stack of 4 PSU units together. 4U-sized handles x2, joining plates x2		

#### FREE DOWNLOAD

Driver LabView Driver

#### PSU-01B

Bus bar for 2 units in parallel connection



#### PSU-232

Rs232 Cable with DB9 connector kit



#### PSU-02C

Cable for 3 units in parallel connection



#### GPW-001

UL/CSA power cord 3m, PSU option



#### PSU-01A

Joins a vertical stack of 2 PSU units together. 2U-sized handles x2, joining plates x2



#### PSU-01C

Cable for 2 units in parallel connection



#### PSU-485

Rs485 Cable with DB9 connector kit



#### PSU-03B

Bus bar for 4 units in parallel connection



#### GPW-002

VDE power cord 3m, PSU option



#### PSU-02A

Joins a vertical stack of 3 PSU units together. 3U-sized handles x2, joining plates x2



#### PSU-02B

Bus bar for 3 units in parallel connection



#### GRM-001

Slide bracket 2pcs/set, PSU option



#### PSU-03C

Cable for 4 units in parallel connection



#### GPW-003

PSE power cord 3m, PSU option



#### PSU-03A

Joins a vertical stack of 4 PSU units together. 4U-sized handles x2, joining plates x2



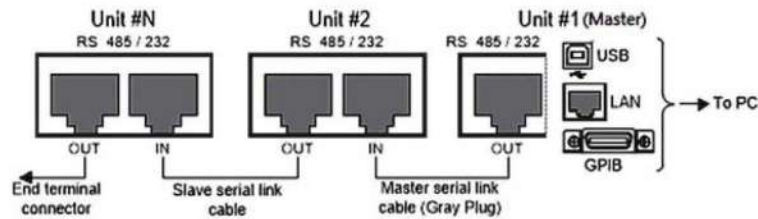
## A. SERIES/PARALLEL OPERATION AND HIGH POWER DENSITY

Series Connection	1 unit	2 units	Parallel connection	1 unit	2 units	3 units	4 units
Height of Sets	1U	2U	Height of Sets	1U	2U	3U	4U
PSU 6-200	6V	12V	PSU 6-200	6V	6V	6V	6V
	200A	200A		200A	400A	600A	800A
PSU 12.5-120	12.5V	25V	PSU 12.5-120	12.5V	12.5V	12.5V	12.5V
	120A	120A		120A	240A	360A	480A
PSU 20-76	20V	40V	PSU 20-76	20V	20V	20V	20V
	76A	76A		76A	152A	228A	304A
PSU 40-38	40V	80V	PSU 40-38	40V	40V	40V	40V
	38A	38A		38A	76A	114A	152A
PSU 60-25	60V	120V	PSU 60-25	60V	60V	60V	60V
	25A	25A		25A	50A	75A	100A
PSU 100-15	100V	200V	PSU 100-15	100V	100V	100V	100V
	15A	15A		15A	30A	45A	60A
PSU 150-10	150V	300V	PSU 150-10	150V	150V	150V	150V
	10A	10A		10A	20A	30A	40A
PSU 300-5	300V	600V	PSU 300-5	300V	300V	300V	300V
	5A	5A		5A	10A	15A	20A
PSU 400-3.8	400V	—	PSU 400-3.8	400V	400V	400V	400V
	3.8A	—		3.8A	7.6A	11.4A	15.2A
PSU 600-2.6	600V	—	PSU 600-2.6	600V	600V	600V	600V
	2.6A	—		2.6A	5.2A	7.8A	10.4A

Remark : 1U → 43.6mm

To augment output power, the PSU-series can realize two-fold rated power(models under 300V) via 2 same model units in series connection; and four-fold rated power via 4 same model units in parallel connection so as to satisfy customers with large voltage and large current requirements. 2U height units in series connection can achieve maximum 600V output. 4U height units in parallel connection can output maximum 800A and 6240W.

## B. REMOTE PROGRAM CONTROL (UP TO 31 UNITS CONNECTION)

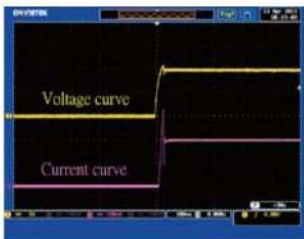


Provide RS-232, RS-485, USB, GPIB and LAN for PC to remote control Master PSU-Series. RJ-45 connector on the rear panel can connect up to 31 units.

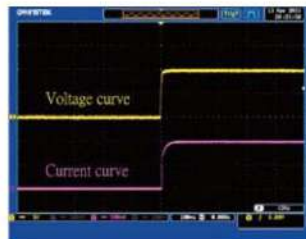
\* For the detailed information please refer to User Manual

LAN or USB remote control and augmenting slave units by using PSU-Series multi-drop mode will no longer need any switch/hub that can help customers save equipment costs.

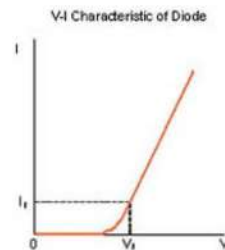
## C. C.V/C.C PRIORITY MODE



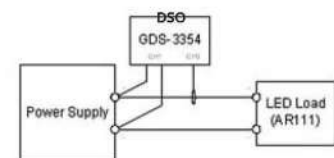
Under the conventional C.V mode, inrush current and surge voltage appeared at forward voltage( $V_f$ ) of LED.



Under C.C priority mode, inrush and surge voltage are effectively restrained.



V-I Characteristic of Diode



Using GDS-3354 DSO to Test LED Operation Under C.V Priority and C.C Priority Respectively

Conventional power supplies under the CV priority mode will produce inrush current and surge voltage at turn-on. The PSU-series has CV and CC priority modes.

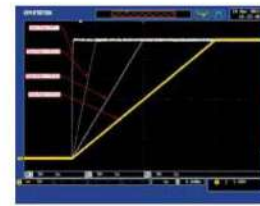
The CC priority mode can prevent inrush current and surge voltage from occurring at turn-on to protect DUT.



# Programmable Switching D.C. Power Supply

## D. ADJUSTABLE SLEW RATE

VOLTAGE SLEW RATE	CURRENT SLEW RATE
0.001V~0.06V/msec (PSU 6-200)	0.001A~2A/msec (PSU 6-200)
0.001V~0.125V/msec (PSU 12.5-120)	0.001A~1.2A/msec (PSU 12.5-120)
0.001V~0.2V/msec (PSU 20-76)	0.001A~0.76A/msec (PSU 20-76)
0.001V~0.4V/msec (PSU 40-38)	0.001A~0.38A/msec (PSU 40-38)
0.001V~0.6V/msec (PSU 60-25)	0.001A~0.25A/msec (PSU 60-25)
0.001V~1.000V/msec (PSU 100-15)	0.001A~0.150A/msec (PSU 100-15)
0.001V~1.500V/msec (PSU 150-10)	0.001A~0.100A/msec (PSU 150-10)
0.001V~1.500V/msec (PSU 300-5)	0.001A~0.025A/msec (PSU 300-5)
0.001V~2.000V/msec (PSU 400-3.8)	0.001A~0.008A/msec (PSU 400-3.8)
0.001V~2.400V/msec (PSU 600-2.6)	0.001A~0.006A/msec (PSU 600-2.6)



Adjustable Voltage Slew Rate

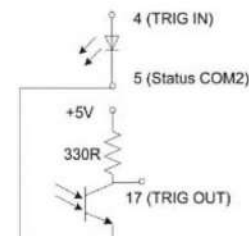
The PSU series can adjust slew rate for current and voltage. Via setting the rise and fall time of voltage and current, users can verify DUT's characteristics during voltage and current variation. Additionally, slew rate adjustment can mitigate voltage shift to effectively prevent DUT from being damaged by inrush current. This function is ideal for tests such as capacitive load and motor.

## E. OVP, OCP AND UVL

PSU-Series	OCP	OVP	UVL
6-200	5 ~ 220	0.6 ~ 6.6	0 ~ 6.3
12.5-120	5 ~ 132	1.25 ~ 13.75	0 ~ 13.12
20-76	5 ~ 83.6	2 ~ 22	0 ~ 21
40-38	3.8 ~ 41.8	4 ~ 44	0 ~ 42
60-25	2.5 ~ 27.5	5 ~ 66	0 ~ 63
100-15	1.5 ~ 16.5	5 ~ 110	0 ~ 105
150-10	1 ~ 11	5 ~ 165	0 ~ 157.5
300-5	0.5 ~ 5.5	5 ~ 330	0 ~ 315
400-3.8	0.38 ~ 4.18	5 ~ 440	0 ~ 420
600-2.6	0.26 ~ 2.86	5 ~ 660	0 ~ 630

Once the voltage or current output exceeds the preset level of OVP or OCP, PSU will shut down output to protect DUT. UVL is for users to set the minimum output voltage from the output terminal.

## F. TRIGGER CONTROL (TRIGGER INPUT/TRIGGER OUTPUT)



PSU-series provides users with complete trigger input and trigger output functions so as to flexibly control PSU-series. Each function is elaborated as follows.

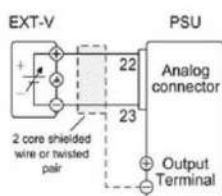
### Trigger Input function :

1. Allow users to set the effective pulse width from 0~60ms for trigger input (0: the LOW or HIGH signal of DC level for trigger input)
2. Receive trigger input to control PSU-series output or to output preset voltage and current.
3. Receive trigger input to upload preset memory parameters.

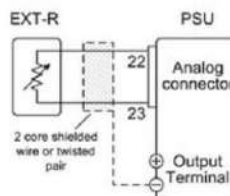
### Trigger Output function :

1. Allow users to set the effective pulse width from 0~60ms for trigger output (0: the LOW or HIGH signal of DC level for trigger output)
2. Set LOW or HIGH for output DC level
3. PSU produces trigger output signal when setting output or changing preset value or uploading preset memory parameters.

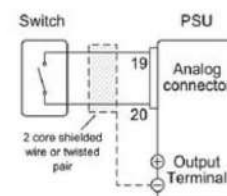
## G. EXTERNAL ANALOG CONTROL FUNCTION



- Pin23 → EXT-V (-)
- Pin22 → EXT-V (+)
- Wire shield → negative (-) output terminal



- Pin22 → EXT-R
- Pin23 → EXT-R
- Wire shield → negative (-) output terminal



- Pin19 → Switch
- Pin20 → Switch
- Wire shield → negative (-) output terminal

### External Voltage Controls Voltage Range

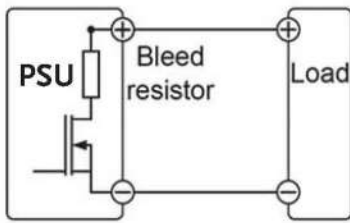
### External Resistance Controls Voltage Range

### External On-off to Control Output, on or off

The rear panel of the PSU-series has an analog control terminal. The external analog control interface allows external voltage or resistance to control voltage and current output; and allows power supply to output or to be turned on and off. The diagram on the upper shows typical connection methods for external control applications. For more detailed connection information please refers to user manual.



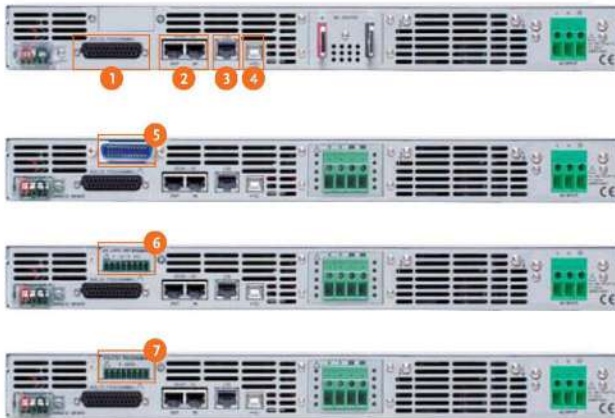
## H. BLEEDER CONTROL



PSU-Series Built-in Bleed Resistor

The PSU-Series employs a bleed resistor in parallel with the output terminal. Bleed resistor is designed to dispatch the power from the power supply filter capacitors when power is turned off or the load is disconnected. Without a bleed resistor, power terminal may remain charged on the filter capacitors for some time and be potentially hazardous. In addition, bleed resistor also allows for smoother voltage regulation of the power supply as the bleed resistor acts as a minimum voltage load. The bleed resistance can be turned on or off using the configuration setting.

## I. VARIOUS INTERFACES SUPPORT



1. Analog Control Interface
2. RS485/RS232 Interface for Remote Control
3. LAN Port for System Communication
4. USB Interface for Remote Control
5. GPIB Interface for Remote Control
6. Isolate Voltage Remote Control Card
7. Isolate Current Remote Control Card

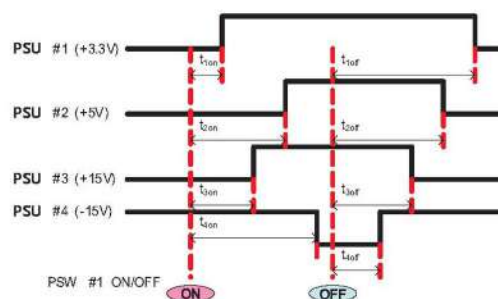
## J. USING THE RACK MOUNT KIT



Rack Mount Kit for PSU-Series EIA & JIS

The rack mount kit of the PSU-Series supports both EIA and JIS standards. A standard rack can accommodate one unit of the PSU-Series.

## K. OUTPUT ON / OFF DELAY



The Example of Output On/Off Delay Control Among Multiple Outputs of the PSU Units

The Output On/Off delay feature enables the setting of a specific time delay for output on after the power supply output is turned on, and a specific time delay for output off after the power supply output is turned off. When multiple PSU units are used, the On/Off

delay time of each unit can be set respectively referring to fix time points. This multiple-output control can be done through the analog control terminal at rear panel or through the PC programming with standard commands.



# Programmable Switching D.C. Power Supply (Multi-range D.C. Power Supply)



PSB-2400L2



PSB-2400L/PSB-2400H/  
PSB-2800L/PSB-2800H



PSB-2800LS



Note : PSB-2400H/PSB-2800H are not CE approved

## FEATURES

- \* Output Voltage Rating : 80V/800V, Output Power Rating : 400W ~ 800W
- \* Constant Power Output for Multi-Range (V & I) Operation
- \* Series and Parallel Operation (2 Units in Series or 4 Units in Parallel Maximum)
- \* 90 Degree Angle Rotatable Control Panel
- \* Sequence Function Edited by PC will be Controlled Through Power Supply Optional Interfaces
- \* Standard Interface : RS-232C/USB/Analog Control Interface
- \* Optional Interface : GPIB
- \* Preset Function (3 Points)
- \* LabVIEW Driver

The PSB-2000 Series is a high power density, programmable and multi-range output DC power supply. There are six models in the series including one power booster unit. The PSB-2000 Series has the output voltage of 0~80V and 0~800V, and the output power ranges of 0~400W and 0~800W. The multi-range output functionality facilitates flexible collocations of higher voltage and larger current under the rated power range. Both series and parallel connections can be applied to the PSB-2000 Series to fulfill the requirements of higher

The PSB-2000 Series provides three sets of preset function keys to memorize regularly used settings of voltage, current and power that users can recall rapidly. The sequence function, via RS232C, USB interface or optional GPIB interface, can connect with the computer to produce output power defined by sequence of a series of set voltage and current steps that are defined by the computer. This function is often used to establish a standard test procedure for the verification of the influence on DUTs done by the swiftly changing operating

The PSB-2000 Series protects over voltage and over current. The power supply output function will be shut down to protect DUTs while the protection mechanism is triggered to function. When conducting battery charging operation, the Hi-Ω mode of the PSB-2000 Series will prevent reverse current from damaging power supply.

The PSB-2000 Series provides analog control interfaces on the rear panel to control PSB-2000 Series output via the external voltage or to externally monitor voltage and current output status of power supply. The PSB-2000 Series panel can be rotated 90 degree angle suitable for vertical or horizontal position to accommodate the ideal space utilization.

## SERIES OPERATION

MODEL NUMBER	SINGLE UNIT	TWO UNITS
PSB-2400L	80V/40A	160V/40A
PSB-2800L	80V/80A	160V/80A
PSB-2800LS (Booster Unit for PSB-2800L Only)	N/A	N/A
PSB-2400L2	N/A	N/A
PSB-2400H	N/A	N/A
PSB-2800H	N/A	N/A

## PARALLEL OPERATION

MODEL NUMBER	SINGLE UNIT	TWO UNITS	THREE UNITS	FOUR UNITS
PSB-2400L	80V/40A	80V/80A	80V/120A	80V/160A
PSB-2800L	80V/80A	80V/160A	80V/240A	80V/320A
PSB-2800LS	N/A	80V/160A (PSB-2800L x 1 + PSB-2800LS x 1)	80V/240A (PSB-2800L x 1 + PSB-2800LS x 2)	N/A
PSB-2400L2	N/A	N/A	N/A	N/A
PSB-2400H	800V/3A	800V/6A	N/A	N/A
PSB-2800H	800V/6A	800V/12A	N/A	N/A

SPECIFICATIONS						
	PSB-2400L	PSB-2800L	PSB-2400L2	PSB-2400H	PSB-2800H	PSB-2800LS
OUTPUT RATING						
Voltage	0 ~ 80V	0 ~ 80V	0 ~ 80V x 2CH	0 ~ 800V	0 ~ 800V	80V
Current	0 ~ 40A	0 ~ 80A	0 ~ 40A x 2CH	0 ~ 3A	0 ~ 6A	80A
Power	400W	800W	800W	400W	800W	800W
REGULATION (CV)						
Load	0.01% ± 3mV of rated voltage			0.01% ± 30mV of rated voltage		N/A
Line	0.01% ± 2mV of rated voltage			0.01% ± 20mV of rated voltage		
REGULATION (CC)						
Load	0.02% ± 3mA of rated current			0.05% ± 15mA of rated current		N/A
Line	0.01% ± 2mA of rated current			0.05% ± 10mA of rated current		
RIPPLE & NOISE (Noise Bandwidth 20MHz ; Ripple Bandwidth=1MHz)						
CV p-p	90mV	150mV	90mV	250mV(only output voltage measures more than 1% of the rated voltage)	300mV(only output voltage measures more than 1% of the rated voltage)	N/A
CV rms	4mV	6mV	4mV	20mV(when current measures<2A) 35mV(when current measures>2A)	25mV(when current measures<2A) 40mV(when current measures>2A)	
CC rms	30mA	60mA	30mA	15mA	20mA	
PROGRAMMING ACCURACY						
Voltage	0.1% setting±2digits			0.1% setting±2digits		N/A
Current	0.2%setting±2digits			0.2% setting±2digits		
Power	± 10W			±10W (only output voltage measures more than 1% of rated voltage)		
READ BACK ACCURACY						
Voltage	0.2% reading±2digits			0.2% reading±2digits		N/A
Current	0.3% reading±2digits			0.3% reading±2digits		
Power	0.5% reading±5digits			0.5% reading±Vout x 40mA		
RESPONSE TIME						
Raise Time(Full load/No load)	50ms			200ms		N/A
Fall Time(Full load)	100ms			500ms		
Fall Time(No load)	500ms			1000ms		
Load Transient Recover Time (Load change from 50~100%)	1ms			7ms		
PROGRAMMING RESOLUTION						
Voltage	10mV			100mV		N/A
Current	10mA			10mA		
Power	10W			10W		
MEASUREMENT RESOLUTION						
Voltage	10mV			100mV		N/A
Current	10mA			10mA		
Power	10W			10W		
SERIES AND PARALLEL CAPABILITY						
Channel Number	1	1	2	1	1	For PSB-2800L Only
Series Operation	Up to 2 Units	Up to 2 Units	N/A	N/A	N/A	
Parallel Operation	Up to 4 Units	Up to 4 Units	N/A	Up to 2 Units	Up to 2 Units	
Parallel with booster PSB-2800LS	N/A	Up to 3 Units	N/A	N/A	N/A	
PPROTECTION FUNCTION						
OVP (Fixed)	Output off when 110% of rated voltage			Output off when output voltage exceeds 110% of rated voltage		N/A
OVP (Variable)	Output off when operating; Setting range:1V~84V with front panel			Presettable in range from 10V ~ 840V om front panel		
OCP (Fixed)	Output off when 110% of rated current			Output off when output voltage exceed 110% of rated current		
OCP (Variable)	Output off when operating;Setting range:1A~42A(84A for model number)			Presettable in range from 0.1A ~ 6.30A om front panel		
OHP	Output off above heat sink setting temperature			Output off at the internal heat sink temperature over setting value		
ENVIRONMENT CONDITION						
Operation Temp	0°C ~ 40°C					N/A
Storage Temp	-20°C ~ 70°C					
Operating Humidity	30% ~ 80% RH (no dew condensation)					
Storage Humidity	30% ~ 80% RH (no dew condensation)					
OTHER						
Inrush Current	35A Max	70A Max	70A Mmax	35A Max	70A Max	70A Max
Power Consumption/Factor	560VA/0.99	1120VA/0.99	1120VA/0.99	560VA/0.99	1120VA/0.99	1120VA/0.99
Cooling Method	Forced air-cooling with fan motor					
Power Source	100VAC ~ 240VAC, 50/60Hz, Single phase					
Interface (Standard)	RS-232C/USB					
Interface (Optional)	GPIB					
Analog Control	Yes					
DIMENSIONS & WEIGHT						
	210(W) x 124(H) x 290(D)mm					
	Approx.5kg	Approx.7kg	Approx.7kg	Approx. 5kg	Approx. 6kg	Approx. 7kg



# Programmable Switching D.C. Power Supply (Multi-range D.C. Power Supply)



**PSB-2400L2**



**PSB-2400L/PSB-2400H/  
PSB-2800L/PSB-2800H**



**PSB-2800LS**

Rear Panel



**PSB-003 Parallel Connection Kit for Horizontal Installation**



**PSB-004 Parallel Connection Kit for Vertical Installation**



## ORDERING INFORMATION

<b>PSB-2400L</b>	0~80V/0~40A/400W Multi-Range DC Power Supply
<b>PSB-2800L</b>	0~80V/0~80A/800W Multi-Range DC Power Supply
<b>PSB-2400L2</b>	0~80V x 2/0~40A x 2/800W Multi-Range DC Power Supply
<b>PSB-2400H</b>	0~800V/0~3A/400W Multi-Range DC Power Supply
<b>PSB-2800H</b>	0~800V/0~6A/800W Multi-Range DC Power Supply
<b>PSB-2800LS</b>	800W Slave (Booster) Unit For Current Extension Only

### ACCESSORIES :

User Manual (CD) x 1, AC Power Cord x 1, External Control Connector (26pin), Screws for output terminals on rear panel, Protection covers for output terminals on rear panel, Protection caps for output terminals on the front panel, GND Cable, USB Cable (For Model Number : PSB-2400L; PSB-2800L; PSB-2400L2; PSB-2400H; PSB-2800H) Local Bus (For Model Number : PSB-2400L; PSB-2800L; PSB-2400L2; PSB-2400H; PSB-2800H)

### OPTIONAL ACCESSORIES

<b>PSB-001</b>	GPIB Card	<b>GTL-246</b>	USB Cable
<b>PSB-003</b>	Parallel Connection Kit for Horizontal Installation. Kit Includes : (PSB-007 Joint Kit, Horizontal bus bar x 2, PSB-005 x1)	<b>GTL-248</b>	GPIB Cable
<b>PSB-004</b>	Parallel Connection Kit for Vertical Installation. Kit Includes : (PSB-007 Joint Kit, Vertical bus bar x 2, PSB-005 x 1)	<b>GRJ-1101</b>	Modular Cable
<b>PSB-005</b>	Parallel Connection Signal Cable	<b>GRA-424</b>	Rack Mount Kit
<b>PSB-006</b>	Series Connection Signal Cable		
<b>PSB-007</b>	Joint Kit : Includes 4 Joining Plates, (M3x6)screws x 4 ; (M3x8) screw x 2		
<b>PSB-008</b>	RS232C Cable (PSB-2000 Only)		

### FREE DOWNLOAD

Driver Labview Driver

**PSB-001 GPIB Control Board**



**GRJ-1101 Modular Cable**



**PSB-008 RS-232C Cable (PSB-2000 Only)**



**PSB-005 Parallel Connection Signal Cable**



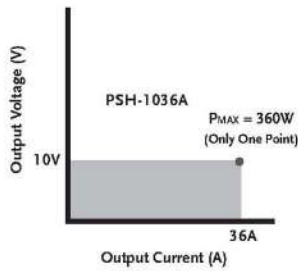
**PSB-006 Series Connection Signal Cable**



**PSB-007 Joint Kit**

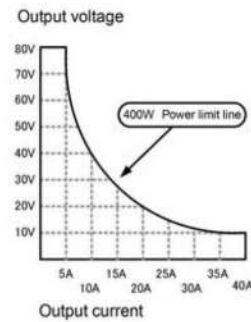


## A. MULTI-RANGE OUTPUT OPERATION



### The operation area of a Conventional Power Supply

Compared with the maximum power output of the conventional power supply that is calculated by the maximum output voltage multiplies by the maximum output current, the PSB-2000 series, defying the formula, has a unique characteristic of multi-range output (voltage and current). This distinguishing feature, under the same maximum power output range, can output a higher voltage with a smaller current and vice versa. For instance, for a conventional power supply with a maximum power output of 360W, the maximum voltage and current outputs are likely to be



### The operation area of a Multi-Range Power Supply for PSB-2000 Series

10V and 36A respectively. Comparatively, PSB-2400L, with the maximum power output of 400W, provides voltage and current output ranges of 0~80V and 0~40A. The maximum current of 5A will be provided when the voltage reaches 80V and the maximum voltage of 10V for the maximum current of 40A. PSB-2400L, breaking the limitation of  $P_{max}=V_{max} \times I_{max}$ , broadens voltage and current application ranges. The following diagrams illustrate the voltage and current comparison between the multi-range output power supply and the conventional power supply.

## B. PRODUCTS IN THE SERIES

There are six models in the PSB-2000 Series. Model type, output voltage, output current and output power are as follows :

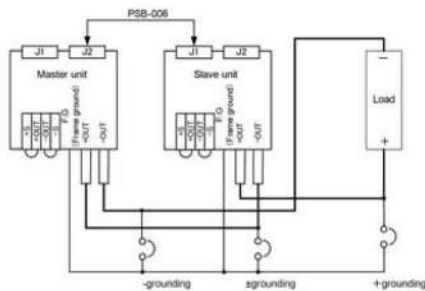
MODEL	PSB-2400L	PSB-2800L	PSB-2400L2	PSB-2400H	PSB-2800H	PSB-2800LS*
Channel Number	1	1	2	1	1	NA
Voltage Rating**	0 ~ 80V	0 ~ 80V	0 ~ 80V x 2CH	0 ~ 800V	0 ~ 800V	80V
Current Rating***	0 ~ 40A	0 ~ 80A	0 ~ 40A x 2CH	0 ~ 3A	0 ~ 6A	80A
Output Power (Max.)	400W	800W	800W	400W	800W	800W

\* PSB-2800LS, a booster unit acting as slave to extend current, can not operate alone. It must operate with PSB-2800L master.

\*\* The maximum current under the highest output voltage is power/voltage. For instance, when PSB-2400L outputs 80V the maximum current is  $400W/80V = 5A$ .

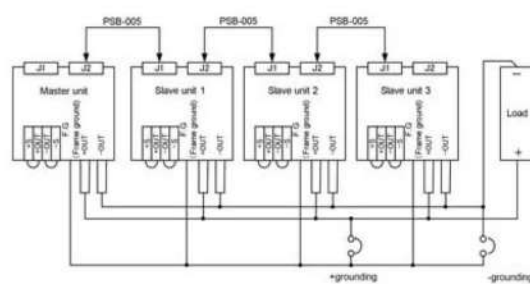
\*\*\* Same as above. When PSB2400L outputs 40A the highest voltage is  $400W/40A = 10V$ .

## C. SERIES AND PARALLEL CONNECTIONS



Series Connection

Hence, the PSB-2000 Series, with its multi-range output function and the power extension capability of series and parallel connections, is the high power density and high performance to cost ratio DC power supply, which provides



Parallel Connection

a wider range of power applications for any limited equipment space. The PSB-2000 Series is an ideal selection for testing DC power supply module, automobile lithium and lithium iron battery and electronic parts.



# Programmable Multi-Range D.C. Power Supply



## PSB-1000 Series



### FEATURES

- \* LCD Display and User-Friendly Menu-Typed Functional Interface
- \* Voltage Rating : 40V/160V, Output Power Rating : 400W/800W
- \* Constant Power Output for Multi-Range(V & I) Operation
- \* The I/V Control Functions(Adjustable Slew Rate) are Suitable for Diode Characteristic Load & Surge Reducing
- \* Sequence Function for Sequential D.C. Waveform Output
- \* C.V/C.C Priority
- \* Auto Run for Output or Sequence Function
- \* Master-Slave Operation : 2 Units in Series/ 4 Units in Parallel
- \* Synchronized Operation(Voltage Trigger, Trigger In/Trigger Out Signal)
- \* Standard Interface : USB Host, LAN; Option : GPIB
- \* Internal Sense Control(Disable/Front Panel/ Rear Panel)Function
- \* LabVIEW Driver

### PSB-106 Basic accessory kit :

M4 Terminal screws and washers x 2,  
M8 Terminal bolts, Nuts and washers x 2,  
Analog control protection dummy x 1,  
Analog control lock level x 2, Short bar x 1



PSB-1000 is a series of Multi-Range DC Power Supply, whose maximum voltage output of 320V can be realized by placing 2 sets of 160V units in series connection. By connecting 4 sets of PSB-1800L units in parallel, the maximum current output of 320A can be achieved.

The PSB-1000 series is a bench-top power supply featuring user friendly interface, which can clearly display setting conditions and measurement results via LCD display and menu-typed functionality selection without referring to the user manual. All settings can be done by functionality keys, numerical keys, and speed dial keys. The 30A output capability from the front output terminal of the PSB-1000 series can better meet the requirements of laboratories and scientific R&D departments.

The PSB-1000 series features user friendly menu-typed functionality interface and its built-in functionalities can better meet industry's application requirements. Both front panel and rear panel output terminals of the PSB-1000 series facilitate researchers to access power output conveniently. The display panel adopts menu-typed functionality selection to help users quickly familiarize with settings and operation that is extremely suitable for on-site engineers and R&D engineers who deal with complicated functional setting requirements. Power On Configuration allows users to select previously set SEQ to carry out automatic execution as soon as power is turned on. For production lines demanding sequential power supply output application requirements, tremendous time can be saved by this function, which exempts users from resetting sequential power supply when power is turned on every single time.

Voltage Trigger allows users to set pulse signals for leading edge threshold and trailing edge threshold. VOLT TRIG can be applied to Automatic test system by providing output time for working voltage via BNC adapter. The Output Delay function facilitates users to respectively set action time for power output on and power output off for multiple sets of PSB-1000 so as to realize sequential power output applications.

The PSB-1000 series is equipped with multi range power output capability providing fourfold rated power output to meet customers' flexible application requirements.

### SPECIFICATIONS

Model Name	PSB-1400L	PSB-1400M	PSB-1800L	PSB-1800M
OUTPUT RATING				
Output Voltage(V)	0~40	0~160	0~40	0~160
Output Current(A)	0~40	0~10	0~80	0~20
Output Power(W)	400W	400W	800W	800W
REGULATION (CV)				
Load Regulation (mV)	25	85	25	85
Line Regulation (mV)	23	83	23	83
REGULATION (CC)				
Load Regulation (mA)	45	15	85	25
Line Regulation (mA)	45	15	85	25
RIPPLE & NOISE (Noise Bandwidth 20MHz ; Ripple Bandwidth = 1MHz)				
CV p-p	60	60	80	80
CV rms	7	12	11	15
CC rms	80	20	160	40
PROGRAMMING ACCURACY				
Voltage (mV) 0.1% +	10	50	10	50
Current (mA) 0.1% +	20	10	40	20
MEASUREMENT ACCURACY				
Voltage (mV) 0.1% +	10	50	10	50
Current (mA) 0.1% +	20	10	40	20
RESPONSE TIME				
Raise Time (ms)	50	100	50	100
Fall Time(Full load) (ms)	50	150	50	150
Fall Time(No load) (ms)	500	1200	500	1200
Load Transient Recover Time(ms) (Load change from 50 to 100%)	1	1	1	1
PROGRAMMING RESOLUTION (By PC Remote Control Mode)				
Voltage (mV)	1	3	1	3
Current (mA)	1	1	2	1
MEASUREMENT RESOLUTION (By PC Remote Control Mode)				
Voltage (mV)	1	3	1	3
Current (mA)	1	1	2	1
SERIES AND PARALLEL CAPABILITY				
Parallel Operation	Up to 4 units including the master unit			
Series Operation	Up to 2 units including the master unit			
PPROTECTION FUNCTION				
OVP (V)	4-44	5-176	4-44	5-176
OCF (A)	4-44	1-11	5-88	2-22
OHP	Turn the output off.	Turn the output off.	Turn the output off.	Turn the output off.



## PSB-1000 Series

### SPECIFICATIONS

Model Name		PSB-1400L	PSB-1400M	PSB-1800L	PSB-1800M
FRONT PANEL DISPLAY ACCURACY (4 Digits)					
Voltage (mV)	0.1% +	20	100	20	100
Current (mA)	0.1% +	20	10	40	20
ENVIRONMENT CONDITION					
Operation Temp	0°C ~ 40°C				
Storage Temp	-25°C ~ 70°C				
Operating Humidity	20% ~ 85% RH; No condensation				
Storage Humidity	90% RH or less; No condensation				
OTHER					
Analog Control	Yes				
Interface	USB/LAN/GPIB(Optional)				
Power Source	100Vac ~ 240Vac, 50Hz ~ 60Hz, single phase				
Dimension	214(W)×124(H)×350(D) mm				
Weight					
		Approx. 5.2kg	Approx. 5.2kg	Approx. 6.8kg	Approx. 6.8kg

### ORDERING INFORMATION

<b>PSB-1400L</b>	40V/40A/400W Programmable Multi-Range D.C. Power Supply
<b>PSB-1400M</b>	160V/10A/400W Programmable Multi-Range D.C. Power Supply
<b>PSB-1800L</b>	40V/80A/800W Programmable Multi-Range D.C. Power Supply
<b>PSB-1800M</b>	160V/20A/800W Programmable Multi-Range D.C. Power Supply

#### ACCESSORIES :

CD ROM (User Manual, Programming Manual) x 1, Power cord for UL/CSA or PSE(Region dependent), Output terminal cover, Type A-B USB cable, PSB-106 Basic accessory kit : M4 terminal screws and washers x 2, M8 Terminal bolts, Nuts and washers x 2, Analog control protection dummy x 1, Analog control lock level x 2, Short bar x 1

#### OPTIONAL ACCESSORIES

<b>PSW-001</b>	Analog remote control connector kit
<b>PSW-002</b>	Simple IDC tool
<b>PSW-003</b>	Contact removal tool
<b>PSB-101</b>	Cable for 2 units of PSB-1000 in parallel connection
<b>PSB-102</b>	Cable for 3 units of PSB-1000 in parallel connection
<b>PSB-103</b>	Cable for 4 units of PSB-1000 in parallel connection
<b>PSB-104</b>	Cable for 2 units of PSB-1000 in series connection
<b>PSB-105</b>	GPIB card
<b>PSB-106</b>	Basic accessory kit : M4 Terminal screws and washers x 2, M8 Terminal bolts, Nuts and washers x 2, Analog control protection dummy x 1, Analog control lock level x 2, Short bar x 1
<b>GRA-418-J</b>	Rack Mount Kit(JIS)
<b>GRA-418-E</b>	Rack Mount Kit(EIA)
<b>GTL-123</b>	Test leads:1x red,1x black

#### FREE DOWNLOAD

Driver	Labview Driver
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### Rear Panel



**PSB-101** Cable for 2 units of PSB-1000 in parallel connection



**PSB-102** Cable for 3 units of PSB-1000 in parallel connection



**PSB-103** Cable for 4 units of PSB-1000 in parallel connection



**PSB-104** Cable for 2 units of PSB-1000 in series connection





# Programmable Switching D.C. Power Supply



## PSH-Series



### FEATURES

- \* Wide Input Voltage Range and High Power Factor (P.F)
- \* High Efficiency and High Power Density
- \* Constant Voltage and Constant Current Operation
- \* Over Voltage , Over Current and Over Temperature Protection
- \* Self-Test and Software Calibration
- \* Output ON/OFF Control
- \* Low Ripple and Noise
- \* LCD Display
- \* Built-in Buzzer Alarm
- \* Standard Interface : RS-232C
- \* Optional Interface : GPIB ( IEEE-488.2 )
- \* LabVIEW Driver

The PSH-Series is a single output from 360W to 1080W, programmable switching DC power supply. OVP, OCP and OTP protect the power supply and loads from unexpected conditions. Remote sensing adds an extra level of precision by compensating cable losses between loads. The bright LCD with simultaneous parameter outputs allows effortless operation. Self-test and software calibration features also reduce maintenance overhead. SCPI commands and LabVIEW driver access through the RS-232C or the optional GPIB interface allow remote control and ATE software development capability. Modular architecture, dedicated rear-panel output, and the 19 inch 4U rack mounting option ensure that the PSH-Series is optimized for large systems.

SPECIFICATIONS				
	PSH-2018A	PSH-3610A	PSH-3620A	PSH-3630A
OUTPUT				
Voltage	20V	36V	36V	36V
Current	18A	10A	20A	30A
REGULATION ( C.V. )				
Load	≤ 0.1%+5mV	≤ 0.1%+5mV	≤ 0.1%+5mV	≤ 0.1%+5mV
Line	≤ 0.05%+5mV	≤ 0.05%+5mV	≤ 0.05%+5mV	≤ 0.05%+5mV
REGULATION ( C.C. )				
Load	≤ 0.2%+5mA	≤ 0.2%+5mA	≤ 0.2%+10mA	≤ 0.2%+15mA
Line	≤ 0.2%+5mA	≤ 0.2%+5mA	≤ 0.2%+10mA	≤ 0.2%+15mA
RIPPLE & NOISE				
Voltage (mVrms)	≤ 10mVrms	≤ 10mVrms	≤ 10mVrms	≤ 10mVrms
Voltage (mVp-p)	≤ 100mVp-p	≤ 100mVp-p	≤ 100mVp-p	≤ 100mVp-p
	20Hz~20MHz	20Hz~20MHz	20Hz~20MHz	20Hz~20MHz
Current (mArms)	≤ 0.2%	≤ 0.2%	≤ 0.2%+20mA	≤ 0.2%+40mA
RESOLUTION				
Voltage	10mV	10mV	10mV	10mV
Current	10mA	10mA	10mA	10mA
PROGRAM ACCURACY				
Voltage	≤ 0.05%+25mV	≤ 0.05%+25mV	≤ 0.05%+25mV	≤ 0.05%+25mV
Current	≤ 0.2%+30mA	≤ 0.2%+30mA	≤ 0.2%+30mA	≤ 0.2%+30mA
REDABACK RESOLUTION (Meter)				
Voltage	Same as Resolution	Same as Resolution	Same as Resolution	As Resolution
Current	Same as Resolution	Same as Resolution	Same as Resolution	As Resolution
REDABACK ACCURACY (Meter)				
Voltage	Same as Program Accuracy	Same as Program Accuracy	Same as Program Accuracy	As Program Accuracy
Current	Same as Program Accuracy	Same as Program Accuracy	Same as Program Accuracy	As Program Accuracy
REDABACK TEMP. COEFFICIENT				
Voltage (25 ±5℃)	≤ 100ppm/℃	≤ 100ppm/℃	≤ 100ppm/℃	≤ 100ppm/℃
RESPONSE (Rise/Fall) TIME				
Voltage Up (10%~90%)	≤ 150mS	≤ 150mS	≤ 150mS	≤ 150mS
	(≤95% rating load)	(≤95% rating load)	(≤95% rating load)	(≤95% rating load)
Voltage Down (90%~10%)	≤ 150mS	≤ 150mS	≤ 150mS	≤ 150mS
	(≥10% rating load)	(≥10% rating load)	(≥10% rating load)	(≥10% rating load)
RECOVERY TIME ( 50% Step Load Change From 25%~75% )				
CV Mode	≤ 2mS	≤ 2mS	≤ 2mS	≤ 2mS
PROTECTION				
OVP/OCP/OTP	✓	✓	✓	✓
Rush Current	✓	✓	✓	✓
OUTPUT ON/OFF CONTROL				
	✓	✓	✓	✓
INTERFACE				
Standard : RS-232C; Optional : GPIB				
POWER SOURCE				
AC90V~250V, 50/60Hz				
DIMENSIONS & WEIGHT				
	108(W)x142(H)x393(D) mm; Approx. 3.3kg	108(W)x142(H)x393(D) mm; Approx. 3.3kg	188(W)x142(H)x393(D) mm; Approx. 6.2kg	268(W)x142(H)x393(D) mm; Approx. 9.3kg

### Rear Panel



### ORDERING INFORMATION

PSH-2018A	360W Programmable Switching D.C. Power Supply
PSH-3610A	360W Programmable Switching D.C. Power Supply
PSH-3620A	720W Programmable Switching D.C. Power Supply
PSH-3630A	1080W Programmable Switching D.C. Power Supply

ACCESSORIES :  
User manual x 1 , Power cord x 1

#### OPTION

Opt. 01: GPIB Interface ( Factory Installed)

#### OPTIONAL ACCESSORIES

GRA-403	Rack Mount Kit
GTL-232	RS-232C Cable, 9-pin Female to 9-pin, null Modem for Computer
GTL-122	Test Lead, U-type to Alligator Test Lead, Max. Current 40A, 1200mm
GTL-248	GPIB Cable, Double Shielded, 2000mm

#### FREE DOWNLOAD

PC Software	PC Software including Data Log ; Remote Control Software
Driver	Labview Driver

Note : When Opt.01 GPIB interface is ordered, the standard interface RS-232C will be deleted.

# Programmable Switching D.C. Power Supply



## PSP-603/405/2010



### FEATURES

- \* LCD Display
- \* Output ON/OFF Control
- \* 3 Step Fan Speed Control
- \* Voltage/Current/Power Setting
- \* Key Lock to Avoid Error Operation
- \* Normal, +% & -% Output Operation Key
- \* Standard Interface : RS-232C
- \* Optional European Type Jack Terminal

### European Type Jack Terminal



### Rear Panel



The PSP-Series is a single output, 200W, programmable switching DC power supply. OVL, OCL, OTP, and OPL protect the PSP-Series and its loads from unexpected conditions. The PSP-Series has a large LCD panel with output and parameter views and a key lock feature to prevent changing the settings. The PSP-Series is suitable for generic bench-top applications in laboratories and educational institutions.

SPECIFICATIONS			
OUTPUT			
Model	PSP-603	PSP-405	PSP-2010
Voltage	0 ~ 60V	0 ~ 40V	0 ~ 20V
Current	0 ~ 3.5A	0 ~ 5A	0 ~ 10A
VOLTAGE REGULATION			
Load	≤ 10mV	≤ 10mV	≤ 10mV
Line	≤ 0.05%	≤ 0.05%	≤ 0.05%
CURRENT REGULATION			
Load	≤ 5mA	≤ 5mA	≤ 5mA
Line	≤ 0.05%	≤ 0.05%	≤ 0.05%
RIPPLE			
Voltage (mVrms)	≤ 20mV	≤ 20mV	≤ 20mV
Current (mA rms)	≤ 10mA	≤ 10mA	≤ 10mA
RESOLUTION			
Voltage	20mV	10mV	10mV
Current	10mA	10mA	10mA
PROGRAM ACCURACY			
Voltage	± 0.05%rdg ± 4digits	± 0.05%rdg ± 3digits	± 0.05%rdg ± 3digits
Current	± 0.1%rdg ± 5digits	± 0.1%rdg ± 5digits	± 0.3%rdg ± 10digits
REARBACK (METER) RESOLUTION			
Voltage	Same as Resolution	Same as Resolution	Same as Resolution
Current	Same as Resolution	Same as Resolution	Same as Resolution
REARBACK (METER) ACCURACY			
Voltage	Same as Program Accuracy	Same as Program Accuracy	Same as Program Accuracy
Current	Same as Program Accuracy	Same as Program Accuracy	Same as Program Accuracy
PROTECTION			
OVL/OCL/OPL/OTP	✓	✓	✓
OUTPUT ON/OFF CONTROL			
	✓	✓	✓
DISPLAY			
LCD			
INTERFACE (STANDARD)			
RS-232C			
POWER SOURCE			
AC 115V±10%, AC 230V±15%, 50/60Hz			
DIMENSIONS & WEIGHT			
225 (W) x 100 (H) x 305 (D) mm ; Approx. 4kg			

### ORDERING INFORMATION

- PSP-603 200W Programmable Switching DC Power Supply  
 PSP-405 200W Programmable Switching DC Power Supply  
 PSP-2010 200W Programmable Switching DC Power Supply

#### ACCESSORIES :

User manual x 1, Power cord x 1, Test lead GTL-104A x 1, European test lead GTL-204A x 1

#### OPTIONAL ACCESSORIES

- GTL-232A RS-232C Cable  
 GRA-428 Rack Mount Kit, 19", 3U Size

#### FREE DOWNLOAD

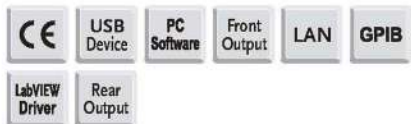
PC Software RS-232C Remote Control Software



# Programmable High Precision D.C. Power Supply



## PPH-1503



## PPH-1503D/1506D/1510D



### FEATURES

- \* 3.5" TFT LCD Display
- \* High Measurement Resolution: 1mV/0.1μA for 5mA range.
- \* Transient Recovery Time: ≤40μs within 100mV; <80μs within 20mV
- \* Current Sink Function
- \* Pulse Current Measurement (Pulse width min.: 33μs)
- \* Long Integration Current Measurement
- \* Built-in DVM Measurement Function
- \* Sequence Function (Sequence power output)
- \* Built-in Battery Simulation Function (CH1 of PPH-15xxD)
- \* OVP, OCP, OTP & Temperature Display for Heat Sink
- \* Support USB (Device & Host)/GPIB/LAN
- \* Five Groups of Save/Recall Setting
- \* External Relay Control

### PPH-1503 Rear Panel



### PPH-1503D/1506D/1510D Rear Panel



PPH-Series high precision measurement capability achieves the maximum resolution of 1mV/0.1μA and the smallest pulse current width of 33μs that satisfy customers' measurement application requirements of high resolution and pulse current. Fast load current variation will result in voltage sag for general power supplies that will have an impact on DUT's internal circuit operation. PPH-Series is equipped with the excellent transient recovery time, which can, in less than 40μs, recover the output voltage to within 100mV of the previous voltage output when the current level changes from 10% to 100% of the full scale. Furthermore, conventional power supplies do not have sufficient response speed to promptly respond to set voltage value once the set voltage is changed. PPH-15xxD has a rise time of 0.2ms and a fall time of 0.3ms, which are 100 times faster than that of conventional power supplies. Therefore, PPH-15xxD can provide DUT with a stable output voltage even when DUT is operating under large transient current output. The internal high-speed sampling circuit design of PPH-15xxD, with the sample rate of 64K, can conduct pulse current measurement without using a current probe and oscilloscope. The current read back accuracy is 0.2%+1μA (equals to 11μA) at 5mA range, and the read back resolution is 0.1μA that allow DUT to be measured with a high accuracy level. Unlike battery, general power supplies, which do not have the characteristics of fast transient recovery time, can not maintain a stable power supply for cellular phone, wireless device, and wearable device which produce large transient pulse current load for hundreds of μs to dozens of ms when in use. PPH-15xxD, different from general power supplies, has the characteristics of fast transient recovery time. While simulating battery to output pulse current, PPH-15xxD can quickly compensate the voltage drop caused by pulse current. PPH-15xxD's CH1 has the built-in battery simulation function, which can define output impedance settings so as to accurately simulate battery's impedance characteristics during battery discharge. Fast transient recovery time and built-in battery simulation function together facilitate PPH-15xxD to accurately simulate battery's real behavior pattern so as to conduct product tests.

PPH-15xxD is not only suitable for simulating battery, charger and supplying power to DUT, but also ideal for simulating an electronic load to conduct discharge tests with its sink current capability. The sink current function allows PPH-15xxD to simulate a voltage source with the sink current capability. The maximum sink current of PPH-15xxD's CH1 is 3.5A and for CH2 is 3A. Long integration current measurement can be utilized to conduct average current measurement for periodical pulse current in a long period of time that is applied to analyze power consumption for a period of time. One of the applications is to measure the average power consumption of a cellular phone in use so as to conduct the internal RF module parameter analysis. The maximum pulse current measurement range of CH1 is 5A and for CH2 is 3A. The built-in sequence function of CH1 provides users with 1000 steps to edit sequential outputs, including voltage, current and execution time. The built-in DVM function of CH2 has a voltage range from 0 to +20VDC that saves users the cost of purchasing an additional voltage meter.

PPH-15xxD provides OTP function and shows heat sink temperature on the upper right corner of the display screen. Other than that, features such as five sets of system setting values for the SAVE/RECALL function, 10 sets of Power On Setup Settings, Key-Lock function to prevent unauthorized inputs, temperature-controlled fan to reduce noise, hardcopy to save screen information, and external relay control device together augment PPH-15xxD's usability. PPH-Series supports test requirements of Profile1, Profile2 and Profile3 from USB Power Delivery(PD) constructed by USB-IF association.

### SELECTION GUIDE

Model	PPH-1503	PPH-1503D	PPH-1506D	PPH-1510D
Channel	1	2	2	2
Dual Range Output				
Channel 1	0~15V/0~3A or 0~9V/0~5A	0~15V/0~3A or 0~9V/0~5A	0~15V/0~3A or 0~9V/0~5A	0~15V/0~3A or 0~9V/0~5A
Channel 2	NA	0~12V/0~1.5A	0~12V/0~3.0A	0~12V/0~3.0A
Display	3.5 Inch TFT LCD	3.5 Inch TFT LCD	3.5 Inch TFT LCD	3.5 Inch TFT LCD
Current Measurement Range	5A/5mA	5A/500mA/5mA(CH1)	5A/500mA/5mA(CH1)	10A/500mA/5mA(CH1)
CV&CC	✓	✓	✓	✓
Built-in DVM Measurement Function	✓	✓ (CH2)	✓ (CH2)	✓ (CH2)
Pulse Current Measurement	✓	✓	✓	✓
Long integration Current Measurement	✓	✓	✓	✓
Battery Simulation	NA	✓ (CH1)	✓ (CH1)	✓ (CH1)
Automated Sequential Output	✓	✓ (CH1)	✓ (CH1)	✓ (CH1)
High Measurement Resolution	✓ (1mV/0.1 μA)	✓ (1mV/0.1 μA)	✓ (1mV/0.1 μA)	✓ (1mV/0.1 μA)
Sink Current Capability	✓ (Max : 2A)	✓ (Max : 3.5A)	✓ (Max : 3.5A)	✓ (Max : 3.5A)
Selectable Output From Front or Rear Panel	✓	✓	✓	✓
Relay Output Control	✓	✓	✓	✓
Memory	5 Sets	5 Sets	5 Sets	5 Sets
Sample Rate	60K	64K	64K	64K
Lock Function	✓	✓	✓	✓
Protection Function	OVP/OTP/OCP	OVP/OTP/OCP	OVP/OTP/OCP	OVP/OTP/OCP
Four Wire Output Open Circuit Protection	NA	✓	✓	✓
Temperature Display for Heat Sink	NA	✓	✓	✓
Standard Interface:	GPIB	✓	✓	✓
LAN, USB, Analog Control	USB	✓ (CDC)	✓ (TMC)	✓ (TMC)
Interface	LAN	✓	✓	✓

### ORDERING INFORMATION

- PPH-1503 (0~15V/0~3A or 0~9V/0~5A) High Precision DC Power Supply  
 PPH-1503D (CH1:0~15V/0~3A or 0~9V/0~5A;CH2:0~12V/0~1.5A) High Precision Dual Channel Output DC Power Supply  
 PPH-1506D (CH1:0~15V/0~3A or 0~9V/0~5A;CH2:0~12V/0~3A) High Precision Dual Channel Output DC Power Supply  
 PPH-1510D (CH1:0~15V/0~3A or 0~9V/0~5A,0~4.5V/0~10A(Rear terminal);CH2:0~12V/0~3A) High Precision Dual Channel Output DC Power Supply

#### ACCESSORIES :

CD (User manual x1, Quick start manual x1), Power cord (Region dependent), Test lead GTL-207A x 1, GTL-203A x 1, GTL-204A x 1

#### OPTIONAL ACCESSORIES

GTL-246 USB Cable (USB 2.0, A-B Type)



SPECIFICATIONS								
Model	PPH-1503		PPH-1503D		PPH-1506D		PPH-1510D	
OUTPUT RATING								
Number of Output Channel	1		2		2		2	
Channel No.	Ch 1		Ch 1		Ch 1		Ch 1	
Power	45W		45W		45W		45W	
Voltage	0 ~ 15V or 0 ~ 9V		0 ~ 15V or 0 ~ 9V		0 ~ 15V or 0 ~ 9V		0 ~ 15V or 0 ~ 9V	
Current	0 ~ 3A or 0 ~ 5A		0 ~ 3A or 0 ~ 5A		0 ~ 3A or 0 ~ 5A		0 ~ 3A or 0 ~ 5A	
			0 ~ 1.5A		0 ~ 3.0A		Rear:0~10A(under 0~4.5V)	
Output Voltage Rising Time	0.15ms (10% ~ 90%)		0.20ms (10% ~ 90%)		0.20ms (10% ~ 90%)		0.20ms (10% ~ 90%)	
Output Voltage Falling Time	0.65ms (90% ~ 10%)		0.30ms (90% ~ 10%)		0.30ms (90% ~ 10%)		0.30ms (90% ~ 10%)	
STABILITY								
Voltage	0.01%+0.5mV		0.01%+3.0mV		0.01%+3.0mV		0.01%+3.0mV	
Current	0.01%+50 μA		—		—		—	
REGULATION (CV)								
Load	0.01%+2mV		0.01%+2mV		0.01%+2mV		0.01%+2mV	
Line	0.5mV		0.5mV		0.5mV		0.5mV	
REGULATION (CC)								
Load	0.01%+1mA		0.01%+1mA		0.01%+1mA		0.01%+1mA	
Line	0.5mA		0.5mA		0.5mA		0.5mA	
RIPPLE & NOISE (20Hz~20MHz)								
CV p-p	8mV		≤5A : 8mVp-p(20Hz~ 20MHz)		≤5A : 8mVp-p(20Hz~ 20MHz)		≤5A : 8mVp-p(20Hz~ 20MHz)	
CV rms	1mV		3mV(0~1MHz)		3mV(0~1MHz)		≤5A : 12mVp-p(20Hz~20MHz)	
CC rms	—		—		—		3mV(0~1MHz)	
PROGRAMMING ACCURACY								
Voltage	0.05%+10mV		0.05%+10mV		0.05%+10mV		0.05%+10mV	
Current(Ch1:5A,10A/CH2:1.5A,3A)	0.16%+5mA		0.16%+5mA(5A/1.5A)		0.16%+5mA(5A/3A)		0.16%+5mA(5A/3A)	
Current (500mA)	—		0.16%+0.5mA		0.16%+0.5mA		0.16%+0.5mA	
Current (5mA)	—		0.16%+5μA		0.16%+5μA		0.16%+5μA	
READBACK ACCURACY								
Voltage	0.05%+3mV		0.05%+3mV		0.05%+3mV		0.05%+3mV	
Current(Ch1:5A,10A/CH2:1.5A,3A)	0.2%+400μA(5A)		0.2%+400μA(5A)		0.2%+400μA(5A)		0.2%+400μA(5A)	
Current (500mA)	—		0.2%+100μA		—		0.2%+100μA	
Current (5mA)	0.2%+1μA		0.2%+1μA		0.2%+1μA		0.2%+1μA	
RESPONSE TIME								
Transient Recovery Time	<40μS (within 100mV)		<40μS (within 100mV, Rear)		<40μS (within 100mV, Rear)		<40μS (within 100mV, Rear)	
(Response to 1000% Load Change)	<80μS (within 20mV)		<50μS (within 100mV,Front)		<50μS (within 100mV,Front)		<50μS (within 100mV,Front)	
			<80μS (within 20mV)		<80μS (within 20mV)		<80μS (within 20mV)	
PROGRAMMING RESOLUTION								
Voltage	2.5mV		2.5mV		2.5mV		2.5mV	
Current (5A range)	1.25mA		1.25mA(5A)		1.25mA		1.25mA(5A)	
Current (500mA range)	—		0.125mA		0.125mA		0.125mA	
Current (5mA range)	—		1.25μA		—		1.25μA	
READBACK RESOLUTION								
Voltage	1mV		1mV		1mV		1mV	
Current (5A range)	0.1mA		0.1mA(5A)		0.1mA(3A)		0.1mA(5A)	
Current (500mA range)	—		0.01mA		—		0.01mA	
Current (5mA range)	0.1μA		0.1μA		0.1μA		0.1μA	
PROTECTION FUNCTION								
OVP Accuracy	50mV		Ch1: 0.8V		Ch1: 0.8V		Ch1: 0.8V	
OVP Resolution	10mV		10mV		10mV		10mV	
DVM								
DC Readback Accuracy(23℃±5℃)	±0.05%+3mV		±0.05%+3mV		±0.05%+3mV		±0.05%+3mV	
Readbck Resolution	1mV		1mV		1mV		1mV	
Input Voltage Range	0 ~ 20VDC		—		—		—	
Maximum Input Voltage	—		0 ~ 20VDC		0 ~ 20VDC		0 ~ 20VDC	
Input Resistance and Capacitance	100000M Ω		-3V, +22V		-3V, +22V		-3V, +22V	
			20M Ω		20M Ω		20M Ω	
PROGRAMMABLE OUTPUT RESISTANCE								
Range	—		0.001 Ω ~ 1.000 Ω		0.001 Ω ~ 1.000 Ω		0.001 Ω ~ 1.000 Ω	
Programming Accuracy	—		0.5% + 10 m Ω		—		0.5% + 10 m Ω	
Resolution	—		1m Ω		1m Ω		1m Ω	
PULSE CURRENT MEASUREMENT								
Trigger Level	5mA ~ 5A, 5mA/Step		5mA ~ 5A, 5mA/Step		5mA ~ 5A, 5mA/Step		5mA ~ 5A, 5mA/Step	
High Time/Low Time/Average Time	33.3μs ~ 833ms, 33.3μs/Step		33.3μs ~ 833ms, 33.3μs/Step		33.3μs ~ 833ms, 33.3μs/Step		33.3μs ~ 833ms, 33.3μs/Step	
Trigger Delay	0 ~ 100ms,10μs/Steps		0 ~ 100ms,10 μ s/Steps		0 ~ 100ms,10 μ s/Steps		0 ~ 100ms,10μs/Steps	
Average Readings	1 ~ 100		1 ~ 100		1 ~ 100		1 ~ 100	
Long Integration Pulse Time	15 ~ 63S		15 ~ 63S		15 ~ 63S		15 ~ 63S	
Long Integration	850ms(60Hz)/840ms(50Hz)~60s, or Auto time		850ms(60Hz)/840ms(50Hz)~60s, or Auto time		850ms(60Hz)/840ms(50Hz)~60s, or Auto time		850ms(60Hz)/840ms(50Hz)~60s, or Auto time	
Measurement Time	16.7ms/Steps(60Hz),20ms/Steps(50Hz)		16.7ms/Steps(60Hz),20ms/Steps(50Hz)		16.7ms/Steps(60Hz),20ms/Steps(50Hz)		16.7ms/Steps(60Hz),20ms/Steps(50Hz)	
Long Integration Trigger Mode	Rising, Falling, Neither		Rising, Falling, Neither		Rising, Falling, Neither		Rising, Falling, Neither	
OTHERS								
Output Terminal	Front/Rear Panel		Front/Rear Panel		Front/Rear Panel		Front/Rear Panel	
DVM Input	Front/Rear Panel		—		—		—	
Relay Control Connector	150mA/15V, 5V output, 100mA		150mA/15V, 5V output, 100mA		150mA/15V, 5V output, 100mA		150mA/15V, 5V output, 100mA	
Operation Temperature	0 ~ 40℃		0 ~ 40℃		0 ~ 40℃		0 ~ 40℃	
Operation Humidity	≤ 80%		≤ 80%		≤ 80%		≤ 80%	
Storage Temperature	-20℃ ~ 70℃		-20℃ ~ 70℃		-20℃ ~ 70℃		-20℃ ~ 70℃	
Storage Humidity	< 80%		< 80%		< 80%		< 80%	
PC REMOTE INTERFACES								
Standard	GPIB/USB/LAN		GPIB/USB/LAN		GPIB/USB/LAN		GPIB/USB/LAN	
CURRENT SINK CAPACITY								
Sink Current Rating	2A (Vout ≤ 5V); 2A-0.1*(Vout-5) (Vout>5V)		Ch1:0~4V:3.5A; 4~15V:3.5A (0.25A/V) *(Vset-4V)		Ch1:0~4V:3.5A; 4~15V:3.5A (0.25A/V) *(Vset-4V)		Ch1:0~4V:3.5A; 4~15V:3.5A (0.25A/V) *(Vset-4V)	
			Ch2:0~5V:2A; 5~12V:2A-(0.1A/V) *(Vset-5V)		Ch2:0~5V:3A; 5~12V:3A (0.25A/V) *(Vset-5V)		Ch2:0~5V:3A; 5~12V:3A (0.25A/V) *(Vset-5V)	
MEMORY								
Save/Recall	5 Sets		5 Sets		5 Sets		5 Sets	
POWER								
Input Power	90 ~ 264VAC ; 50/60Hz		90 ~ 264VAC ; 50/60Hz		90 ~ 264VAC ; 50/60Hz		90 ~ 264VAC ; 50/60Hz	
Power Consumption	150W		160W		160W		160W	
DIMENSIONS & WEIGHT								
	222(W)x86(H)x363(D)mm; Approx 4.2kg		222(W)x86(H)x363(D)mm; Approx 4.5kg		222(W)x86(H)x363(D)mm; Approx 4.5kg		222(W)x86(H)x363(D)mm; Approx 4.5kg	



# Single Output Programmable Linear D.C. Power Supply



## PPS-3635



### FEATURES

- \* Easy Operation with UP/DOWN Key
- \* High Resolution: 10mV, 1mA
- \* Over Voltage Protection, Over Current Protection ( by Hardware )
- \* 100 Set Memory
- \* Self Test and Software Calibration
- \* Auto Step Running With Time Setting
- \* FRONT/REAR Output and Sense Switch Selectable
- \* IEEE-488.2 and SCPI Compatible Command set
- \* LabVIEW Driver Software
- \* High Stability, Low Drift
- \* 4 Digit Display
- \* IEC Safety Regulation

### Rear Panel



PPS-3635 is a single output, 126W output, programmable linear DC power supply. OVP and OCP hardware protection, compliance to major safety standards such as UL, CSA, and IEC ensure a high level of safety and reliability. The remote sense adds extra level of precision by compensating cable losses between loads. The SCPI command set and LabVIEW driver access through the GPIB interface provide remote control and ATE software development capability. The flexible PPS-3635 GPIB is ideal for high-level applications requiring high precision and an extra level of safety.

### SPECIFICATIONS

OUTPUT		
Voltage		0 ~ 36V
Current		0 ~ 3.5A
OVP		0 ~ 38.5V
LOAD REGULATION		
Voltage		≤ 3mV rear output ( ≤ 6mV front output )
Current		≤ 3mA ( ≤ 6mA rating current > 3.5A )
LINE REGULATION		
Voltage		≤ 3mV
Current		≤ 3mA
RESOLUTION		
Voltage		10mV ( 20mV rating voltage > 36V )
Current		1mA ( 2mA rating current > 3.5A )
OVP		10mV ( 20mV rating voltage > 36V )
PROGRAM ACCURACY (25±5°C)		
Voltage		≤ 0.05% + 25mV ( + 50mV rating voltage > 36V )
Current		≤ 0.2% + 10mA
OVP		≤ 2% + 0.6V
RIPPLE & NOISE (20Hz ~ 20MHz)		
Voltage		Ripple 1mVrms / 3mVp-p Noise 2mVrms / 30mVp-p
Current		≤ 3mA rms ( ≤ 5mA rms rating current > 3.5A )
TEMPERATURE COEFFICIENT (0~40°C)		
Voltage		≤ 100ppm + 3mV
Current		≤ 150ppm + 3mA
REARBACK RESOLUTION ACCURACY (25±5°C)		
Voltage		10mV ( 20mV rating voltage > 36V )
Current		1mA ( 2mA rating current > 3.5A )
Voltage		≤ 0.05% + 25mV ( + 50mV rating voltage > 36V )
Current		≤ 0.2% + 10mA
RESPONSE TIME		
VOLTAGE UP	10% ~ 90%	≤ 100mS
VOLTAGE DOWN	90% ~ 10%	≤ 100mS ( ≥ 10% rating load )
REARBACK TEMPERATURE		
COEFFICIENT	Voltage	≤ 100ppm + 10mV ( + 20mV rating voltage > 36V )
	Current	≤ 150ppm + 10mA
DRIFT	Voltage	≤ 0.03% + 6mV
	Current	≤ 0.1% + 6mA
MEMORY		
Store/Recall		100 sets
TIMER		
Setting Time		1 second ~ 255 minutes (Max. 255 minutes x 100 Sets)
Resolution		1 second
Function		for output working loop (Auto Step running )
INTERFACE		
GPIB Interface Standard		
POWER SOURCE		
AC 100V/120V/ 220V/240V ±10%, 50/60Hz		
DIMENSIONS & WEIGHT		
255(W) x 145(H) x 346(D) mm; Approx. 9.5kg		

### ORDERING INFORMATION

**PPS-3635** 126W Single Output Programmable D.C. Power Supply

#### ACCESSORIES :

User manualx1, Power cordx1, Test lead GTL-104A x 1

#### OPTIONAL ACCESSORIES

**GRA-401** Rack Adapter Panel, 19" 4U

**GTL-248** GPIB Cable, Double Shielded, 2000mm

#### FREE DOWNLOAD

Driver LabView Driver

# Programmable Dual-range Linear D.C. Power Supply



## PSM-2010/3004/6003



### FEATURES

- \* Single Output Dual Range Max. 200W
- \* High Resolution: 1mV/1mA
- \* Stable & Clear Power: 0.01% Load/Line Regulation, 350 $\mu$ Vrms Ripple
- \* 100 Sets Memory
- \* Auto Step Running With Timer Setting
- \* Safety Design: OVP, OCP & OTP ; Output ON/OFF Control(OCP Provides Delay Setting to Prevent Trip of High Start-Up Current)
- \* Self-Test and Software Calibration
- \* Highly Visible Vacuum-Fluorescent Display
- \* Front and Rear Output Terminal
- \* Standard Interface : RS-232C, GPIB
- \* Optional European Jack Type Terminal

### European Type Jack Terminal



### Rear Panel



The PSM-Series is a single output / dual range, 120W or 200W, programmable linear DC power supply. OVP, OCP, OTP, and output On/Off control protect the PSM-Series and their loads from unexpected conditions. High resolution, high regulation, and low ripple are maintained at 1mV/1mA, 0.01%, and <350 $\mu$ Vrms, respectively. Operation and configuration is simplified with a digital interface and a clear LCD display. Standard features include; store/recall output memories, automatic stepping with timers for continuous testing and self-testing and software calibration features to reduce maintenance overhead. SCPI programming, LabVIEW drivers, RS-232C and GPIB interfaces enable easy automated test system integration and remote control. The PSM-Series is an ideal choice for high precision applications such as QA verification and product development.

SPECIFICATIONS				
		PSM-2010	PSM-3004	PSM-6003
DC OUTPUT				
Low Range		0 ~ 8V/20A	0 ~ 15V/7A	0 ~ 30V/6A
High Range		0 ~ 20V/10A	0 ~ 30V/4A	0 ~ 60V/3.3A
CONSTANT VOLTAGE OPERATION				
Regulation (% of output + offset)		Load regulation $\leq 0.01\% + 2\text{mV}$ ; Line regulation $\leq 0.01\% + 2\text{mV}$		
Ripple & Noise		$< 350\mu\text{Vrms}/3\text{mVpp}$	$< 350\mu\text{Vrms}/2\text{mVpp}$	$\leq 50\text{V}$ : $< 500\mu\text{Vrms}/3\text{mVpp}$ $> 50\text{V}$ : $< 1\text{mVrms}/3\text{mVpp}$
CONSTANT CURRENT OPERATION				
Regulation (% of output + offset)		Load regulation $\leq 0.01\% + 250\mu\text{A}$ ; Line regulation $\leq 0.01\% + 250\mu\text{A}$		
Ripple & Noise		$< 2\text{mArms}$		
RESOLUTION				
Programming	Voltage	1mV	1mV	2mV
	Current	1mA	0.5mA	0.5mA
Readback	Voltage	0.5mV	0.5mV	1mV
	Current	1mA	0.1mA	0.5mA
Front Panel	Voltage	1mV		
	Current	1mA( $< 10\text{A}$ ), 10mA( $\geq 10\text{A}$ )		
OVP/OCP	Voltage	10mV		
	Current	10mA		
ACCURACY				
Programming	Voltage	0.05% + 10mV		
	Current	0.2% + 10mA		
Readback	Voltage	0.05% + 5mV		
	Current	0.15% + 5mA		
OVP/OCP	Voltage	0.1% + 10mV		
	Current	0.4% + 10mA		
TRANSIENT RESPONSE				
		$< 50\mu\text{sec}$ ( for output to recover within 15mV following a change in output current from full load to half load )		
COMMAND PROCESSING TIME				
		100 ms		
VOLTAGE PROGRAMMING RESPONSE TIME (for resistive load)(10% ~ 90%)				
Voltage Up	Full Load	95 ms	50 ms	80 ms
	No Load	45 ms	20 ms	100 ms
Voltage Down	Full Load	30 ms	45 ms	30 ms
	No Load	450 ms	400 ms	450 ms
STABILITY (% of output + offset)				
Voltage		0.02% + 1mV		
Current		0.1% + 1mA		
MEMORY				
Store/Recall		100 sets		
TEMPERATURE COEFFICIENT PER $^{\circ}\text{C} \pm$ (% of Output + Offset)				
Voltage		0.01% + 3mV		
Current		0.02% + 3mA		
POWER SOURCE				
AC 100V/120V/220V $\pm 10\%$ , 230V ( - 6% ~ + 10%), 50/60Hz				
INTERFACE				
Standard RS-232C , GPIB				
DIMENSIONS & WEIGHT				
230(W) x 140(H) x 380(D) ; Approx. 10kg				

### ORDERING INFORMATION

- PSM-2010 200W Single Output, Programmable Power Supply  
 PSM-6003 200W Single Output, Programmable Power Supply  
 PSM-3004 120W Single Output, Programmable Power Supply

#### ACCESSORIES :

User manual x 1, Power cord x 1, Test lead GTL-104A x 1, European test lead GTL-204A x 1, Ground lead GTL-201A x 1 (European terminal), Sense lead GTL-202 x 1 (European Terminal)

#### OPTION

Opt. 01 GRA-407 Rack Mount Kit

#### OPTIONAL ACCESSORIES

GTL-232 RS-232C Cable, 9-pin Female to 9-pin, Null Modem for PC Computer GRA-407 Rack Mount Kit  
 GTL-248 GPIB Cable, Double Shielded, 2000mm

#### FREE DOWNLOAD

PC Software PC Software including Data Log ; Remote Control Software  
 Driver Labview Driver ; PSM VB Example ; PSM VC++ Example



# Programmable Linear D.C. Power Supply



## PSS-2005/3203



### FEATURES

- \* Digitized Programmable Interface
- \* High Resolution 10mV, 1mA
- \* High Stability, Low Drift
- \* Over-Voltage, Over-Current, Over Temperature Protection
- \* Intelligent Fan Control (Change by Output Power)
- \* Built-in Buzzer Alarm
- \* LabVIEW Driver
- \* Standard Interface : RS-232C
- \* Optional Interface : GPIB (IEEE-488.2)
- \* Optional European Jack Type Terminal

### European Type Jack Terminal



### Rear Panel



The PSS-Series is a single output, 96W or 100W, programmable linear DC power supply. OVP, OCP, and OTP protect the PSS series and their loads from unexpected conditions. The LCD panel simultaneously displays output and other parameters and the regulated cooling fan ensures low noise for comfortable operation. RS232C and GPIB interfaces, SCPI command sets and LABVIEW drivers make remote control and ATE software development easier. (Note: only RS-232C or GPIB can be installed at one time) The compact PSS series is suitable for any high resolution bench-top or rack mount application.

### SPECIFICATIONS

		PSS-2005	PSS-3203
OUTPUT			
Voltage	0 ~ 20V	0 ~ 32V	
Current	0 ~ 5A	0 ~ 3A	
OVP	0 ~ 21V	0 ~ 33V	
LOAD REGULATION			
Voltage	$\leq 3\text{mV}$ ( $\leq 5\text{mV}$ , rating current $> 3.0\text{A}$ )		
Current	$\leq 3\text{mA}$ ( $\leq 5\text{mA}$ , rating current $> 3.0\text{A}$ )		
LINE REGULATION			
Voltage	$\leq 3\text{mV}$		
Current	$\leq 3\text{mA}$		
RESOLUTION			
Voltage	10mV		
Current	1mA (2mA, rating current $> 3.0\text{A}$ )		
OVP	10mV		
PROGRAM ACCURACY (25 ± 5°C)			
Voltage	$\leq 0.05\%+20\text{mV}$		
Current	$\leq 0.1\%+5\text{mA}$ (+10mA, rating current $> 3.0\text{A}$ )		
OVP	$\leq 0.05\%+20\text{mV}$		
RIPPLE & NOISE (20Hz ~ 20MHz)			
Voltage	Ripple $\leq 1\text{mVrms}/3\text{mVp-p}$ ; Noise $\leq 2\text{mVrms}/30\text{mVp-p}$		
Current	$\leq 3\text{mA}_{\text{rms}}$ ( $\leq 5\text{mA}_{\text{rms}}$ , rating current $> 3.0\text{A}$ )		
TEMPERATURE COEFFICIENT (0 ~ 40°C)			
Voltage	$\leq 100\text{ppm}+3\text{mV}$		
Current	$\leq 100\text{ppm}+3\text{mA}$		
READBACK RESOLUTION			
Voltage	10mV		
Current	1mA (2mA, rating current $> 3.0\text{A}$ )		
READBACK ACCURACY(25 ± 5°C)			
Voltage	$\leq 0.05\%+10\text{mV}$		
Current	$\leq 0.1\%+5\text{mA}$ (10mA rating current $> 3.0\text{A}$ )		
READBACK TEMPERATURE COEFFICIENT			
Voltage	$\leq 100\text{ppm}+10\text{mV}$		
Current	$\leq 100\text{ppm}+5\text{mA}$ (10mA rating current $> 3.0\text{A}$ )		
RESPONSE TIME			
Voltage Up (10%~90%)	$\leq 100\text{mS}$		
Voltage Down (90%~10%)	$\leq 100\text{mS}$ ( $\geq 10\%$ rating load)		
DRIFT			
Voltage	$\leq 100\text{ppm}+10\text{mV}$		
Current	$\leq 150\text{ppm}+10\text{mA}$		
INTERFACE			
Standard : RS-232C; Option : GPIB			
POWER SOURCE			
AC 100V/120V/220V±10%, 230V (+10%/-6%), 50/60Hz			
DIMENSIONS & WEIGHT			
108(W) x 142(H) x 318(D) mm, Approx. 4.8kg			

### ORDERING INFORMATION

**PSS-2005** 100W Single Output Programmable D.C. Power Supply

**PSS-3203** 96W Single Output Programmable D.C. Power Supply

#### ACCESSORIES :

User manual x 1, Power cord x 1 Test lead GTL-104A x 1 (PSS-2005) or GTL-105A x 1 (PSS-3203)  
European Test Lead GTL-204A x 1 (PSS-2005) or GTL-203A x 1 (PSS-3203)

#### OPTION

Opt.01 : GPIB Interface (factory installed)

#### OPTIONAL ACCESSORIES

**GTL-232** RS-232C Cable, 9-pin Female to 9-pin, null Modem for Computer

**GRA-408** Rack Adapter Panel (19" 4U)

**GTL-248** GPIB Cable, Double Shielded, 2000mm

#### FREE DOWNLOAD

**PC Software** PC Software including Data Log ; Remote Control Software  
**Driver** LabView Driver

Note : When Opt.01 GPIB interface is ordered, the standard interface RS-232C will be deleted.

# Switching D.C. Power Supply



The SPS-Series is a single output, 360W, switching DC power supply. OVP protects the SPS-Series and their loads from unexpected conditions. High regulation is maintained at 0.01%. Remote sensing adds an extra level of precision by compensating cable losses between loads. Turning the output On/Off from external device is available through Remote control terminals. The GPS-Series is an ideal solution for power-efficient bench-top or portable applications requiring high regulation.

## SPS-1230/1820/2415/3610/606



### FEATURES

- \* Dual Measurement Display
- \* 0.01 % High Regulation
- \* Constant Voltage and Constant Current Operation
- \* High Efficiency
- \* High Power Density
- \* Over Voltage Protection
- \* Remote Output ON/OFF Control

SPECIFICATIONS					
OUTPUT					
	SPS-1230	SPS-1820	SPS-2415	SPS-3610	SPS-606
Voltage	0 ~ 12V	0 ~ 18V	0 ~ 24V	0 ~ 36V	0 ~ 60V
Current	0 ~ 30A	0 ~ 20A	0 ~ 15A	0 ~ 10A	0 ~ 6A
CONSTANT VOLTAGE OPERATION					
Regulation	Line regulation $\leq 5\text{mV}$ Load regulation $\leq 5\text{mV}$				
Ripple & Noise	$\leq 5\text{mVrms}$ , 100mVp-p 20Hz ~ 20MHz				
Recovery Time	$\leq 500\mu\text{S}$ (50% Load change, Minimum load 0.5A)				
Temp. Coefficient	$\leq 100\text{ppm}/^{\circ}\text{C}$				
Output Range	0 to rating voltage continuously adjustable				
CONSTANT CURRENT OPERATION					
Regulation	Line regulation $\leq 3\text{mA}$ Load regulation $\leq 3\text{mA}$				
Ripple Current	$\leq 3\text{mA}_{\text{rms}}$ (SPS-606) $\leq 5\text{mA}_{\text{rms}}$ (SPS-3610) $\leq 10\text{mA}_{\text{rms}}$ (SPS-2415) $\leq 10\text{mA}_{\text{rms}}$ (SPS-1820) $\leq 30\text{mA}_{\text{rms}}$ (SPS-1230)				
Output Range	0 to rating current continuously adjustable (HI/LO range switchable)				
METER					
Type	3 1/2 digit, 0.39" LED display				
Accuracy	$\pm (0.5\% \text{ of rdg} + 2\text{digits})$				
INSULATION					
Chassis and Terminal	20M $\Omega$ or above ( DC 500V )				
Chassis and AC Cord	30M $\Omega$ or above ( DC 500V )				
POWER SOURCE					
AC 115V/ 230V $\pm$ 15 %, 50/60Hz					
DIMENSIONS & WEIGHT					
128(W) x 151(H) x 295(D) mm, Approx. 3.2kg					

### Rear Panel



ORDERING INFORMATION	
SPS-1230	360W Switching D.C. Power Supply
SPS-1820	360W Switching D.C. Power Supply
SPS-2415	360W Switching D.C. Power Supply
SPS-3610	360W Switching D.C. Power Supply
SPS-606	360W Switching D.C. Power Supply
ACCESSORIES :	
User manual x 1 , Power cord x 1 , Test lead GTL-203A x 1	



# Linear D.C. Power Supply



## GPR-H Series



### FEATURES

- \* 0.01% High Regulation
- \* Constant Voltage and Constant Current Operation
- \* Internal Select for Continuous or Dynamic Load
- \* Low Ripple and Noise
- \* Overload and Reverse Polarity Protection
- \* 3 1/2 Digit 0.5" LED Display
- \* Internal Select for Continuous or Dynamic Load (for GPR-3510HD/GPR-6060D/GPR-7550D)

The GPR-H Series consists of single output linear DC power supplies with voltage outputs rating from 8V to 300V. The series includes overload and reversed polarity protection to protect devices under test from being damaged due to inappropriate operation. The internal select for dynamic loads is often used for amplifier testing. It can support high pulse current derived from dynamic processes as well as support low noise and noise, which make it suitable for high-end bench-top applications requiring precision. Its rear panel supports output wiring. These features combined into one assembly allow the GPR-H Series to predominate in applications requiring high voltage or high current.

SPECIFICATIONS	
CONSTANT VOLTAGE OPERATION	
Regulation	Line regulation $\leq 0.01\% + 3\text{mV}$ Load regulation $\leq 0.01\% + 5\text{mV}$ ( $<10\text{A}$ ) $\leq 0.02\% + 5\text{mV}$ ( $\geq 10\text{A}$ )
Ripple & Noise	$\leq 1\text{mVrms}$ 5Hz ~ 1MHz
Recovery Time	$\leq 100\mu\text{S}$ (50% load change, minimum load 0.5A)
Output Range	0 to rating voltage continuously adjustable
CONSTANT CURRENT OPERATION	
Regulation	Line regulation $\leq 0.2\% + 3\text{mA}$ Load regulation $\leq 0.2\% + 5\text{mA}$
Ripple Current	$\leq 5\text{mA}$ ( $\leq 20\text{A}$ ), $\leq 10\text{mA}$ ( $\leq 30\text{A}$ ) $\leq 20\text{mA}$ ( $\leq 50\text{A}$ )
Output Range	0 to rating current continuously adjustable
METER	
Type	3 1/2 Digit 0.5" LED display
Accuracy	$\pm (0.5\% \text{ of rdg} + 2 \text{ digits})$
INSULATION	
Chassis and Terminal	$100\text{M}\Omega$ or above (DC 1000V)
Chassis and AC Cord	$100\text{M}\Omega$ or above (DC 1000V)
POWER SOURCE	
AC 100V/120V/220V/240V $\pm 10\%$ , 50/60Hz	
DIMENSIONS	
254(W) x 152(H) x 456(D) mm	

### Rear Panel



ORDERING INFORMATION				
Model		Output Volts (V)	Output Amps (A)	Weight (kg)
GPR-0830HD	240W D.C. Power Supply	0 ~ 8	0 ~ 30	18.5
GPR-1820HD	360W D.C. Power Supply	0 ~ 18	0 ~ 20	18.5
GPR-3510HD	350W D.C. Power Supply	0 ~ 35	0 ~ 10	18.5
GPR-6060D	360W D.C. Power Supply	0 ~ 60	0 ~ 6	18.5
GPR-7550D	375W D.C. Power Supply	0 ~ 75	0 ~ 5	18.5
GPR-11H30D	330W D.C. Power Supply	0 ~ 110	0 ~ 3	13.5
GPR-30H10D	300W D.C. Power Supply	0 ~ 300	0 ~ 1	13.5
ACCESSORIES :				
User manual x 1, Power cord x 1				
Test lead GTL-105A x 1 ( $\leq 3\text{A}$ ) or GTL-104A x 1 ( $\leq 10\text{A}$ ) or Not Available ( $>10\text{A}$ )				
OPTIONAL ACCESSORIES				
GTL-122	Test Lead, U-type to Alligator Test Lead, Max. Current 40A, 1200mm			

Note: **CE** Approved Only for GPR-1820HD, GPR-3510HD, GPR-7550D, GPR-11H30D  
Rear-Panel Output Only for GPR-0830HD, GPR-1820HD

# Linear D.C. Power Supply



## GPR-M Series



### FEATURES

- \* 0.01% High Regulation
- \* Constant Voltage and Constant Current Operation
- \* Internal Select for Continuous or Dynamic Load
- \* Low Ripple and Noise
- \* Overload and Reverse Polarity protection
- \* 3 1/2 Digit 0.5" LED Display

The GPR-M Series is a single output, 180W, linear DC power supply which featuring all the same functions as the GPR-H Series but for lower power demands. Like the GPR-H Series, the GPR-M Series is suitable for high-end precision bench top applications. Low load and line regulation for both constant voltage and constant current mode ensure reliable, predictable output. Overload and reverse polarity protection as well as internal selection for dynamic or constant load are standard.

SPECIFICATIONS	
CONSTANT VOLTAGE OPERATION	
Regulation	Line regulation $\leq 0.01\% + 3\text{mV}$ Load regulation $\leq 0.01\% + 5\text{mV}$ ( $<10\text{A}$ ) Load regulation $\leq 0.02\% + 5\text{mV}$ ( $\geq 10\text{A}$ )
Ripple & Noise	$\leq 1\text{mVrms}$ 5Hz – 1MHz
Recovery Time	$\leq 100\mu\text{s}$ (50% load change, minimum load 0.5A)
Output Range	0 to rating voltage continuously adjustable
CONSTANT CURRENT OPERATION	
Regulation	Line regulation $\leq 0.2\% + 3\text{mA}$ Load regulation $\leq 0.2\% + 3\text{mA}$
Ripple Current	$\leq 3\text{mA}_{\text{rms}}$
Output Range	0 to rating current continuously adjustable
METER	
Digital	3 1/2 Digits 0.5" LED display Accuracy $\pm (0.5\% \text{ of rdg} + 2 \text{ digits})$
INSULATION	
Chassis and Terminal	$20\text{M}\Omega$ or above (DC 500V)
Chassis and AC Cord	$30\text{M}\Omega$ or above (DC 500V)
POWER SOURCE	
AC 100V/120V/220V/240V $\pm 10\%$ , 50/60Hz	
DIMENSIONS	
254(W) x 152(H) x 349(D) mm	

ORDERING INFORMATION				
Model		Output Volts (V)	Output Amps (A)	Weight (kg)
GPR-1810HD	180W D.C. Power Supply	0 ~ 18	0 ~ 10	11.5
GPR-3060D	180W D.C. Power Supply	0 ~ 30	0 ~ 6	11.5
GPR-6030D	180W D.C. Power Supply	0 ~ 60	0 ~ 3	11.5
ACCESSORIES :				
User manual x 1 , Power cord x 1				
Test lead GTL-105A x 1 ( GPR-6030D )				
GTL-104A x 1 ( GPR-1810HD/3060D )				
OPTIONAL ACCESSORIES				
GRA-401 Rack Adapter Panel (19" , 4U)				



# Linear D.C. Power Supply



GPS-1830D/1850D/3030D



GPS-3030



GPS-3030DD



The GPS-Series is a single output, 54W to 90W, linear DC power supply. The GPS-Series includes both analog and digital display meters with varying power outputs. The GPS-Series features overload and reverse polarity protection as well as high regulation and low ripple/noise that are maintained at 0.01% and < 1mVrms, respectively. Continuous or dynamic internal load selection accommodates applications such as pulsed current. Remote control terminals offer programming and operation from an external device.

## SPECIFICATIONS

### CONSTANT VOLTAGE OPERATION

Regulation	Line regulation $\leq 0.01\% + 3mV$ Load regulation $\leq 0.01\% + 3mV$ (rating current $\leq 3A$ ) $\leq 0.01\% + 5mV$ (rating current $> 3A$ )
Ripple & Noise	$\leq 0.5mVrms$ 5Hz ~ 1MHz (rating current $\leq 3A$ ) $\leq 1mVrms$ 5Hz ~ 1MHz (rating current $> 3A$ )
Recovery Time	$\leq 100\mu S$ (50% load change, minimum load 0.5A)
Temp. Coefficient	$\leq 300 ppm / ^\circ C$
Output Range	0 to rating voltage continuously adjustable

### CONSTANT CURRENT OPERATION

Regulation	Line regulation $\leq 0.2\% + 3mA$ Load regulation $\leq 0.2\% + 3mA$
Ripple Current	$\leq 3mA_{rms}$
Output Range	0 to rating current continuously adjustable (Hi / Lo range switchable)

### METER

Analog	V-meter and I-meter 2.5 class Dimensions 50 x 50 mm
Digital	3 1/2 digits 0.5" LED display (GPS-1830D/1850D/3030D) 3 1/2 digits 0.39" LED display (GPS-3030DD) Accuracy $\pm (0.5\% \text{ of rdg} + 2 \text{ digits})$

### INSULATION

Chassis and Terminal	20M $\Omega$ or above (DC 500V)
Chassis and AC Cord	30M $\Omega$ or above (DC 500V)

### POWER SOURCE

AC 100V/120V/220V/240V  $\pm 10\%$ , 50/60Hz

### DIMENSIONS

128(W) x 145(H) x 285(D) mm

## FEATURES

- \* Light and Compact Design
- \* 0.01% High Regulation
- \* Constant Voltage and Constant Current Operation
- \* Remote Control for External Programmability
- \* Internal Select for Continuous or Dynamic Load
- \* Low Ripple and Noise
- \* Overload and Reverse Polarity Protection
- \* Series or Parallel Operation
- \* Optional European Type Jack Terminal for GPS-3030/GPS-3030D/GPS-3030DD

## European Type Jack Terminal



## ORDERING INFORMATION

	Model	Output Volts(V)	Output Amps(A)	Weight (kg)
GPS-3030	90W D.C. Power Supply	0 ~ 30	0 ~ 3	5
GPS-1830D	54W D.C. Power Supply	0 ~ 18	0 ~ 3	4
GPS-1850D	90W D.C. Power Supply	0 ~ 18	0 ~ 5	5
GPS-3030D	90W D.C. Power Supply	0 ~ 30	0 ~ 3	5
GPS-3030DD	90W D.C. Power Supply	0 ~ 30	0 ~ 3	5

### ACCESSORIES :

User manual x 1, Power cord x 1  
Test lead GTL-105A x 1 ( $\leq 3A$ ) or GTL-104A x 1 ( $\leq 10A$ )  
European test lead GTL-203A x 1 ( $\leq 3A$ ) or GTL-204A x 1 ( $\leq 10A$ )

# Multiple Output Programmable Linear D.C. Power Supply



## PPE-3323



### FEATURES

- \* Easy Operation with UP/DOWN Key
- \* High Resolution: 10mV, 1mA
- \* Over Voltage Protection, Over Current Protection (by Software)
- \* 50 Sets Memory
- \* Self Test and Software Calibration
- \* Auto Step Running With Timer Setting
- \* Triple Output
- \* Auto Tracking
- \* RS-232C Communication
- \* High Stability, Low Drift
- \* 4 Digit Display
- \* IEC Safety Regulation

### Rear Panel



The PPE-Series is a 3-channel, programmable linear DC power supply with 207W output. The PPE-Series features OVP and OCP and is compliant with all major safety standards (UL, CSA, and IEC) for safe, reliable operation. The digital interface and smart features simplify operation and configuration with output limit store/recall functions, tracking, serial operation, and auto stepping for continuous testing. The series has PC software and SCPI commands as standard for remote control and PC interfacing via RS-232C. The versatile PPE-Series is ideal for high-level applications requiring high resolution, multiple outputs, and an extra level of safety.

### SPECIFICATIONS

OUTPUT	
Voltage	0~32V, 0~32V, 3.3V/5V FIXED
Current	0~3A, 0~3A, 3A FIXED
OVP	0~33V, 0~33V
LOAD REGULATION	
Voltage	≤6mV
Current	≤3mA
LINE REGULATION	
Voltage	≤3mV
Current	≤3mA
RESOLUTION	
Voltage	10mV (20mV rating voltage > 36V)
Current	1mA (2mA rating current > 3.5A)
OVP	10mV (20mV rating voltage > 36V)
PROGRAM ACCURACY (25±5°C)	
Voltage	≤0.05% + 25mV ( + 50mV rating voltage > 36V )
Current	≤0.2% + 10mA
OVP	≤2% + 0.6V
RIPPLE & NOISE (20Hz ~ 20MHz)	
Voltage	Ripple 1mVrms / 3mVp-p Noise 2mVrms / 30mVp-p
Current	≤3mA rms ( ≤ 5mA rms rating current > 3.5A )
TEMPERATURE COEFFICIENT (0~40°C)	
Voltage	≤100ppm + 3mV
Current	≤150ppm + 3mA
READBACK RESOLUTION/ACCURACY (25±5°C)	
Voltage	10mV (20mV rating voltage > 36V)
Current	1mA (2mA rating current > 3.5A)
Voltage	≤0.05% + 25mV ( + 50mV rating voltage > 36V )
Current	≤0.2% + 10mA
RESPONSE TIME	
VOLTAGE UP 10% ~ 90%	≤100mS
VOLTAGE DOWN 90% ~ 10%	≤100mS ( ≥ rating load )
READBACK TEMPERATURE COEFFICIENT	
Voltage	≤100ppm + 10mV ( + 20mV rating voltage > 36V )
Current	≤150ppm + 10mA
DRIFT	
Voltage	≤100ppm + 10mV
Current	≤150ppm + 10mA
TRACK OPERATION	
Tracking Error	≤0.1% + 50mV
Series Regulation	≤50mV
PARALLEL OPERATION (PPT-Series only)	
Program Accuracy (25±5°C)	Voltage ≤0.05% + 25mV ( + 50mV rating voltage > 36V ) Current ≤0.2% + 20mA OVP ≤2% + 0.6V
Load Effect	Voltage ≤3mV rear output ( ≤ 6mV front output ) Current ≤6mA ( ≤12mA rating current > 3.5A )
Source Effect	Voltage ≤3mV; Current ≤6mA
MEMORY	
Store/Recall	50 sets
TIMER	
Setting Time	1 second ~ 99 minutes (Max. 99 minutes x 50 sets)
Resolution Function	1 second for output working loop (Auto Step running)
STANDARD INTERFACE	
RS-232C	
POWER SOURCE	
AC 100V/120V/ 220V/240V ±10%, 50/60Hz	
DIMENSIONS & WEIGHT	
255(W) x 145(H) x 346(D) mm; Approx. 10kg	

### ORDERING INFORMATION

PPE-3323 207W Triple Output Programmable D.C. Power Supply

Model	Independent	Series	Parallel	Display Type	Weight (kg)
PPE-3323	(0~32V/0~3A)x2, (5V/3A) FIXED	64V/3A	32V/6A	LED	10

ACCESSORIES :  
User manual x 1, Power cord x 1, Test lead GTL-105A x 3

### OPTIONAL ACCESSORIES

GRA-401 Rack Mount Kit

### FREE DOWNLOAD

PC Software Remote Control Software



# Multiple Output Programmable Linear D.C. Power Supply



## PPT-1830/PPT-3615



### FEATURES

- \* Easy Operation with UP/DOWN Key
- \* High Resolution: 10mV, 1mA
- \* Over Voltage Protection, Over Current Protection (PPT-Series by Hardware)
- \* 50 Sets Memory
- \* Self Test and Software Calibration
- \* Auto Step Running With Timer Setting
- \* FRONT/REAR Output and Sense Switch Selectable
- \* Triple Output
- \* Auto Series and Parallel Operation
- \* Auto Tracking
- \* IEEE-488.2 and SCPI Compatible Command set
- \* GPIB Standard Interface
- \* LabVIEW Driver
- \* High Stability, Low Drift
- \* 4 Digit Display
- \* IEC Safety Regulation

### Rear Panel



The PPT-Series a is 3-channel, programmable linear DC power supply with 138W or 126W outputs. The PPT-Series features OVP and OCP and is compliant with all major safety standards(UL, CSA, and IEC) for safe, reliable operation. For extra precision, the PPT-Series includes remote sensing that adds an extra level of precision by compensating cable losses between loads. The digital interface and smart features simplify operation and configuration with output limit store/recall functions, automatic tracking, automatic serial or parallel operation, and auto stepping for continuous testing. The series has Labview drivers and SCPI commands as standard for remote control and PC interfacing via GPIB. The versatile PPT-Series is ideal for high-level applications requiring high resolution, multiple outputs, and an extra level of safety.

### SPECIFICATIONS

SPECIFICATIONS		PPT-1830	PPT-3615
OUTPUT			
Voltage	0~18Vx2,0~6Vx1	0~36Vx2,0~6Vx1	
Current	0~3Ax2,0~5Ax1	0~1.5Ax2,0~3Ax1	
OVP	0~20Vx2,0~7Vx1	0~38.5Vx2,0~7Vx1	
LOAD REGULATION			
Voltage	≤ 3mV rear output (≤ 6mV front output )		
Current	≤ 3mA (≤ 6mA rating current > 3.5A )		
LINE REGULATION			
Voltage	≤ 3mV		
Current	≤ 3mA		
RESOLUTION			
Voltage	10mV ( 20mV rating voltage > 36V )		
Current	1mA ( 2mA rating current > 3.5A )		
OVP	10mV ( 20mV rating voltage > 36V )		
PROGRAM ACCURACY (25±5°C)			
Voltage	≤0.05% + 25mV ( + 50mV rating voltage > 36 V )		
Current	≤ 0.2% + 10mA		
OVP	≤ 2% + 0.6V		
RIPPLE & NOISE (20Hz ~ 20MHz)			
Voltage	Ripple 1mVrms / 3mVp-p Noise 2mVrms / 30mVp-p		
Current	≤3mA rms ( ≤ 5mA rms rating current > 3.5A )		
TEMPERATURE COEFFICIENT (0~40°C )			
Voltage	≤100ppm + 3mV		
Current	≤150ppm + 3mA		
READBACK RESOLUTION/ACCURACY (25± 5°C)			
Voltage	10mV ( 20mV rating voltage > 36V )		
Current	1mA ( 2mA rating current > 3.5A )		
Voltage	≤0.05% + 25mV ( + 50mV rating voltage > 36V )		
Current	≤ 0.2% + 10mA		
RESPONSE TIME			
VOLTAGE UP 10% ~ 90%	≤100mS		
VOLTAGE DOWN 90% ~ 10%	≤100mS ( ≥ rating load )		
READBACK TEMPERATURE COEFFICIENT			
Voltage	≤100ppm + 10mV ( + 20mV rating voltage > 36V )		
Current	≤150ppm + 10mA		
DRIFT			
Voltage	≤0.03% + 6mV		
Current	≤0.1% + 6mA		
TRACK OPERATION			
Tracking Error	≤0.1% + 50mV		
Series Regulation	≤50mV		
PARALLEL OPERATION			
Program Accuracy (25±5°C)	Voltage	≤ 0.05% + 25mV ( + 50mV rating voltage > 36V )	
	Current	≤ 0.2% + 20mA	
	OVP	≤ 2% + 0.6V	
Load Effect	Voltage	≤ 3mV rear output ( ≤ 6mV front output )	
	Current	≤ 6mA ( ≤12mA rating current > 3.5A )	
Source Effect	Voltage	≤ 3mV; Current ≤ 6mA	
MEMORY			
Store/Recall	50 sets		
TIMER			
Setting Time	1 second ~ 255 minutes (Max. 255 minutes x 50 sets)		
Resolution	1 second		
Function	for output working loop (Auto Step running)		
STANDARD INTERFACE			
GPIB			
POWER SOURCE			
AC 100V/120V/ 220V/240V ±10%, 50/60Hz			
DIMENSIONS & WEIGHT			
255(W) x 145(H) x 346(D) mm; Approx. 10kg			

### ORDERING INFORMATION

PPT-1830	138W Triple Output Programmable D.C. Power Supply					
PPT-3615	126W Triple Output Programmable D.C. Power Supply					
Model	Independent	Series	Parallel	Display Type	Weight (kg)	
PPT-1830	(0-18V/0-3A)x2, (0-6V/0-5A)x1	36V/3A	18V/6A	LED	10	
PPT-3615	(0-36V/0-1.5A)x2, (0-6V/0-3A)x1	72V/1.5A	36V/3A	LED	10	

#### ACCESSORIES:

User manual x 1, Power cord x 1, Test lead GTL-105A x 3, GTL-104A x 3

#### OPTIONAL ACCESSORIES

GRA-401 Rack Mount Kit  
GTL-248 GPIB Cable, Double Shielded, 2000mm

GTL-204A European test lead x 3

#### FREE DOWNLOAD

Driver LabVIEW Driver

# Multiple Output Programmable Linear D.C. Power Supply



## PST-3201/3202



### FEATURES

- \* Digitized Programmable Interface
- \* High Resolution 10mV, 1mA
- \* 192 x 128 LCD Display, Simultaneously Shows Settings and Measuring Result
- \* Over-Voltage, Over-Current, Over Temperature Protection
- \* Intelligent Fan Control (Changes by Output Power)
- \* 100 Sets Memory
- \* Auto Step Running With Timer Setting
- \* Auto Series and Parallel Function
- \* LabVIEW Driver
- \* Standard Interface : RS-232C
- \* Optional Interface : GPIB (IEEE-488.2)
- \* Optional European Jack Type Terminal

### European Type Jack Terminal



### Rear Panel



PST series is a 3-channel, 96W or 158W, programmable linear DC power supply. High resolution is maintained at 10mV, 1mA (3A). OVP, OCP, and OTP protect the PST-Series and its loads from unexpected conditions. PST-Series is capable of independent, series or parallel operation for increased flexibility. The large LCD display conveniently displays all outputs and configurations simultaneously to simplify operation. The programmable interface allows automatic stepping, 100 sets of memory and comprehensive timing operations. GPIB and RS232C interfaces, Labview drivers and SCPI compatibility allow easy ATE software development and remote control. The versatile PST-Series is ideal for high resolution, multiple output, automated operations such as production testing and rack mounting systems.

SPECIFICATIONS		
	PST-3202	PST-3201
OUTPUT		
Voltage	0~32Vx2, 0~6Vx1	0~32Vx3
Current	0~2Ax2, 0~5Ax1	0~1Ax3
OVP	0~33Vx2, 0~7Vx1	0~33Vx3
LOAD REGULATION		
Voltage	≤ 3mV (≤ 5mV rating current >3.0A)	
Current	≤ 3mA (≤ 5mA rating current >3.0A)	
LINE REGULATION		
Voltage	≤ 3mV	
Current	≤ 3mA	
RESOLUTION		
Voltage	10mV	
Current	1mA (2mA, rating current >3.0A)	
OVP	10mV	
PROGRAM ACCURACY(25 ± 5 °C)		
Voltage	≤ 0.05%+20mV	
Current	≤ 0.1%+5mA (+10mA, rating current>3.0A)	
OVP	≤ 0.05%+20mV	
RIPPLE & NOISE(20Hz~20MHz)		
Voltage	Ripple: ≤ 1mVrms/3mVp-p ; Noise: ≤ 2mVrms/30mVp-p	
Current	≤ 3mArms (≤ 5mArms, rating current >3.0A)	
TEMPERATURE COEFFICIENT (0 ~ 40 °C)		
Voltage	≤ 100ppm+3mV	
Current	≤ 100ppm+3mA	
READBACK RESOLUTION		
Voltage	10mV(20mV, rating voltage >36V)	
Current	1mA(2mA, rating current >3.0A)	
READBACK ACCURACY(25 ± 5 °C)		
Voltage	≤ 0.05%+10mV(+20mV, rating voltage >36V)	
Current	≤ 0.1%+5mA(+10mA, rating current>3.0A)	
READBACK TEMPERATURE COEFFICIENT		
Voltage	≤ 100ppm+10mV(+20mV, rating voltage >36V)	
Current	≤ 150ppm+10mA(+20mA, rating current >3.0A)	
RESPONSE TIME		
Voltage Up (10%~90%)	≤ 100mS	
Voltage Down (90%~10%)	≤ 100mS (≥ 10% rating load)	
DRIFT		
Voltage	≤ 100ppm+10mV(+20mV, rating voltage >36V)	
Current	≤ 150ppm+10mA	
TRACK OPERATION		
Tracking Error	≤ 0.1%+20mV	
Series(Load Effect)	≤ 20mV	
PARALLEL OPERATION		
Program Accuracy(25± 5 °C)	Voltage ≤ 0.05%+20mV,Current ≤ 0.1%+10mA, OVP ≤ 0.05%+20mV	
Load Effect	Voltage ≤ 3mV(≤ 5mV, rating current>3.0A); Current≤ 6mA	
Source Effect	Voltage ≤ 3mV; Current ≤ 6mA	
MEMORY		
Store/Recall	100 Sets	
TIMER		
Setting Time	0.1 second~99 Minutes 59 second (Max. 99 Minutes 59 second x 100)	
Resolution	0.1 second	
Function	Auto step running (for output working loop)	
INTERFACE		
Standard : RS-232C ; Option: GPIB (IEEE488.2)		
POWER SOURCE		
AC 100V/120V/220V± 10%, 230V(+10%/-6%), 50/60Hz		
DIMENSIONS & WEIGHT		
230(W) x 140(H) x 380(D) mm . Approx.10kg		

### ORDERING INFORMATION

PST-3202 158W Triple Output Programmable D.C. Power Supply  
PST-3201 96W Triple Output Programmable D.C. Power Supply

Model	Independent	Series	Parallel	Display Type	Weight (kg)
PST-3201	(0~32V/0~1A)x3	64V/1A	32V/2A	LCD	10
PST-3202	(0~32V/0~2A)x2, (0~6V/0~5A)x1	64V/2A	32V/4A	LCD	10

#### ACCESSORIES :

User manual x 1, Power cord x 1, Test lead: GTL-104A x 3 (PST-3202) or GTL-105A x 3 (PST-3201)  
European test lead: GTL-204A x 3 (PST-3202) or GTL-203A x 3 (PST-3201)

#### OPTION

Opt.01 GPIB Interface (factory installed)

#### OPTIONAL ACCESSORIES

GRA-407 Rack Mount Kit  
GTL-248 GPIB Cable, Double Shielded, 2000mm  
GTL-232 RS-232C Cable, 9-pin Female to 9-pin, null Modem for Computer

#### FREE DOWNLOAD

PC Software PC Software including Data Log ; Remote Control Software  
Driver LabVIEW Driver



# Multiple Output Programmable Linear D.C. Power Supply



## GPD-2303S/3303S/ 4303S/3303D



### FEATURES

- \* 2, 3 and 4 Independent Isolated Output
- \* 4 LED Display Sets : 3 Digits After Decimal Point (GPD-2303S/3303S/4303S)
- \* Minimum Resolution :  
GPD-2303S/3303S/4303S (1mV/1mA)  
GPD-3303D (100mV/10mA)
- \* Digital Panel Control (Rotary Encoder Switch, Rubber Key With Indicator)
- \* User-Friendly Operation, Coarse / Fine Volume Control
- \* 4 Sets Save / Recall
- \* Key-Lock
- \* Output ON/OFF
- \* Tracking Series and Parallel Mode
- \* Smart Cooling Fan Achieving Low Noise
- \* Compact Design
- \* PC Software & USB Driver
- \* USB Standard Interface
- \* Optional European Jack Type Terminal

### European Type Jack Terminal



### Rear Panel



The GPD-Series is a cutting edge, economical, high resolution programmable power supply, Which is equipped with 2, 3 and 4 independent output channels and support a maximum output from 180Watt to 195Watt. The power supplies include four sets of memory for voltage and current setting, a USB remote interface, high resolution (GPD-2303S / GPD-3303S / GPD-4303S) and intelligent fan control to reduce noise. The durable features along with the free output monitoring software make the GPD-Series suitable for any lab as well as the LED industry.

### SPECIFICATIONS

	GPD-2303S		GPD-3303S		GPD-4303S				GPD-3303D			
OUTPUT												
Channel	CH1	CH2	CH1	CH2	CH3	CH1	CH2	CH3	CH4	CH1	CH2	CH3
Voltage	0-30V	0-30V	0-30V	0-30V	2.5/3.3/5.0V	0-30V	0-30V	0-5V or 5.001V-10V	0-5V	0-30V	0-30V	2.5/3.3/5.0V
Current	0-3A	0-3A	0-3A	0-3A	0-3A	0-3A	0-3A	0-3A or 0-1A	0-1A	0-3A	0-3A	0-3A
CONSTANT VOLTAGE OPERATION												
Regulation	Line regulation $\leq 0.01\%+3mV$ Load regulation $\leq 0.01\%+3mV$ (rating current $\leq 3A$ ); $\leq 0.02\%+5mV$ (rating current $>3A$ )											
Ripple & Noise	$\leq 1mVrms$ (5Hz-1MHz)											
Recovery Time	$\leq 100\mu s$ (50%Load change, Minimum load 0.5A)											
Temp.Coefficient	$\leq 300ppm / ^\circ C$											
Output Range	0 to rating voltage continuously adjustable											
CONSTANT CURRENT OPERATION												
Regulation	Line regulation $\leq 0.2\%+3mA$ ; Load regulation $\leq 0.2\%+3mA$											
Ripple Current	$\leq 3mA_{rms}$											
Output Range	0 to rating current continuously adjustable											
TRACKING OPERATION												
Regulation of	Line regulation $\leq 0.01\%+3mV$											
PAR.	Load regulation $\leq 0.01\%+3mV$ (rating current $\leq 3A$ ); $\leq 0.02\%+5mV$ (rating current $>3A$ )											
Regulation of	Line regulation $\leq 0.01\%+5mV$											
SER.	Load regulation $\leq 300mV$											
Tracking Error	$\leq 0.5\%\pm 10mV$ (10 ~ 30V no load) with load added $\leq 300mV$ $\leq 0.5\%\pm 30mV$ (0 ~ 9.99V no load) with load added $\leq 300mV$											
METER												
Tracking error	$\leq 0.5\% + 10mV$								$\leq 0.5\% + 50mV$			
Display	Voltage: 4 3/4 digits 0.4" LED Display Current: 3 3/4 digits 0.4" LED Display								Voltage:2 3/4 digits 0.4" LED Display Current:2 3/4 digits 0.4" LED Display			
Resolution	Voltage: 1mV Current: 1mA								Voltage:100mV Current:10mA			
Program	Voltage: $\pm(0.03\%$ of RDG +10 digits)								Voltage: $\pm(0.5\%$ of RDG+2 digits)			
Accuracy(25 $\pm$ 5 $^\circ$ C)	Current: $\pm(0.3\%$ of RDG +10 digits)								Current: $\pm(0.5\%$ of RDG+2 digits)			
Readback	Voltage: $\pm(0.03\%$ of RDG +10 digits)								Voltage: $\pm(0.5\%$ of RDG+2 digits)			
Aaccuracy(25 $\pm$ 5 $^\circ$ C)	Current: $\pm(0.3\%$ of RDG +10 digits)								Current: $\pm(0.5\%$ of RDG+2 digits)			
CH3 SPECIFICATIONS												
Output Voltage	( 2.5V/3.3V/5V ) $\pm 8\%$				0-5V / 5-10V				( 2.5V/3.3V/5V ) $\pm 8\%$			
Output Current	3A				0-3A / 0-1A				3A			
Regulation	Line regulation $\leq$				Line regulation $\leq$				Line regulation $\leq$			
(25 $\pm$ 5 $^\circ$ C )	0.01%+3mV				0.01%+3mV				0.01%+3mV			
	Load regulation $\leq$				Load regulation $\leq$				Load regulation $\leq$			
	0.01%+3mV				0.01%+3mV				0.01%+3mV			
Repple & Noise	$\leq 1mVrms$ (5Hz-1MHz)				$\leq 2mVrms$ (5Hz-1MHz)				$\leq 1mVrms$ (5Hz-1MHz)			
KEY LOCK												
Yes												
MEMERY SAVE/RECALL												
4 sets												
POWER SOURCE												
AC100V/120V/220V/230V $\pm 10\%$ , 50/60Hz												
DIMENSION & WEIGHT												
210(W) x 130 (H) x 265(D) mm ; Approx. 7kg												

### ORDERING INFORMATION

GPD-2303S GPD-2303S 2 Channels, 180W Programmable Linear DC Power Supply  
GPD-3303S GPD-3303S 3 Channels, 195W Programmable Linear DC Power Supply  
GPD-4303S GPD-4303S 4 Channels, 195W Programmable Linear DC Power Supply  
GPD-3303D GPD-3303D 3 Channels, 195W Programmable Linear DC Power Supply

#### ACCESSORIES :

User Manual x 1, Power cord x 1

GPD-2303S Test Lead GTL-104A x 2, European Test Lead GTL-204Ax2, GTL-201A x 1

GPD-3303S Test Lead GTL-104A x 2, GTL-105A x 1; European Test Lead GTL-203A x 1, GTL-204A x 2, GTL-201A x 1

GPD-4303S Test Lead GTL-104A x 2, GTL-105A x 2; European Test Lead GTL-203A x 2, GTL-204A x 2, GTL-201A x 1

GPD-3303D Test Lead GTL-104A x 2, GTL-105A x 1; European Test Lead GTL-203A x 1, GTL-204A x 2, GTL-201A x 1

#### OPTIONAL ACCESSORIES

GTL-246 USB Cable

#### FREE DOWNLOAD

PC Software PC Software including Data Log  
Driver Labview Driver



# Multi-output Programmable D.C. Power Supply



## GPP-Series

NEW



### FEATURES

- \* 4.3" TFT LCD Display
- \* Supports Setting Value, Measurement Value and Output Waveform Display
- \* Load Function (CC, CV, CR Mode)
- \* Setting Resolution: 1mV/0.1mA ; Read Back Resolution: 0.1mV/0.1mA
- \* Low Ripple Noise:  $\leq 350\mu\text{Vrms}/\leq 2\text{mArms}$
- \* Transient Response Time:  $\leq 50\mu\text{s}$
- \* Tracking Series and Parallel Function without Additional External Wiring
- \* Utilizing Hardware to Realize Over Voltage Protection/Over Current Protection/Over Temperature Protection
- \* Delay Function/Output Monitoring Function/ Output Recorder Function
- \* Intelligent Temperature Control Fan Effectively Reduces Noise
- \* Sequential Output Function and Built-in 8 Template Waveforms
- \* The Output Recorder Function Records The Output Voltage & Current Parameters with A Minimum Recording Interval of 1 Second
- \* Provides 10 Sets of Memory for Each Sequence /Delay/Recorder/Panel Setting Condition
- \* GPP-3323 Supports A USB(Type A) Output Terminal
- \* Standard: RS-232, USB, Ext I/O; Optional (Manufacturer Installed Only) : LAN, GPIB+LAN
- \* Compatible with Commands of GPD-X303S Series

With the maximum output power of 217W, the GPP-Series, the multi-channel programmable DC power supply, includes four models: GPP-1326 (0-32V/0-6A) for single-channel output and GPP-2323 for dual-channel output (CH1: 0-32V/0-3A, CH2: 0-32V/0-3A), GPP-3323 for three-channel output (CH1: 0-32V/0-3A, CH2: 0-32V/0-3A, CH3: 1.8V, 2.5V, 3.3V, 5.0V/5A) and GPP-4323 for four-channel output (CH1: 0-32V/0-3A, CH2: 0-32V/0-3A, CH3: 0-5V/0-1A, CH4: 0-15V/0-1A). This series not only provides high program resolution (1mV/0.1mA) and read back resolution (0.1mV/0.1mA), but also features optimal low-ripple noise characteristics  $\leq 350\mu\text{Vrms}/\leq 2\text{mArms}$  and output transient recovery capability  $\leq 50\mu\text{s}$ . Independent output on-off switch is provided for each channel.

For series and parallel applications of CH1 and CH2, the tracking function of the GPP-Series utilizes the internal circuit to automatically switch the output to serial or parallel output without additional external wiring, providing users with convenience not only in operating procedures but also a more stable output. The tracking function design of other brands requires additional external wiring connections for the output in series or parallel. However, excessively long, thin or inconsistent external wiring may cause inaccurate voltage or current output.

The GPP-Series offers a variety of display modes, including single or multi-channel setting values, measurement values, and waveform displays. The Monitor function of the GPP-Series allows users to set monitoring conditions according to requirements, sound alarms or stop output during the measurement process, and stop measurement and protect the customer's DUT. The GPP-Series provides output recorder function, which records the voltage/current of the output process to the internal memory, and the result can be stored as a (\*.REC) or (\*.CSV) file, which can then be transferred to the USB flash drive. The stored \*.CSV can be exported to the Excel to conduct the future analysis.

The CH1/CH2 of the GPP-Series are designed with the load function. A single power supply can set one channel as the power output, and one channel for the load function to consume the power of the DUT so as to meet the basic charging and discharging test requirements for battery. Channel 1 and channel 2 not only provide 32V/3A power output, but also feature built-in maximum 32V constant voltage load (CV), maximum 3.2A constant current load (CC) and maximum 1k $\Omega$  constant resistance load (CR) function.

The GPP-Series provides the sequential output function on Channel 1 and Channel 2. This function not only allows users to edit the power output waveform, but also allows users to set the sequential constant voltage (CV) or constant current (CC) load waveform, i.e. a serial power output or a simulation test of a dynamic load. In order to simplify the setting of waveform editing, the GPP-Series has 8 built-in Template waveforms in the sequence output function for users to directly apply for output, including Sine, Pulse, Ramp, Stair Up, Stair Dn, Stair UpDn, Exp Rise, Exp Fall waveforms.

The sound protection functions include OVP/OCPP/OPP/OTP, in which the protection mechanism for OVP/OCPP/OTP is implemented by hardware circuit that has the advantage of faster response time compared with competitors who adopt software to achieve protections. The OVP/OCPP functions allow users to set the protection action point (except CH3 of GPP-3323) according to the conditions of the DUT. The OPP is only activated during the operation of the load function. The Delay Function sets the length of time during channel 1 or channel 2 power output on or during power output off.

In addition, the Trigger In/ Trigger Out functions synchronize external devices. The GPP-3323 channel 3 adds a 3A USB (Type A) output terminal for USB charging test. The intelligent temperature-controlled fan can adjust the speed according to the temperature of the power transistor so as to reduce unnecessary noise. The output value setting and the Sequence/Delay/Recorder functions provide 10 sets of internal memory for use, and can be loaded/stored using a USB flash drive. In addition to the standard RS-232 and USB remote interfaces, the GPP-Series also has an optional LAN or LAN+GPIB interface to facilitate different requirements. The commands of the GPP-Series conform to SCPI requirements and are compatible with the commands of the GPD-X303S Series.

### SPECIFICATIONS

	GPP-4323				GPP-3323			GPP-2323		GPP-1326
OUTPUT MODE										
Number of Channel	CH1	CH2	CH3	CH4	CH1	CH2	CH3	CH1	CH2	CH1
Voltage	0~32V	0~32V	0~5V	0~15V	0~32V	0~32V	1.8/2.5/3.3/5.0V	0~32V	0~32V	0~32V
Current	0~3A	0~3A	0~1A	0~1A	0~3A	0~3A	5A	0~3A	0~3A	0~6A
Tracking Series Voltage	0~64V		—		0~64V		—	0~64V		—
Tracking Parallel Current	0~6A				0~6A			0~6A		
CONSTANT VOLTAGE OPERATION										
Line Regulation	≤0.01%+3mV									
Load Regulation	≤0.01%+3mV(rating current ≤3A); ≤0.02%+5mV(rating current >3A)									
Ripple & Noise(5Hz~1MHz)	≤350μVrms		≤1mVrms		≤350μVrms		≤2mVrms	≤350μVrms		≤500μVrms
Recovery Time	≤50μs		≤50μs		≤50μs		≤100μs	≤50μs		≤100μs
CONSTANT CURRENT OPERATION										
Line Regulation	≤0.2%+3mA									
Load Regulation	≤0.2%+3mA									
Ripple & Noise	≤2mArms				≤2mArms			≤2mArms		≤4mArms
PROGRAMMING RESOLUTION										
Voltage	1mV				1mV		—	1mV		1mV
Current	0.1mA				0.1mA			0.1mA		0.2mA
TRACKING OPERATION (CH1,CH2)										
Tracking Error	≤0.1%+10mV of Master(0~32V, No Load, with Load add Load regulation≤100mV)									
Parallel Regulation	Line : ≤0.01%+3mV Load : ≤0.01%+3mV(rating current≤3A); ≤0.02%+5mV(rating current >3A)									
Series Regulation	Line : ≤0.01%+5mV ; Load : ≤100mV									
Ripple & Noise	≤1mVrms, 5Hz ~ 1MHz									
CH3 OPERATION FOR (GPP-3323)										
Output Voltage	1.8V/2.5V/3.3V/5.0V, ±5%									
Output Current	5A									
Line Regulation	≤3mV									
Load Regulation	≤5mV									
Ripple & Noise	2mVrms(5Hz~1MHz)									
Transient Recovery Time	100μs									
USB Port Output	1.8V/2.5V/3.3V/5.0V, ±0.35V, 3A									



# Multi-output Programmable D.C. Power Supply

Rear Panel (LAN+GPIB)



Rear Panel (LAN)



Rear Panel



GPP-1326



GPP-2323



GPP-3323



GPP-4323

## SPECIFICATIONS

	GPP-4323		GPP-3323		GPP-2323	GPP-1326
METER						
Voltage Resolution	0.1mV		0.1mV		0.1mV	0.1mV
Current Resolution	0.1mA		0.1mA		0.1mA	0.2mA
Setting Accuracy	$\leq \pm(0.03\%+10\text{mV})$ $\leq \pm(0.30\%+10\text{mA})$		$\leq \pm(0.03\%+10\text{mV})$ $\leq \pm(0.30\%+10\text{mA})$	—	$\leq \pm(0.03\%+10\text{mV})$ $\leq \pm(0.30\%+10\text{mA})$	$\leq \pm(0.03\%+10\text{mV})$ $\leq \pm(0.30\%+10\text{mA})$
Readback Accuracy	$\leq \pm(0.03\%+10\text{mV})$ $\leq \pm(0.30\%+10\text{mA})$		$\leq \pm(0.03\%+10\text{mV})$ $\leq \pm(0.30\%+10\text{mA})$		$\leq \pm(0.03\%+10\text{mV})$ $\leq \pm(0.30\%+10\text{mA})$	$\leq \pm(0.03\%+10\text{mV})$ $\leq \pm(0.30\%+10\text{mA})$
DC LOAD CHARACTERISTIC						
Channel	2		2		2	1
Display Power	0~50.00W		0~50.00W		0~50.00W	0~100.00W
Display Voltage	1~33.00V		1~33.00V		1~33.00V	1~33.00V
Display Current	0~3.200A		0~3.200A		0~3.200A	0~6.200A
CV Mode Setting Range	1.500V~33.00V		1.500V~33.00V		1.500V~33.00V	1.500V~33.00V
Resolution	10mV		10mV		10mV	10mV
Set Accuracy	$\leq 0.1\%+30\text{mV}$		$\leq 0.1\%+30\text{mV}$		$\leq 0.1\%+30\text{mV}$	$\leq 0.1\%+30\text{mV}$
Read Accuracy	$\leq 0.1\%+30\text{mV}$	—	$\leq 0.1\%+30\text{mV}$	—	$\leq 0.1\%+30\text{mV}$	$\leq 0.1\%+30\text{mV}$
CC Mode Setting Range	0~3.200A		0~3.200A		0~3.200A	0~6.200A
Resolution	1mA		1mA		1mA	1mA
Set Accuracy	$\leq 0.3\%+10\text{mA}$		$\leq 0.3\%+10\text{mA}$		$\leq 0.3\%+10\text{mA}$	$\leq 0.3\%+10\text{mA}$
Read Accuracy	$\leq 0.3\%+10\text{mA}$		$\leq 0.3\%+10\text{mA}$		$\leq 0.3\%+10\text{mA}$	$\leq 0.3\%+10\text{mA}$
CR Mode Setting Range	1~1k $\Omega$		1~1k $\Omega$		1~1k $\Omega$	1~1k $\Omega$
Resolution	1 $\Omega$		1 $\Omega$		1 $\Omega$	1 $\Omega$
Set Accuracy	$\leq 0.3\%+1\Omega$		$\leq 0.3\%+1\Omega$		$\leq 0.3\%+1\Omega$	$\leq 0.3\%+1\Omega$
Read Accuracy	(Voltage $\geq 0.1\text{V}$ and current $\geq 0.1\text{A}$ )		(Voltage $\geq 0.1\text{V}$ and current $\geq 0.1\text{A}$ )		(Voltage $\geq 0.1\text{V}$ and current $\geq 0.1\text{A}$ )	(Voltage $\geq 0.1\text{V}$ and current $\geq 0.1\text{A}$ )
INSULATION						
Chassis and Terminal	20M $\Omega$ or above (DC 500V)					
Chassis and AC Cord	30M $\Omega$ or above (DC 500V)					
ENVIRONMENT CONDITION						
Operation Temp	0~40 $^{\circ}\text{C}$					
Storage Temp	-10~70 $^{\circ}\text{C}$					
Operating Humidity	$\leq 80\% \text{ RH}$					
Storage Humidity	$\leq 70\% \text{ RH}$					
EXTERNAL CONTROL						
Yes						
INTERFACE						
Std: RS-232/USB(CDC), Opt(Manufacturer installed only): LAN/ GPIB+LAN						
POWER SOURCE						
AC100V/120V/220V/230V $\pm 10\%$ , 50/60Hz						
DIMENSION & WEIGHT						
213(W) x 145 (H) x 312(D) mm ; Approx. 7.5kg						

## OPERATING RANGE

Model Number	Number of Outputs	CH1	CH2	CH3	CH4
GPP-1326	1	0-32V/0-6A			
GPP-2323	2	0-32V/0-3A	0-32V/0-3A		
GPP-3323	3	0-32V/0-3A	0-32V/0-3A	1.8V/2.5V/3.3V/5V/5A	
GPP-4323	4	0-32V/0-3A	0-32V/0-3A	0-5V/0-1A	0-15V/0-1A

## OUTPUT FUNCTION LIST

Model Number	GPP-4323			
	GPP-3323			
	GPP-2323			
Number of Outputs	CH1	CH2	CH3	CH4
Sequence Output Function	✓	✓		
Load Functions (CC, CV, CR mode)	✓	✓		
Output Delay Function	✓	✓		
Output Monitoring Monitor(10 sets)	✓	✓	(GPP-1326 not supported)	✓
Output Recorder Function	✓	✓	(GPP-1326 not supported)	✓
Panel Save/Recall	✓	✓	✓	✓

## ORDERING INFORMATION

GPP-1326	(32V/6A) Single-Output Programmable DC Power Supply
GPP-2323	(32V/3A*2) Dual-Output Programmable DC Power Supply
GPP-3323	(32V/3A*2; 1.8V or 2.5V or 3.3V or 5V/5A*1) Three-Output Programmable DC Power Supply
GPP-4323	(32V/3A*2; 5V/1A; 15V/1A) Four-Output Programmable DC Power Supply
<b>ACCESSORIES :</b>	
User Manual x 1 , Power cord x 1	
GPP-1326	Test Lead GTL-104A x 1, GTL-105A x 1
GPP-4323	Test Lead GTL-104A x 2, GTL-105A x 2
<b>European Test Leads :</b>	
GPP-1326	GTL-203A x 1, GTL-204A x 1, GTL-201A x 1
GPP-4323	GTL-203A x 2, GTL-204A x 2, GTL-201A x 1
GPP-2323	Test Lead GTL-104A x 2
GPP-3323	Test Lead GTL-104A x 3
GPP-2323	GTL-204A x 2, GTL-201A x 1
GPP-3323	GTL-204A x 3, GTL-201A x 1

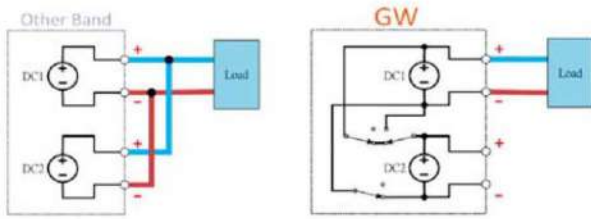
## OPTIONAL ACCESSORIES

GTL-246	USB Cable	GRA-437-J	Rack Mount Kit (JIS)	GRA-437-E	Rack Mount Kit (EIA)
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## OPTIONS (Manufacturer Installed Only)

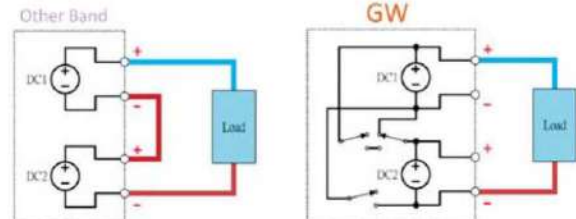
LAN Interface; GPIB+LAN Interface

## A. TRACKING SERIES AND PARALLEL FUNCTION



Output in Parallel Connections

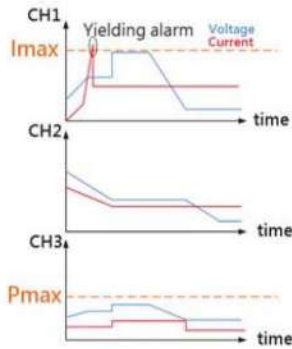
For series and parallel applications of CH1 and CH2, the tracking function of the GPP-Series utilizes the internal circuit to automatically switch the output to serial or parallel output without additional external wiring, providing users with convenience not only in operating procedures but also a more stable output.



Output in Series Connections

The tracking function design of other brands requires additional external wiring connections for the output in series or parallel. However, excessively long, thin or inconsistent external wiring may cause inaccurate voltage or current output.

## B. OUTPUT MONITORING FUNCTION



Output Monitoring

The output monitoring function allows users to set the monitoring conditions according to the requirements, including the voltage, current, and power greater than or less than the setting and the logical relationship of AND, OR. It also allows users to sound



Monitoring Function Setting

alarms or stop the output during the measurement process, stop the measurement, and protect the customer's DUT. Each Channel could be monitored simultaneously as well.

\* Channel 3 of GPP-3323 does not support the output monitoring function.

## C. SEQUENCE OUTPUT FUNCTION



Output Waveform of the GPP-X323 Series

The GPP-Series provides a sequential output function on Channel 1 and Channel 2. This function not only allows users to edit the power output waveform, but also allows users to set the sequential constant voltage (CV) or constant current (CC) load waveform, i.e. a serial power output or a simulation test of a dynamic load. The maximum settable points for sequence function are 2048, and interval range of each point can be set from 1 to 300 seconds. In order to simplify the setting of waveform editing, the GPP-Series has 8 built-in Templet waveforms in sequence output function for

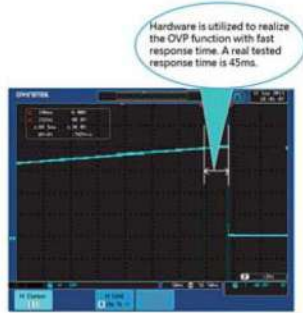
users to directly apply for output, including Sine, Pulse, Ramp, Stair Up, Stair Dn, Stair UpDn, Exp Rise, and Exp Fall waveforms.

The editing data of the sequence output can be stored in the internal 10 sets of the memory, or to be saved by USB flash drive (Save/Recall) and saved as \*.SEQ or \*.CSV file; The stored \*.CSV can be exported into Excel for editing and analysis. The final edited file can be imported to (Save/Recall) of the power supply using a USB flash drive.



# Multi-output Programmable D.C. Power Supply

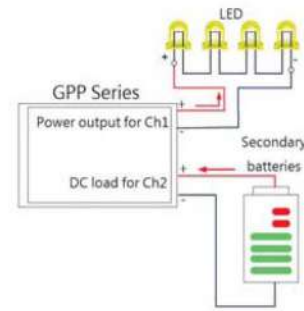
## D. HARDWARE PROTECTION FUNCTION(OVP/OCV/OTP)



OVP Trigger

The protection mechanism of OVP/OCV/OTP is implemented by hardware circuit, which has the advantage of faster response time than competitors who use software to achieve protection. When it is detected that the voltage of the DUT exceeds the setting value of the OVP, the output of the power supply can be stopped in a short time to achieve the purpose of protecting the DUT.

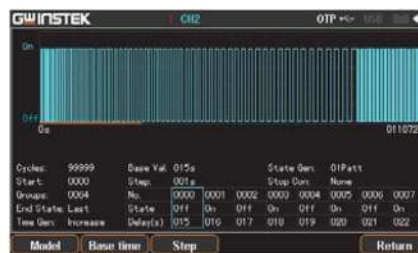
## E. LOAD FUNCTION



GPP-Series Application

The CH1/CH2 of the GPP-Series is designed with the load function. A single power supply can meet the basic battery charging and discharging test requirements. It can provide 32V/3A power output in channel 1 and channel 2. The maximum 32V constant voltage load (CV), maximum 3.2A constant current load (CC) and maximum 1kΩ constant resistance load (CR) function are built-in to allow users do conduct discharging test without using an electronic load. In application, users can also set either that one channel of the single GPP series as the power output, one channel as the load function to consume the power of the DUT, or that both channels as load functions to consume the power of different loads simultaneously.

## F. OUTPUT DELAY FUNCTION

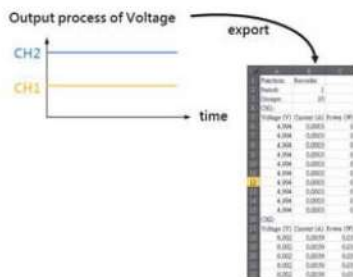


GPP-Series Delayed Waveform

Output delay function allows users to edit the timing waveform of the power output on/off when the front panel voltage and current settings are unchanged. In order to simplify the setting of waveform editing, the GPP-Series has three built-in timing modes in the delay output function, including Fixtime, Increase, Decline for users to apply directly. The editing data of the output delay can be stored in

the internal 10 sets of memory, or to be saved by USB flash drive (Save/Recall) and saved as \*.DLY or \*.CSV file. The stored \*.CSV can be exported into Excel for editing and analysis. The final edited file can be exported to (Save/Recall) of the power supply using a USB flash drive.

## G. OUTPUT RECORDER FUNCTION



Schematic Diagram for Recorder Function

The output recorder function records the voltage & current parameters of the output process. The recording interval of each point can be set according to user's requirements, and the shortest interval is 1 second and the longest is 300 seconds. The results can be stored in \*.REC or \*.CSV format to the power supply or directly



Recorder Function Setting



Save as \*.REC

saved in the USB flash drive. The stored \*.CSV can be exported into Excel to conduct the future analysis. (\*.REC can be saved to 2018 records, \*.CSV can be saved to 614400 records)

\* Channel 3 of GPP-3323 does not support the output recorder function

# Multiple Output Dual Range D.C. Power Supply



## SPD-3606



### FEATURES

- \* Three Independent, Isolated Output
- \* CH1/CH2 : Dual Output Range of 30V/6A or 60V/3A
- \* CH3 Adjustable Output : 0.1~5V/3A
- \* High Efficiency Power Conversion (Up to 25% Than Traditional Power Supply)
- \* Remote Output On/Off Control
- \* OVP to Protect the DUT
- \* OTP to Protect SPD-3606 for Reducing the Repair Rate
- \* Automatically Switches AC 115V/230V Source
- \* Full Safety Design: Reverse Polarity, CH3 Overload Protection, Safe Output Setting , C.C./C.V. Mode
- \* Compact Size, Light Weight
- \* Low Fan Acoustic Noise with Fan Speed Control Circuit
- \* Voltage/Current Protection Knob(Optional)
- \* Optional European Jack Type Terminal

### European Type Jack Terminal



### Rear Panel



### GPS-001

#### Voltage/Current protection Knob



The SPD-3606 DC power supply provides 375W output capacity, three isolated outputs with dual-range for CH1 & CH2, highly efficient power conversion, low noise, high reliability, thorough protection, excellent value and a compact size. SPD-3606 creates a new bench mark for satisfying mainstream power supply demands. CH1 & CH2 offer dual-range output either at 30V/6A or 60V/3A per channel to accommodate a wide range of applications. SPD-3606 supports series and parallel tracking, allowing the CH1 and CH2 to be internally connected in series or parallel providing flexible output (30V/12A, 60V/6A, or 120V/3A). High power density and high power conversion efficiency lets SPD-3606 consume less energy making for a greener power supply. In addition, the high power density makes SPD-3606 weigh less than half and occupy much less space compared to linear power supplies. To avoid damage caused by improper operation, it also has OVP and OTP. The dual range AC input accepts both 115V and 230V inputs. When the instrument is on, devices can be connected and voltage/current levels can be adjusted safely from the front panel by turning off the output using the Output on/off key. The optional voltage/current protection knobs can be used to prevent accidentally changing the output levels. These knobs are useful for automated testing at fixed output levels, such as in assembly lines or product inspections.

### SPECIFICATIONS

#### OUTPUT RATINGS

CH1/CH2 Independent	0 ~ 30V / 0 ~ 6A ; 0 ~ 60V / 0 ~ 3A
CH1/CH2 Series	0 ~ 60V / 0 ~ 6A ; 0 ~ 120V / 0 ~ 3A
CH1/CH2 Parallel	0 ~ 30V / 0 ~ 12A ; 0 ~ 60V / 0 ~ 6A
CH3	0.1 ~ 5V / 3A

#### VOLTAGE REGULATION

Line	$\leq 0.01\% + 3\text{mV}$
Load	$\leq 0.01\% + 5\text{mV}$ (rating current $\leq 6\text{A}$ ) $\leq 0.01\% + 8\text{mV}$ (rating current $\leq 12\text{A}$ )
Ripple & Noise	$\leq 5\text{mVrms}$ (5Hz ~ 1MHz) ; $\leq 50\text{mVpp}$ (20Hz ~ 20MHz)
Recovery Time	$\leq 100\mu\text{s}$ (50% load change, minimum load 0.5A)

#### CURRENT REGULATION

Line	$\leq 0.2\% + 3\text{mA}$
Load	$\leq 0.2\% + 3\text{mA}$
Ripple & Noise	$\leq 3\text{mA rms}$

#### TRACKING OPERATION

Tracking Error	$\leq 0.5\% + 10\text{mV}$ of master
Series Regulation	$\leq 300\text{mV}$
Ripple & Noise	$\leq 10\text{mVrms}$ (5Hz ~ 1MHz) ; $\leq 100\text{mVpp}$ (20Hz ~ 20MHz)

#### OUTPUT ON/OFF RESPONSE TIME

Voltage Up (10% ~ 90%)	$\leq 100\text{ms}$ ( $\leq 95\%$ rating load)
Voltage Down (90% ~ 10%)	$\leq 100\text{ms}$ ( $\geq 10\%$ rating load)

#### OVP

Accuracy	$\pm (0.5\% \text{ of reading} + 0.5\text{V})$
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#### METER

Type	3 1/2 digit 0.5" LED display
Accuracy	$\pm (0.5\% \text{ of reading} + 2 \text{ digits})$
Resolution	100mV/10mA

#### INSULATION

Chassis & Terminal	100M $\Omega$ or above (DC 1000V)
Chassis & AC code	100M $\Omega$ or above (DC 1000V)

#### TEMPERATURE COEFFICIENT

Voltage	$\leq 100\text{ppm}/^\circ\text{C} + 3\text{mV}$
Current	$\leq 150\text{ppm}/^\circ\text{C} + 3\text{mA}$

#### REMOTE CONTROL

Output On/Off

#### FAN NOISE

$\leq 50\text{dB}$

#### OPERATION ENVIRONMENT

Ambient temperature 0 ~ 40 $^\circ\text{C}$  ; Relative humidity  $\leq 80\%$

#### STORAGE ENVIRONMENT

Ambient temperature -10 ~ 70 $^\circ\text{C}$  ; Relative humidity  $\leq 70\%$

#### POWER SOURCE

AC 115V/230V $\pm 15\%$ , 50/60Hz

#### DIMENSIONS & WEIGHT

255 (W) x 145 (H) x 265 (D) mm ; Approx. 6kg

### ORDERING INFORMATION

**SPD-3606** Multiple Output Dual Range D.C. Power Supply

#### ACCESSORIES :

User manual x 1, Power cord x 1, Test lead GTL-104A x 2, GTL-105A x 1  
European Test Lead GTL-201A x 1, GTL-203A x 1, GTL-204A x 2

#### OPTIONAL ACCESSORIES

**GPS-001** Voltage/Current protection Knob



# Multiple Output Linear D.C. Power Supply



## GPE-X323 Series



### FEATURES

- \* 1/2/3/4 Independent Isolated Output
- \* 4.3 Inch LCD Display
- \* Setting & Read Back Resolution 100mV/10mA (\*1)
- \* Output ON/OFF Switch
- \* Analog Control (Remote I/O) for Output ON/OFF
- \* Set View Function for Checking an Original V/I Setting During Output On
- \* Key Lock Function
- \* Tracking Series and Parallel Operation
- \* Smart Cooling Fan Achieving Low Noise
- \* Optional European Jack Type Terminal

The GPE-X323 series is a cutting edge, economical linear DC Power supply. The GPE-X323 series features output power from 192 to 217 watts, three independent isolated output channels (for GPE-3323), high resolution, low noise, high reliability, and compact size. The GPE-X323 series has a built-in digital panel control design to replace conventional control method. This unique design allows the GPE-X323 series linear DC power supply to provide users with more efficient functionalities, including set view and key lock so as to expedite the operation process. The key lock function protects DUTs by preventing others from changing voltage and current parameters. Additionally, output key light facilitates users in clearly reading the operational status of power supply.

### SPECIFICATIONS

		GPE-4323				GPE-3323			GPE-2323		GPE-1326
OUTPUT MODE											
Number of Channel	CH1	CH2	CH3	CH4	CH1	CH2	CH3	CH1	CH2	CH1	
Voltage	0~32V	0~32V	0~5V	0~15V	0~32V	0~32V	5V	0~32V	0~32V	0~32V	
Current	0~3A	0~3A	0~1A	0~1A	0~3A	0~3A	5A	0~3A	0~3A	0~6A	
Tracking Series Voltage	0~64V		-		0~64V		-	0~64V		-	
Tracking Parallel Current	0~6A				0~6A			0~6A			
CONSTANT VOLTAGE OPERATION											
Line Regulation	≤0.01%+3mV										
Load Regulation	≤0.01%+3mV(rating current ≤3A) ≤0.02%+5mV(rating current >3A)										
Ripple & Noise	≤1mVrms(5Hz~1MHz)										
Recovery Time	≤100μs(50% Load Change, minimum load 0.5A)										
CONSTANT CURRENT OPERATION											
Line Regulation	≤0.2%+3mA										
Load Regulation	≤0.2%+3mA										
Ripple & Noise	≤3mA <sub>rms</sub>										
TRACKING OPERATION (CH1,CH2)											
Tracking Error	≤0.1%+10mV of Master(0~32V) No Load , with Load add load regulation≤100mV										
Parallel Regulation	Line : ≤0.01%+3mV Load : ≤0.01%+3mV(rating current≤3A) ≤0.02%+5mV(rating current>3A)										
Series Regulation	Line : ≤0.01%+5mV Load : ≤100mV										
Ripple & Noise	≤2mVrms , 5Hz ~ 1MHz										
CH3 OPERATION FOR (GPE-3323)											
Output Voltage	5.0V, ±5%										
Output Current	5A										
Line Regulation	≤3mV										
Load Regulation	≤5mV										
Ripple & Noise	1mVrms(5Hz~1MHz)										
METER											
Voltage Resolution	100mV (*1)										
Current Resolution	10mA (*1)										
Setting Accuracy	Voltage±(0.1% of reading +30mV); Current±(0.3% of reading +6mA)										
Readback Accuracy	Voltage±(0.1% of reading +30mV); Current±(0.3% of reading +6mA)										
INSULATION											
Chassis and Terminal	20MΩ or above (DC 500V)										
Chassis and AC Cord	30MΩ or above (DC 500V)										
ENVIRONMENT CONDITION											
Operation Temp	0~40℃										
Storage Temp	-10~70℃										
Operating Humidity	≤80% RH										
Storage Humidity	≤70% RH										
OTHER											
Power Source	AC100V/120V/220V±10%; 230V(+10%~-6%); 50/60Hz										
Dimensions & Weight	210(W)x 155(H) x 306(D) mm ; Approx. 7kg										



## GPE-X323 Series

### ORDERING INFORMATION

**GPE-1326** Single Channel, 192W Linear DC Power Supply

**GPE-2323** 2 Channels, 192W Linear DC Power Supply

**GPE-3323** 3 Channels, 217W Linear DC Power Supply

**GPE-4323** 4 Channels, 212W Linear DC Power Supply

#### ACCESSORIES :

User Manual (CD) x 1 ; Power Cord x 1

**GPE-1326** Test Lead GTL-104A x 1 ; GTL-105A x 1 ; or European GTL-204A x 1, GTL-203A x 1

**GPE-2323** Test Lead GTL-104A x 2 ; or European GTL-204A x 2

**GPE-3323** Test Lead GTL-104A x 3 ; or European GTL-204A x 3

**GPE-4323** Test Lead GTL-104A x 2 ; GTL-105A x 2 or European GTL-204A x 2 , GTL-203A x 2

Note : (\*1) For a higher resolution (10mV/1mA), please follow the setting procedure of the user manual on p35.  
When using a higher resolution, the current or voltage adjustment may be limited by the knob sensibility.

### A. TRACKING SERIES AND PARALLEL OPERATION

In addition to independent output channels, the GPE-X323 series provides tracking series and parallel operation (For GPE-2323/GPE-3323/GPE-4323). The series and parallel connections allow power supplies to output 32V/6A (Parallel Connection) and 64V/3A (Series Connection).



Internal connection for tracking Series and Parallel operation via control panel

### B. CONVENIENT FUNCTION

The GPE-X323 series has a built-in set view and key lock so as to expedite the operation process. The key lock function protects DUTs by preventing others from changing voltage/current parameters.



The key lock function prevent DUTs from unnecessary damages caused by mis-operation.

### C. REMOTE I/O FOR OUTPUT ON/OFF FUNCTION

The GPE-X323 Series also provides the analog control (Remote I/O) function for external output On/Off control.



For controlling the output On/Off function through the specific pin assignment of remote control connector which is in rear panel.

### Rear Panel



### European Type Jack Terminal





# Multiple Output Linear D.C. Power Supply



## GPS-2303/3303/4303



### FEATURES

- \* 2, 3 and 4 Independent Isolated Output
- \* Four "3 Digits" LED Displays
- \* 0.01% Load and Line Regulation
- \* Low Ripple and Noise
- \* Tracking Operation and Auto Series/Parallel Operation
- \* Output ON/OFF Switch
- \* Output Voltage and Current Setting When Output Disable (Except for GPS-2303)
- \* Fan Speed Control Circuit to Minimize Fan Noise
- \* Over Load and Reverse Polarity Protection
- \* Optional European Jack Type Terminal

### European Type Jack Terminal



### GPS-001

#### Voltage/Current protection Knob



### Rear Panel



GPS-3303

The GPS Series linear power supplies have 2-4 independent output channels, 180W to 200W output, overload and reverse polarity protection as well as an output ON/OFF switch for safety. The tracking mode switches allow voltage/current to be output in parallel or series and the intelligent fan reduces noise. The GPS-Series is an entry level general purpose power supply recognized for their affordability in education, laboratories and industry.

SPECIFICATIONS											
		GPS-4303				GPS-3303			GPS-2303		
OUTPUT MODE											
		CH1	CH2	CH3	CH4	CH1	CH2	CH3	CH1	CH2	
Voltage		0 ~ 30V		2.2 ~ 5.2V		8 ~ 15V		0 ~ 30V	5V Fixed		0 ~ 30V
Current		0 ~ 3A		1A Max.		1A Max.		0 ~ 3A	3A Max.		0 ~ 3A
Tracking Series Voltage		0 ~ 60V				0 ~ 60V			0 ~ 60V		
Tracking Parallel Current		0 ~ 6A				0 ~ 6A			0 ~ 6A		
CONSTANT VOLTAGE OPERATION (CH1, CH2)											
Line Regulation		≤ 0.01% + 3mV									
Load Regulation		≤ 0.01% + 3mV (rating current ≤ 3A)									
		≤ 0.02% + 5mV (rating current > 3A)									
Ripple & Noise		≤ 1mVrms , 5Hz ~ 1MHz									
Recovery Time		≤ 100μS (50% Load change, Minimum load 0.5A)									
CONSTANT CURRENT OPERATION (CH1, CH2)											
Line Regulation		≤ 0.2% + 3mA									
Load Regulation		≤ 0.2% + 3mA									
Ripple & Noise		≤ 3mArms									
TRACKING OPERATION (CH1, CH2)											
Tracking Error		≤ 0.5% + 10mV of CH1									
Series Regulation		≤ 0.01% + 5mV									
Load Regulation		≤ 300mV									
Ripple & Noise		≤ 2mVrms , 5Hz ~ 1MHz									
CH3 OPERATION (for GPS-3303/4303)											
CH3 Voltage		GPS-4303 : 2.2V ~ 5.2V , GPS-3303 : 5V Fix									
Line Regulation		≤ 5mV									
Load Regulation		≤ 15mV									
Ripple & Noise		≤ 2mVrms, 5Hz ~ 1MHz									
Current Output		GPS-4303 : 1A, GPS-3303 : 3A									
CH4 OPERATION (for GPS-4303)											
CH4 VOLTAGE		8V ~ 15V									
Line Regulation		≤ 5mV									
Load Regulation		≤ 10mV									
Ripple & Noise		≤ 2mVrms, 5Hz ~ 1MHz									
Current Output		1A									
METER											
Digital		3 digits 0.5" LED display GPS-4303/3303 Out ON Accuracy ± (0.5% of rdg + 2 digits) GPS-4303/3303 Out OFF Accuracy ± (0.5% of rdg + 8 digits) GPS-2303 Accuracy ± (0.5% of rdg + 2 digits)									
INSULATION											
Chassis and Terminal		≥ DC 500V / 20MΩ									
Chassis and AC Cord		≥ DC 500V / 30MΩ									
POWER SOURCE											
AC 100V/120V/220V±10%, 230V(+10%~-6%), 50/60Hz											
DIMENSIONS & WEIGHT											
255(W) x 145(H) x 265(D) mm, Approx. 7 kg											

### ORDERING INFORMATION

- GPS-4303 4-channels, 200W Multiple Output Linear DC Power Supply  
GPS-3303 3-channels, 195W Multiple Output Linear DC Power Supply  
GPS-2303 2-channels, 180W Multiple Output Linear DC Power Supply

#### ACCESSORIES :

User manual x 1, Power cord x 1,  
GPS-4303 : Test lead GTL-104A x 2, GTL-105A x 2 ; European test lead GTL-203A x 2, GTL-204A x 2, GTL-201 x 1  
GPS-3303 : Test lead GTL-104A x 2, GTL-105A x 1 ; European test lead GTL-203A x 1, GTL-204A x 2, GTL-201 x 1  
GPS-2303 : Test lead GTL-104A x 2 ; European test lead GTL-204A x 2, GTL-201A x 1

#### OPTIONAL ACCESSORIES

GPS-001 Voltage/Current Protection Knob

# Triple Output Linear D.C. Power Supply



## GPC-3060D/6030D

### FEATURES

- \* Triple Output
- \* Auto Tracking
- \* Auto Series and Parallel Operation
- \* Constant Voltage and Constant Current Operation
- \* Low Ripple and Noise
- \* Internal Select for Continuous or Dynamic Load
- \* Overload and Reverse Polarity Protection
- \* 3 1/2 Digits 0.5" LED Display
- \* 5V, 3A Fixed Output

The GPC-Series is a triple output, 375W, linear DC power supply. Channel 1 and 2 are fully adjustable (model dependant) and channel 3 is fixed at 5V/3A with ripple and noise at less than 2mVrms. Overload and reverse polarity protection keep GPC-Series and its loads safe from unexpected conditions. GPC features continuous or dynamic internal load selection and series or parallel tracking for application flexibility. The GPC-Series is an ideal solution for inexpensive bench-top applications requiring low noise and multiple outputs.

SPECIFICATIONS	
OPERATION MODE	
Independent	Two independent outputs and 5V fixed output
Series	Output from 0 to rating volts and 0 to rating amperes
Parallel	Output from 0 to $\pm$ rating volts at rating amperes each Output from 0 to double rating volts at rating amperes Output from 0 to double rating amperes at rating volts
CONSTANT VOLTAGE OPERATION	
Regulation	Line regulation $\leq 0.01\% + 3\text{mV}$ Load regulation $\leq 0.01\% + 3\text{mV}$ (rating current $\leq 3\text{A}$ ) $\leq 0.01\% + 5\text{mV}$ (rating current $\leq 10\text{A}$ ) $\leq 0.02\% + 5\text{mV}$ (rating current $\geq 10\text{A}$ )
Ripple & Noise	$\leq 1\text{mVrms}$ 5Hz ~ 1MHz
Recovery Time	$\leq 100\mu\text{S}$ (50% Load change, Minimum load 0.5A)
CONSTANT CURRENT OPERATION	
Regulation	Line regulation $\leq 0.2\% + 3\text{mA}$ Load regulation $\leq 0.2\% + 5\text{mA}$
Ripple Current	$\leq 3\text{mA rms}$
5V FIXED OUTPUT	
Regulation	Line regulation $\leq 5\text{mV}$ Load regulation $\leq 10\text{mV}$
Ripple & Noise	$\leq 2\text{mVrms}$
Voltage Accuracy	$5\text{V} \pm 0.25\text{V}$
Output Current	3A
TRACKING OPERATION	
Tracking Error	$\leq 0.5\% + 10\text{mV}$ of the master
Series Regulation	$\leq 300\text{mV}$
METER	
Digital	3 1/2 digits 0.5" LED display Accuracy $\pm (0.5\% \text{ of rdg} + 2 \text{ digits})$
INSULATION	
Chassis and Terminal	100M $\Omega$ or above (DC 1000V)
Chassis and AC Cord	100M $\Omega$ or above (DC 1000V)
POWER SOURCE	
AC 100V/120V/220V/240V $\pm 10\%$ , 50/60Hz	
DIMENSIONS	
255(W) x 145(H) x 420(D) mm	

ORDERING INFORMATION					
Model		Independent	Series	Parallel	Weight (kg)
GPC-6030D	375W D.C. Power Supply	(0 ~ 60V/0 ~ 3A) x 2, (5V/3A MAX) x 1	120V 3A	60V 6A	18.5
GPC-3060D	375W D.C. Power Supply	(0 ~ 30V/0 ~ 6A) x 2, (5V/3A MAX) x 1	60V 6A	30V 12A	18.5
ACCESSORIES :					
User manual x 1, Power cord x 1					
Test lead GTL-105A x 1 ( $\leq 3\text{A}$ ) or GTL-104A x 2 ( $\leq 10\text{A}$ )					
OPTIONAL ACCESSORIES					
GRA-401	Rack Mount Kit				





## AC POWER SOURCES

GW Instek AC Power Sources currently can be divided into three categories. Programmable AC/DC Power Source, Programmable AC Power Source, AC Power Source.

AC Power Source ASR-2000 Series not only plays the role as a precision AC/DC power source but also a powerful analyzer. It contains abundant features for the testing and characteristic analysis of power supplies, electronic devices, components and modules.

The APS-7000 series is programmable linear AC Power Source, with the height of 2U and output frequency range is 45~500Hz. The maximum rated output for APS-7050 is 500VA, 310Vrms, 4.2Arms and APS-7100 is 1000VA, 310Vrms, 8.4Arms. The APS-7000 series comprises nine measurement and test functions and provides user interface similar to that of AC Power Meter.

### PRODUCTS

- Programmable AC/DC Power Source
- Programmable AC Power Source
- AC Power Source

## AC POWER SOURCES

### Programmable Switching AC/DC Power Source

GW Instek not only provides compact and lightweight switching AC/DC power sources but also features AC, DC and AC+DC power outputs and the real time measurements of Vrms, Vavg, Vpeak, Irms, IpkH, Iavg, Ipeak, P, S, Q, PF, CF, 40 th-order Voltage Harmonic and Current Harmonic. Four signal sources are collocated as Internal (INT), External (EXT), Internal+ External (ADD), and External Synchronization (SYNC) to flexibly output power so as to meet customers' demands. The powerful sequence function is very suitable for producing arbitrary waveforms. 16 sets of arbitrary waveform storage space and 10 sets of panel setting memory space are provided for data storage and setting input.

### Linear AC Power Source

GW Instek recommends linear AC power source for AC power with the requirements of high accuracy, high stability and low ripple/noise. Programmable AC Power Source APS-7000 is suitable for simulating AC power outputs and it has 9 measurement functions (Vrms, Irms, F, Ipk, W, VA, PF, Ipk hold, CF), 7 waveform modes, Sequence mode, Simulate mode, and Surge/Dip Control Mode etc. Purpose AC power source applications, non-programmable AC source APS-7000E Series, with high precision and THD of less than 0.5%, is the ideal selection.

### PROGRAMMABLE SWITCHING AC/DC POWER SOURCE

Model	Output Capacity	Output Freq.	Output Voltage	Max. Current	Display Type	Weight(kg)	Page
ASR-2050/ ASR-2050R	500VA	1~999.9Hz	AC 100V Range 0.0V~175.0V AC 200V Range 0.0V~350.0V DC 100V Range -250.0V~+250.0V DC 200V Range -500.0V~+500.0V	AC 100V Range 5A AC 200V Range 2.5A DC 100V Range 5A DC 200V Range 2.5A	LCD	11.5 ASR-2000 Series 10.5 ASR-2000R Series	D59-62
ASR-2100/ ASR-2100R	1000VA	1~999.9Hz	AC 100V Range 0.0V~175.0V AC 200V Range 0.0V~350.0V DC 100V Range -250.0V~+250.0V DC 200V Range -500.0V~+500.0V	AC 100V Range 10A AC 200V Range 5A DC 100V Range 10A DC 200V Range 5A	LCD	11.5 ASR-2000 Series 10.5 ASR-2000R Series	

### PROGRAMMABLE LINEAR AC POWER SOURCE

Model	Output Capacity	Output Freq.	Output Voltage	Max. Current	Display Type	Weight(kg)	Page
APS-7050	500 VA	45~500Hz Option: 45~999.9Hz	0~310V 0~155V Option: 0~600V	2.1A 4.2A	LCD	24	D63-66
APS-7100	1000 VA	45~500Hz Option: 45~999.9Hz	0~310V 0~155V Option: 0~600V	4.2A 8.4A	LCD	38	
APS-7200	2000 VA	45~500Hz Option: 45~999.9Hz	0~310V 0~155V Option: 0~600V	8.4A 16.8A	LCD	90	
APS-7300	3000 VA	45~500Hz Option: 45~999.9Hz	0~310V 0~155V Option: 0~600V	12.6A 25.2A	LCD	128	

### LINEAR AC POWER SOURCE

Model	Output Capacity	Output Freq.	Output Voltage	Max. Current	Display Type	Weight(kg)	Page
APS-7050E	500 VA	45~500Hz	0~310V 0~155V	2.1A 4.2A	LCD	24	D67-68
APS-7100E	1K VA	45~500Hz	0~310V 0~155V	4.2A 8.4A	LCD	38	



# Compact Programmable A.C./D.C. Power Source



NEW

## ASR-2050/2100 Series



NEW

## ASR-2050R/2100R Series



### FEATURES

- \* Output Rating: AC 0 ~ 350 Vrms, DC 0 ~ ± 500 V
- \* Output Frequency up to 999.9 Hz
- \* DC Output (100% of Rated Power)
- \* Output Capacity: 500VA/1000VA
- \* Measurement Items: Vrms, Vavg, Vpeak, Irms, IpkH, Iavg, Ipeak, P, S, Q, PF, CF
- \* Voltage and Current Harmonic Analysis (THDv, THDi)
- \* Customized Phase Angle for Output On/Off
- \* Remote Sensing Capability
- \* OVP, OCP, OPP, OTP, AC Fail Detection and Fan Fail Alarm
- \* Interface: USB, LAN(std.); RS-232+GPIB(opt.)
- \* Built-in External Control I/O and External Signal Input
- \* Built-in Output Relay Control
- \* Memory Function (up to 10 sets)
- \* Sequence and Simulation Function (up to 10 sets)
- \* Support Arbitrary Waveform Function
- \* Built-in Web Server

The ASR-2000 series, an AC+DC power source aiming for system integration or desktop applications, provides both rated power output for AC output and rated power output for DC output. Nine ASR-2000 output modes are available, including 1) AC power output mode (AC-INT Mode), 2) DC power output mode (DC-INT Mode), 3) AC/DC power output mode (AC+DC-INT Mode), 4) External AC signal source mode (AC-EXT Mode), 5) External AC/DC signal source mode (AC+DC-EXT Mode), 6) External AC signal superimposition mode (AC-ADD Mode), 7) External AC/DC signal superimposition mode (AC+DC-ADD Mode), 8) External AC signal synchronization mode (AC-SYNC Mode), 9) External AC/DC signal synchronization mode (AC+DC-SYNC Mode).

The ASR-2000 series provides users with waveform output capabilities to meet the test requirements of different electronic component development, automotive electrical devices and home appliance, including 1) Sequence mode generates waveform fallings, surges, sags, changes and other abnormal power line conditions; 2) Arbitrary waveform function allows users to store/upload user-defined waveforms; and 3) Simulate mode simulates power outage, voltage rise, voltage fall, and frequency variations. When the ASR-2000 series power source outputs, it can also measure Vrms, Vavg, Vpeak, Irms, Iavg, Ipeak, IpkH, P, S, Q, PF, CF, 40th-order Voltage Harmonic and Current Harmonic. In addition, the Remote sense function ensures accurate voltage output. The Customized Phase Angle for Output On/Off function can set the starting angle and ending angle of the voltage output according to the test requirements. V-Limit, Ipeak-Limit, F-Limit, OVP, OCP, OPP function settings can protect the DUT during the measurement process. In addition to OTP, OCP, and OPP protection, the ASR-2000 series also incorporates the Fan fail alarm function and AC fail alarm function.

The front panel of the ASR-2050/2100 provides a universal socket or a European socket, which allows users to plug and use so as to save wiring time. The ASR-2050R/2100R is 3U height and 1/2 Rack width design, which is compatible with ATS assembly. The ASR-2000 series supports I/O interface and is equipped with USB, LAN, External I/O and optional RS-232C and GPIB.

### SPECIFICATIONS

		ASR-2050/ASR-2050R	ASR-2100/ASR-2100R
<b>INPUT RATING (AC)</b>			
NORMAL INPUT VOLTAGE		100 Vac to 240 Vac	100 Vac to 240 Vac
INPUT VOLTAGE RANGE		90 Vac to 264 Vac	90 Vac to 264 Vac
PHASE		Single phase, Two-wire	Single phase, Two-wire
INPUT FREQUENCY RANGE		47 Hz to 63 Hz	47 Hz to 63 Hz
MAX. POWER CONSUMPTION		800 VA or less	1500 VA or less
POWER FACTOR <sup>1</sup>	100Vac	0.95 (typ.)	0.95 (typ.)
	200Vac	0.90 (typ.)	0.90 (typ.)
MAX. INPUT CURRENT	100Vac	8 A	15 A
	200Vac	4 A	7.5 A
<sup>1</sup> 1. For an output voltage of 100 V/200 V (100V/200V range), maximum current, and a load power factor of 1.			
<b>AC MODE OUTPUT RATINGS (AC rms)</b>			
VOLTAGE	Setting Range <sup>1</sup> Setting Resolution Accuracy <sup>2</sup>	0.0 V to 175.0 V / 0.0 V to 350.0 V 0.1 V ±(0.5 % of set + 0.6 V / 1.2 V)	
OUTPUT PHASE		Single phase, Two-wire	
MAXIMUM CURRENT <sup>3</sup>	100 V 200 V	5 A 2.5 A	10 A 5 A
MAXIMUM PEAK CURRENT <sup>4</sup>	100 V 200 V	20 A 10 A	40 A 20 A
POWER CAPACITY		500 VA	1000 VA
FREQUENCY	Setting Range Setting Resolution Accuracy Stability <sup>5</sup>	AC Mode: 40.00 Hz to 999.9 Hz, AC+DC Mode: 1.00 Hz to 999.9 Hz 0.01 Hz (1.00 to 99.99 Hz), 0.1 Hz (100.0 to 999.9 Hz) For 45 Hz to 65 Hz: 0.01% of set, For 40 Hz to 999.9 Hz: 0.02% of set ± 0.005% 0.0° to 359.9° variable (setting resolution 0.1°) Within ± 20 mV (TYP)	
OUTPUT ON PHASE DC OFFSET <sup>6</sup>			
<sup>1</sup> 1. 100 V / 200 V range			
<sup>2</sup> 2. For an output voltage of 175.0 V to 175 V / 35 V to 350 V, sine wave, an output frequency of 45 Hz to 65 Hz, no load, DC voltage setting 0V (AC+DC mode) and 23°C ± 5°C			
<sup>3</sup> 3. For an output voltage of 1 V to 100 V / 2 V to 200 V, Limited by the power capacity when the output voltage is 100 V to 175 V / 200 V to 350 V.			
<sup>4</sup> 4. With respect to the capacitor-input rectifying load. Limited by the maximum current.			
<sup>5</sup> 5. For 45 Hz to 65 Hz, the rated output voltage, no load and the resistance load for the maximum current, and the operating temperature.			
<sup>6</sup> 6. In the case of the AC mode and output voltage setting to 0 V.			
<b>OUTPUT RATING FOR DC MODE</b>			
VOLTAGE	Setting Range <sup>1</sup> Setting Resolution Accuracy <sup>2</sup>	-250 V to +250 V / -500 V to +500 V 0.1 V ±(0.5 % of set) + 0.6 V / 1.2 V)	
MAXIMUM CURRENT <sup>3</sup>	100 V 200 V	5 A 2.5 A	10 A 5 A
MAXIMUM PEAK CURRENT <sup>4</sup>	100 V 200 V	20 A 10 A	40 A 20 A
POWER CAPACITY		500 W	1000 W
<sup>1</sup> 1. 100 V / 200 V range			
<sup>2</sup> 2. For an output voltage of -250 V to -25 V, +25 V to +250 V / -500 V to -50 V, +50 V to +500 V, no load, AC voltage setting 0V (AC+DC mode) and 23°C ± 5°C			
<sup>3</sup> 3. For an output voltage of 1.4 V to 100 V / 2.8 V to 200 V, Limited by the power capacity when the output voltage is 100 V to 250 V / 200 V to 500 V.			
<sup>4</sup> 4. Within 5 ms, Limited by the maximum current.			
<b>OUTPUT VOLTAGE STABILITY</b>			
LINE REGULATION <sup>1</sup>		±0.2% or less	
LOAD REGULATION <sup>2</sup>		0.15% @ 45-65 Hz; 0.5% @ DC, all other frequencies (0~100%, via output terminal)	
RIPPLE NOISE <sup>3</sup>		0.7 Vrms / 1.4 Vrms (TYP)	
<sup>1</sup> 1. Power source input voltage is 100 V, 120 V, or 230 V, no load, rated output.			
<sup>2</sup> 2. For an output voltage of 75 V to 175V/150V to 350V, a load power factor of 1, stepwise change from an output current of 0 A to maximum current (or its reverse), using the output terminal on the rear panel.			
<sup>3</sup> 3. For 5 Hz to 1 MHz components in DC mode using the output terminal on the rear panel.			
<b>OUTPUT VOLTAGE WAVEFORM DISTORTION RATIO, OUTPUT VOLTAGE RESPONSE TIME, EFFICIENCY</b>			
OUTPUT VOLTAGE WAVEFORM DISTORTION RATIO <sup>1</sup>		0.5 % or less	
OUTPUT VOLTAGE RESPONSE TIME <sup>2</sup>		100 us (TYP)	
EFFICIENCY <sup>3</sup>		70 % or more	
<sup>1</sup> 1. At an output voltage of 50 V to 175 V / 100 V to 350 V, a load power factor of 1, and in AC and AC+DC mode.			
<sup>2</sup> 2. For an output voltage of 100 V / 200 V, a load power factor of 1, with respect to stepwise change from an output current of 0 A to the maximum current (or its reverse); 10% ~ 90% of output voltage			
<sup>3</sup> 3. For AC mode, at an output voltage of 100 V / 200 V, maximum current, and load power factor of 1 and sine wave only.			
<b>MEASURED VALUE DISPLAY</b>			
VOLTAGE RMS, AVG Value <sup>1</sup>	Resolution Accuracy <sup>2</sup>	0.1 V For 45 Hz to 65 Hz and DC: ±(0.5 % of reading + 0.3 V/0.6 V) For 40 Hz to 999.9 Hz: ±(0.7 % of reading + 0.9 V/1.8 V)	
PEAK Value	Resolution Accuracy	0.1 V For 45 Hz to 65 Hz and DC: ±(2 % of reading) + 1 V / 2 V)	
CURRENT RMS, AVG Value	Resolution Accuracy <sup>3</sup>	0.01 A For 45 Hz to 65 Hz and DC: ±(0.5 % of reading + 0.02 A/0.02 A); For 40 Hz to 999.9 Hz: ±(0.7 % of reading + 0.04 A / 0.04 A)	
		0.01 A For 45 Hz to 65 Hz and DC: ±(0.5 % of reading + 0.04 A/0.04 A); For 40 Hz to 999.9 Hz: ±(0.7 % of reading + 0.08 A / 0.04 A)	





## ASR-2000 Series

### SPECIFICATIONS

		ASR-2050/ASR-2050R	ASR-2100/ASR-2100R
PEAK Value	Resolution	0.1 A	0.1 A
	Accuracy <sup>*1</sup>	For 45 Hz to 65 Hz and DC: ±(2 % of reading)+0.2 A/0.1 A)	For 45 Hz to 65 Hz and DC: ±(2 % of reading)+0.2 A/0.1 A)
POWER Active (W)	Resolution	0.1 / 1 W	0.1 / 1 W
	Accuracy <sup>*3</sup>	±(2 % of reading + 0.5 W)	±(2 % of reading + 1 W)
Apparent (VA)	Resolution	0.1 / 1 VA	0.1 / 1 VA
	Accuracy <sup>*5</sup>	±(2 % of reading + 0.5 VA)	±(2 % of reading + 1 VA)
Reactive (VAR)	Resolution	0.1 / 1 VAR	0.1 / 1 VAR
	Accuracy <sup>*5</sup>	±(2 % of reading + 0.5 VAR)	±(2 % of reading + 1 VAR)
LOAD POWER FACTOR	Range	0.000 to 1.000	0.000 to 1.000
	Resolution	0.001	0.001
LOAD CREST FACTOR	Range	0.00 to 50.00	0.00 to 50.00
	Resolution	0.01	0.01
HARMONIC VOLTAGE EFFECTIVE VALUE (RMS) PERCENT (%)	Range	Up to 40th order of the fundamental wave	Up to 40th order of the fundamental wave
	Full Scale	175 V / 350 V, 100%	175 V / 350 V, 100%
(AC-INT and 50/60 Hz only)	Resolution	0.1 V, 0.01%	0.1 V, 0.01%
	Accuracy <sup>*8</sup>	Up to 20th±(0.2 % of reading + 0.5 V/1 V); 20th to 40th±(0.3 % of reading + 0.5 V/1 V)	Up to 20th±(0.2 % of reading + 0.5 V/1 V); 20th to 40th±(0.3 % of reading + 0.5 V/1 V)
HARMONIC CURRENT EFFECTIVE VALUE (RMS) PERCENT (%)	Range	Up to 40th order of the fundamental wave	Up to 40th order of the fundamental wave
	Full Scale	5 A / 2.5 A, 100%	10 A / 5 A, 100%
(AC-INT and 50/60 Hz only)	Resolution	0.01 A, 0.01%	0.01 A, 0.01%
	Accuracy <sup>*7</sup>	Up to 20th±(1 % of reading + 0.1 A/0.05 A); 20th to 40th±(1.5 % of reading + 0.1 A/0.05 A)	Up to 20th±(1 % of reading + 0.2 A/0.1 A); 20th to 40th±(1.5 % of reading + 0.2 A/0.1 A)

\*1. The voltage display is set to RMS in AC/AC+DC mode and AVG in DC mode.

\*2. AC mode: For an output voltage of 17.5V to 175V/35V to 350V and 23 °C±5 °C. DC mode: For an output voltage of 25V to 250V/50V to 500V and 23 °C±5 °C.

\*3. An output current in the range of 5 % to 100 % of the maximum current, and 23 °C ± 5 °C.

\*4. An output current in the range of 5 % to 100 % of the maximum peak current in AC mode, an output current in the range of 5 % to 100 % of the maximum instantaneous current in DC mode, and 23 °C ± 5 °C. The accuracy of the peak value is for a waveform of DC or sine wave.

\*5. For an output voltage of 50V or greater, an output current in the range of 10 % to 100 % of the maximum current, DC or an output frequency of 45Hz to 65Hz, and 23 °C±5 °C.

\*6. The apparent and reactive powers are not displayed in the DC mode. \*7. The reactive power is for the load with the power factor 0.5 or lower.

\*8. An output voltage in the range of 17.5 V to 175 V/35 V to 350 V and 23 °C ± 5 °C.

### OTHERS

PROTECTIONS		OCP, OTP, OPP, FAN Fail
DISPLAY		TFT-LCD, 4.3 inch
MEMORY FUNCTION		10 sets for Store and Recall settings
ARBITRARY WAVE	Number of Memories	16 (nonvolatile)
	Waveform Length	4096 words
INTERFACE	Standard	Type A: Host, Type B: Slave, Speed: 1.1/2.0, USB-CDC
	USB	MAC Address, DNS IP Address, User Password, Gateway IP Address, Instrument IP Address, Subnet Mask
Factory Optional	EXT Control	External Signal Input; External Control I/O
	RS-232C	SCPI-1993, IEEE 488.2 compliant interface
INSULATION RESISTANCE		Complies with the EIA-RS-232 specifications
WITHSTAND VOLTAGE		500 Vdc, 30 MΩ or more
EMC		1500 Vac, 1 minute
Safety		EN 61326-1 (Class A); EN 61326-2-1/-2-2 (Class A); EN 61000-3-2 (Class A, Group 1); EN 61000-3-3 (Class A, Group 1); EN 61000-4-2/-4-3/-4-4/-4-5/-4-6/-4-8/-4-11 (Class A, Group 1); EN 55011 (Class A, Group 1); EN 61010-1
Environment	Operating Environment	Indoor use, Overvoltage Category II
	Operating Temperature Range	0 °C to 40 °C
Storage Temperature Range	Storage Temperature Range	-10 °C to 70 °C
	Operating Humidity Range	20 %rh to 80 % RH (no condensation)
Storage Humidity Range	Storage Humidity Range	90 % RH or less (no condensation)
	Altitude	Up to 2000 m
DIMENSIONS & WEIGHT		ASR-2000 : 285 (W)×124 (H)×480 (D) (not including protrusions); Approx. 11.5 kg ASR-2000R : 213 (W)×124 (H)×480 (D) (not including protrusions); Approx. 10.5 kg

### ORDERING INFORMATION

ASR-2050	500VA Programmable AC/DC Power Source
ASR-2100	1000VA Programmable AC/DC Power Source
ASR-2050R	500VA Programmable AC/DC Power Source for 3U 1/2 Rack Mount
ASR-2100R	1000VA Programmable AC/DC Power Source for 3U 1/2 Rack Mount

### ACCESSORIES :

CD ROM (User Manual, Programming manual), Safety Guide, Power Cord, Mains Terminal Cover Set, Remote Sense Terminal Cover Set, GTL-123 Test Lead, GTL-246 USB Cable

### OPTIONAL ACCESSORIES

Opt01 : RS-232+GPIB Communication Functions (Factory installed)	GRA-439-E Rack Mount Kit (EIA)
Opt02 : European Output Outlet only for ASR-2000 (Factory installed)	GRA-439-J Rack Mount Kit (JIS)
GET-003 Extended Universal Power Socket (ASR-2000R only)	GTL-232 RS-232C Cable, approx. 2M
GET-004 Extended European Power Socket (ASR-2000R only)	GTL-258 GPIB Cable, approx. 2M, including 25 pins Micro-D connector
ASR-001 Air Inlet Filter	

### FREE DOWNLOAD

USB Driver

Note : GET-003/GET-004 are not CE approved.

### ASR-2050/2100 Rear Panel



### ASR-2050R/2100R Rear Panel



### GRA-439-J/E Rack Mount Kit (JIS/EIA)

For : ASR-2000 Series



### GET-003 Universal Extended Terminal Box (ASR-2000R only)



### GET-004 Euro Extended Terminal Box (ASR-2000R only)



### GTL-258 GPIB Cable, 2000mm



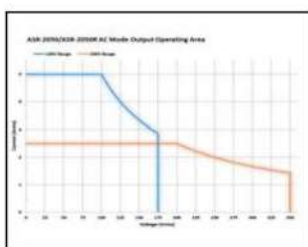
### ASR-001 Air Inlet Filter



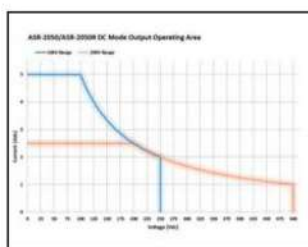


# Compact Programmable A.C./D.C. Power Source

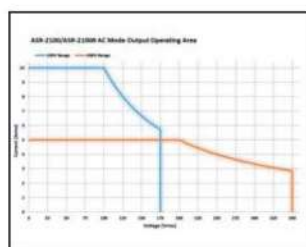
## A. OPERATING AREA FOR ASR-2000 SERIES



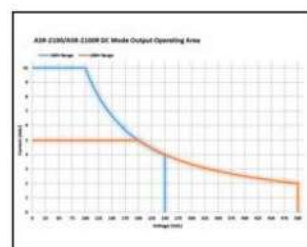
AC Output for  
ASR-2050/ASR-2050R



DC Output for  
ASR-2050/ASR-2050R



AC Output for  
ASR-2100/ASR-2100R



DC Output for  
ASR-2100/ASR-2100R

The ASR-2000 series is an AC+DC power source that provides rated power output not only at the AC output, but also at the DC output. The operation areas are shown in diagrams.

Model Name	Power Rating	Max. Output Current	Max. Output Voltage
ASR-2050	500 VA	5 / 2.5 A	350 Vrms / 500 Vdc
ASR-2100	1000 VA	10 / 5 A	350 Vrms / 500 Vdc
ASR-2050R	500 VA	5 / 2.5 A	350 Vrms / 500 Vdc
ASR-2100R	1000 VA	10 / 5 A	350 Vrms / 500 Vdc

## B. MEASUREMENT ITEMS FOR ASR-2000 SERIES



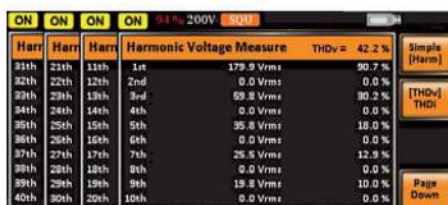
RMS Meas Display



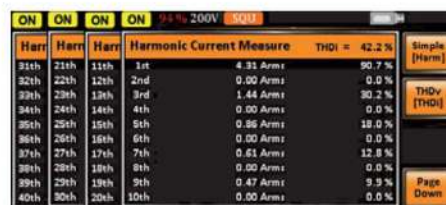
AVG Meas Display



Peak Meas Display



Voltage Harmonic

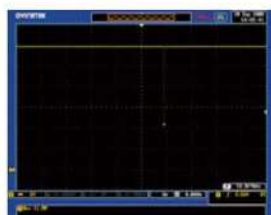


Current Harmonic

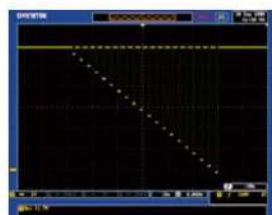
The ASR-2000 series provides users with measurement capabilities including Vrms, Vavg, Vpeak, Irms, Iavg, Ipeak, IpkH, P, S, Q, PF, CF, 40th-order Voltage Harmonic and Current Harmonic. During the power output, the measurement

parameters including Vrms/Irms, Vavg/Iavg and Vmax/Vmin/Imax/Imin can be switched by users at any time to display the instantaneous calculation reading.

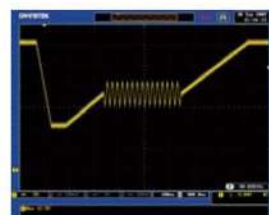
## C. SEQUENCE MODE AND APPLICATIONS



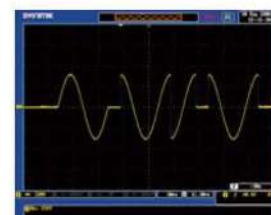
Momentary Drop in Supply Voltage



Reset Behavior at Voltage Drop



Starting Profile Waveform

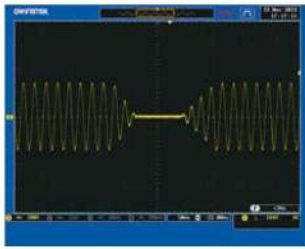


Instantaneous Power Failure

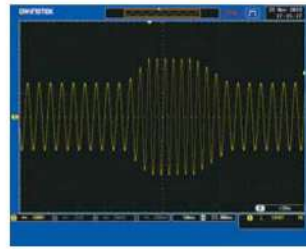
There are 10 sets of Sequence mode and each set has 0~999 steps. The time setting range of each step is 0.0001 ~ 999.9999 seconds. Users can combine multiple sets of steps to generate

the desired waveforms, including waveform fallings, surges, sags, changes and other abnormal power line conditions to meet the needs of the test application.

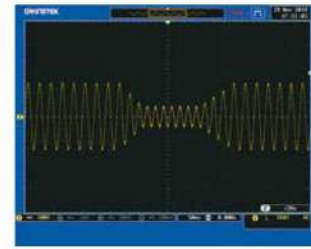
## D. SIMULATE MODE



Power Outage



Voltage Rise

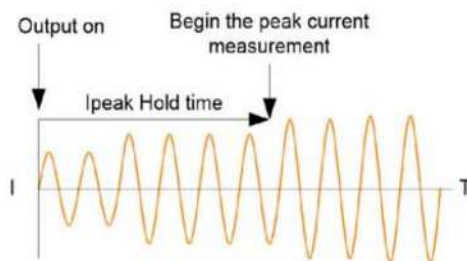


Voltage Fall

Simulate Mode can quickly simulate different transient waveforms, such as power outage, voltage rise, voltage fall, etc.,

for engineers to evaluate the impact of transient phenomena on the DUT. Ex: Capacitance durability test.

## E. T, IPK HOLD & IPK, HOLD FUNCTIONS

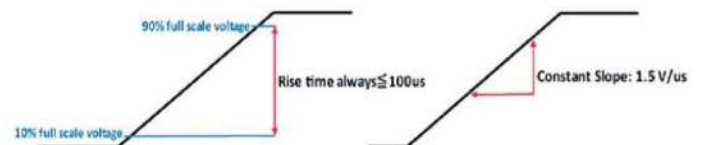


T, Ipk Measurement

T, Ipk Hold is used to set the delay time after the output (1ms ~ 60,000ms) to capture the Ipeak value and keep the maximum value. The update only functions when the measurement value is greater than the original value. The T, Ipk Hold delay time setting can be used to measure surge current at the power on process of the DUT.

Ipk Hold can be used to measure the transient surge current of the DUT at power on without using an oscilloscope and a current probe.

## F. SLEW RATE MODE



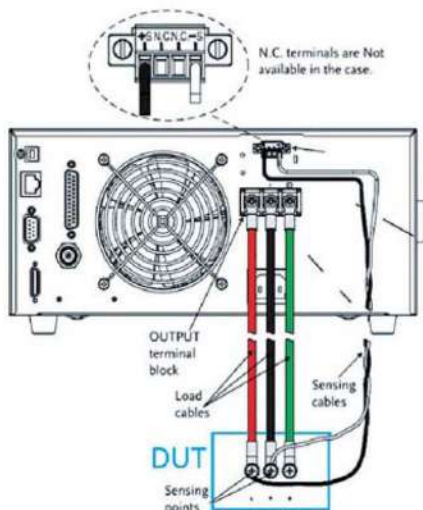
Time Mode

Slope Mode

The ASR-2000 series can set the Slew Rate Mode to determine the rise time of the voltage according to the test requirements of the DUT. Slew Rate Mode provides "Time" and "Slope" modes. When setting "Time" mode, ASR-2000 can increase output to 10~90% of the set voltage within 100 $\mu$ s; and when selecting "Slope" mode, ASR-2000 increases output voltage by a fixed rising slope of 1.5V/ $\mu$ s until reaching the set voltage value.

In addition, if users decide to self-define the rise time of the output voltage, users can flexibly set the rise time of the ASR-2000 series voltage by editing the Sequence mode.

## G. REMOTE SENSE FUNCTION



For high current output applications, the voltage drop caused by large current passing through the load cables will affect the measurement results. The ASR-2000 series provides the remote sense function that can sense the voltage drop of the DUT to the ASR-2000 series and the DUT will be compensated by the ASR-2000 series. The maximum voltage that the remote sense function can compensate is 5% of the output voltage.



# 500/1000/2000/3000 VA Programmable Linear AC Power Source



APS-7050



APS-7100

NEW



## FEATURES

- \* 4.3-inch TFT-LCD
- \* Output Capacity: APS-7050(500VA, 310Vrms, 4.2Arms); APS-7100(1000VA, 310Vrms, 8.4Arms); APS-7200(2000VA, 310Vrms, 16.8Arms); APS-7300(3000VA, 310Vrms, 25.2Arms) Output Augmentation by Options(0~600Vrms/45~999.9Hz)
- \* Low Ripple & Noise
- \* Measurement and Test Functions Include VOLT, CURR, PWR, SVA, IPK, IPKH, FREQ, PF, CF
- \* Support a Small AC Current Measurement 2mA ~35A, Min. Resolution 0.01mA(APS-7050&APS-7100)
- \* Reverse Current Alarm Function
- \* 10 sets of Sequence Function to Edit Output Waveforms/10 sets of Simulate Mode to Rapidly Simulate Transient Power Supply/10 sets of Program Mode to Define Measurement Sequence/10 sets of Panel Memory Function
- \* Automatic Execution of Sequence, Simulate, Program mode and Output Function when the Power is on
- \* Standard Interfaces: USB Host, USB Device, LAN
- \* Optional Interfaces: GPIB(APS-001); RS-232/USB CDC(APS-002 for APS-7050&APS-7100 only) RS-232 (APS-007 for APS-7200& APS-7300 only)

### APS-001 GPIB Interface Card

For: APS-7000 Series



### APS-002 RS-232/USB Interface Card

For: APS-7000 Series



### Mains Terminal Cover Set

For: APS-7100/7100E Series



For: APS-7050/7050E Series

GWInstek introduces APS-7000 series programmable AC power sources, which consists of 500VA of APS-7050, 1000VA of APS-7100, 2000VA of APS-7200 and 3000VA of APS-7300. APS-7000 series features power characteristics from its linear structure design including low noise, low THD, and highly stabilized power output that are ideal for the product development and verification of input power with low noise requirement or stereo, video and audio device applications, etc. The maximum rated voltage is 0~310Vrms, 25.2Arms, 100.8A peak current and the output frequency range is 45~500.0Hz. Users can conveniently augment the output voltage from 0Vrms to 600Vrms and output frequency from 45Hz to 999.9Hz by purchasing options without sending equipment back to GW Instek.

One of the popular alternative energy solutions in the market is to utilize inverter to convert DC to AC and the converted AC is then sent to power grid or products require electricity. For instance, AC produced by PV inverter is sent to power grid or equipment requires electricity. While simulating power grid to verify inverter connecting with power grid, general AC power sources cannot withstand DUT's feedback energy, hence, additional power consumption resistors are needed to prevent AC power source from being damaged. On the contrary, APS-7000 series has the characteristic of absorbing reverse current so that additional power consumption resistors are not required. The input terminal of APS-7000 series is designed to isolate from the simulated AC power grid output terminal, therefore, users do not need an additional isolation device to protect DUT. APS-7000 series is suitable for simulating power grid and conducting inverter output characteristic tests, including synchronized phase and frequency. Reverse current and power detected by APS-7000 series will be displayed in red readings to facilitate user's test observation. APS-7000 series utilizes Simulate mode and Sequence mode to provide a single step or consecutive power changes; and to simulate power grid's Voltage Abnormality Test and Frequency Abnormality Test.

APS-7000 series comprises nine measurement and test functions (Vrms, Irms, F, Ipk, W, VA, PF, Ipk hold, CF), and provides user interface similar to that of AC Power Meter. APS-7000 series is ideal for the LED industry and standby mode power consumption test. Under the ARB mode, APS-7000 series provides waveforms in seven categories including Sine waveform, Triangle waveform, Staircase waveform(Square wave), Clipped Sinewave, Crest factor waveform, Surge waveform, and Fourier series and 20,000 waveform combinations so as to meet the requirements of simulating abnormal input power waveform test of various industries. Ten Preset settings allow users to store ten sets of data; Power ON Output setting allows Sequence, Simulate, and Program to automatically execute output after the equipment power is on.

To meet the test criteria of line voltage fluctuation often seen in consumer electronics, APS-7000 series features five methods to cope with special purpose or abnormal voltage, frequency, and phase; ten sets of the Simulate mode simulate power outage, voltage rise, and voltage fall; ten sets of the Sequence mode allow users to define parameters and produce sine wave by editing steps; ten sets of the Program mode can edit AC waveform output and define the ceiling and floor level of measurement items for different DUTs; Ramp Control allows users to set the variation speed for output voltage rise and fall; Surge/Dip Control simulates DUT's input power producing a Surge or Dip voltage overlapping with output voltage waveform at a specific time. For larger current output applications, voltage drop across the output cables should be avoided. APS-7200/7300 also provide the remote sense function, which senses DUT's voltage and sends the information back to APS-7200/7300 for program controlled voltage compensation. Therefore, APS-7200/7300 can avoid the voltage drop of the cable to affect output voltage.

Ethernet Port, on the rear panel, can be used for remote program control; Sync Output Socket provides external 10V sync output; Signal Output Connector provides monitor of Program execution results. APS-7000 series also provides users with Trigger In/Out and Output on/off remote control functions from J1 connector on the rear panel.

## SPECIFICATIONS

Model		APS-7050	APS-7100	APS-7200	APS-7300
AC OUTPUT					
Power Rating		500VA	1000VA	2000VA	3000VA
Output Voltage		0 ~ 155Vrms, 0 ~ 310Vrms	0 ~ 155Vrms, 0 ~ 310Vrms	0 ~ 155Vrms, 0 ~ 310Vrms	0 ~ 155Vrms, 0 ~ 310Vrms
Output Frequency		45.00 ~ 500.0 Hz	45.00 ~ 500.0 Hz	45.00 ~ 500.0 Hz	45.00 ~ 500.0 Hz
Maximum Current(r.m.s) *1	0~155Vrms 0~310Vrms	4.2A 2.1A	8.4A 4.2A	16.8A 8.4A	25.2A 12.6A
Maximum Current(peak)	0~155Vrms 0~310Vrms	16.8A 8.4A	33.6A 16.8A	67.2A 33.6A	100.8A 50.4A
OPT. APS-003(rms)	0~600Vrms	1.05A	2.1A	4.2A	6.3A
OPT. APS-003(peak)	0~600Vrms	4.2A	8.4A	16.8A	25.2A
Total Harmonic Distortion (THD)*2		≤0.5% at 45 ~ 500Hz (Resistive Load)			
Crest Factor		≥ 4			
Line Regulation		0.1% (% of full scale)			
Load Regulation		0.5% (% of full scale)			
Response Time		<100us			
Reverse Current		30% of Maximum Output RMS Current (Continue); 100% of Maximum Output RMS Current (Within 3 minutes)			
SETTING					
Voltage	Range	0~155Vrms, 0~310Vrms, Auto			
	Resolution	0.01V at 0.00 ~ 99.99Vrms; 0.1V at 100.0 ~ 310.0Vrms			
	Accuracy	±(0.5% of setting+2 counts)			
Frequency	Range	45 ~ 500Hz			
	Resolution	0.01Hz at 45.00 ~ 99.99Hz; 0.1Hz at 100.0 ~ 500.0Hz			
	Accuracy	±0.02% of setting			
Power On/Off	Range	0 ~ 359°			
Phase Angle	Resolution	1°			
	Accuracy	±1°(45 ~ 65Hz)			
MEASUREMENT*3					
Voltage(RMS)	Range	0.20~38.75Vrms; 38.76~77.50Vrms; 77.51~155.0Vrms; 155.1~310.0Vrms		0.20~38.75Vrms; 38.76~77.50Vrms; 77.51~155.0Vrms; 155.1~310.0Vrms	
	Resolution	0.01V at 0.00 ~ 99.99Vrms; 0.1V at 100.0 ~ 310.0Vrms		0.01V at 0.00 ~ 99.99Vrms; 0.1V at 100.0 ~ 310.0Vrms	
Frequency	Accuracy*4	±(0.5% of reading + 2 counts)		±(0.5% of reading + 2 counts)	
	Range	45 ~ 500Hz		45 ~ 500Hz	
	Resolution	0.01Hz at 45Hz~99.99Hz; 0.1Hz at 100Hz~500.0Hz		0.01Hz at 45Hz~99.99Hz; 0.1Hz at 100Hz~500.0Hz	
Current(RMS)	Accuracy	±0.1Hz		±0.1Hz	
	Range	2.00 ~ 70.00mA; 60.0 ~ 350.0mA; 0.300 ~ 3.500A; 3.00 ~ 17.5A		0.200 ~ 3.500A; 3.00~35.00A	
	Resolution	0.01mA, 0.1mA, 0.001A, 0.01A		0.001A; 0.01A	
	Accuracy	±(0.6% of reading+5 counts); 2.00~350.0mA; ±(0.5% of reading+5 counts); 0.300~3.500A; ±(0.5% of reading+3 counts); 3.000~17.50A		±(0.5% of reading+5 counts); 0.200~3.500A ±(0.5% of reading+3 counts); 3.00~35.00A	





APS-7200



APS-7300

#### SPECIFICATIONS

Model	APS-7050	APS-7100	APS-7200	APS-7300
Current(Peak)	Range Resolution Accuracy	0.0 ~ 70.0A 0.1A ±(1% of reading+1 count)	0.0 ~ 140.0A 0.1A ±1% of reading+1 counts)	
Power(W)	Resolution Accuracy	0.01W, 0.1W, 1W ±(0.6% of reading+5 counts), 0.20~99.99W; ±(0.6% of reading+5 counts), 100.0~999.9W; ±(0.6% of reading+2 counts), 1000~9999W	0.1W, 1W ±(0.6% of reading+5 counts), 0.2~999.9W; ±(0.6% of reading+2 counts), 1000~9999W	
Apparent(VA)	Resolution Accuracy	0.01VA, 0.1VA, 1VA ±(1% of reading+7 counts), 0.20~99.99VA; ±(1% of reading+7 counts), 100.0~999.9VA; ±(1% of reading+5 counts), 1000~9999VA	0.1VA, 1VA ±(1% of reading+7 counts), 0.2~999.9VA; ±(1% of reading+5 counts), 1000~9999VA	
Power Factor	Resolution Accuracy	0.001 ±(2% of reading + 2 counts)	0.001 ±(2% of reading+2 counts)	

#### GENERAL

Remote output signal	Pass, Fail, Test-in Process, Trigger in, Trigger out, OUT ON/OFF
Sync output signal	Output Signal 10 V, BNC Type
Number of Preset	10 (0~9 numeric keys)
Protection	OCV, OPP, OTP and Alarm
Trigger Out	Maximum low level output = 0.8V ; Minimum high level output = 2V ; Maximum source current = 8mA
Trigger In	Maximum low level input voltage = 0.8V ; Minimum high level input voltage = 2.0V; Maximum sink current = 8mA

#### SEQUENCE/SIMULATION FUNCTION

Number of Memories	10 (0 ~ 9 Numeric keys)
Number of Steps	255 max. (For 1 sequence)
Step Time Setting Range	0.01 ~ 999.99S
Operation Within Step Parameters	Constant, Keep, Linear Sweep Output Range, Frequency, Waveform (sine wave only); On Phase, Off Phase, Term Jump Count (0 ~ 255) jump-to, Branch 1, Branch 2, Trigger Output Start, Stop, Hold, Continue, Branch 1, Branch 2
Sequence Control	

#### AC INPUT

Phase	Single Phase	Single Phase	Single Phase	Single Phase
Input Voltage	115/230Vac±15%	115/230Vac±15%	230Vac±15%	230Vac±15%
Input Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Max. Current	16A/8A	32A/16A	32A	50A
Power Factor	0.7 Typ.	0.7 Typ.	0.7 Typ.	0.7 Typ.

#### ENVIRONMENT CONDITIONS

Operating Temperature Range	0 ~ +40℃
Storage Temperature Range	-10 ~ +70℃
Operating Humidity Range	20 ~ 80% RH (No Condensation)
Storage Humidity Range	80% RH or less(No Condensation)

#### INTERFACE

Standard	USB Host, LAN	USB Host, USB CDC, LAN
Optional	GPIO (APS-001) RS232 / USB CDC (APS-002)	GPIO (APS-001) RS232 (APS-007)

#### DIMENSIONS & WEIGHT

430(W) x 89(H) x 400(D) mm; Approx. 24Kg	430(W) x 89(H) x 560(D) mm; Approx. 38Kg	430(W) x 312(H) x 650(D) mm; Approx. 90Kg	430(W) x 400(H) x 650(D) mm; Approx. 128Kg
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#### ORDERING INFORMATION

APS-7050	500VA Programmable AC Power Source	APS-7200	2000VA Programmable AC Power Source
APS-7100	1000VA Programmable AC Power Source	APS-7300	3000VA Programmable AC Power Source

#### ACCESSORIES :

CD ROM(User Manual, Programming Manual for APS-7000) x 1, Power Cord(Region Dependent), GTL-123 Test Lead

#### OPTIONAL ASSESSORIES

APS-001	GPIO interface card	APS-004	Output Frequency Capacity(45~999.9Hz)
APS-002	RS-232/USB interface card (APS-7050, APS-7100)	GRA-423	APS-7050, APS-7100 rack mount kit
APS-007	RS-232 interface card (APS-7200, APS-7300)	GRA-429	Rack mount kit (APS-7200)
APS-003	Output Voltage Capacity(0~600Vrms)	GRA-430	Rack mount kit (APS-7300)

Note : APS-7200/APS-7300 are not CE approved.

APS-7300 Rear Panel



APS-7200 Rear Panel



APS-7100 Rear Panel



APS-7050 Rear Panel



Note:

The Specifications are not suit for ARB mode.

\*1. Maximum output current at working voltage 120Vrms, 240Vrms

\*2. 45~500Hz, 10% or higher of the rated output voltage, the maximum current or lower

\*3. All of measurement accuracy is at 23±5℃

\*4. In the case of 15~155V, 30~310V, sine wave, no load

APS-7000E Series

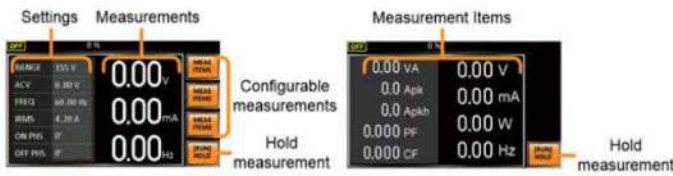
Europe Type Output Outlet





# 500/1000/2000/3000 VA Programmable Linear AC Power Source

## A. CONTROL PANEL CHARACTERISTICS



### Standard Mode

There are two control panel modes: Standard mode and Simple mode. Both modes are shown on the above. Standard mode combines settings and AC Power Meter measurement window display. Users apply Function key (F1~F3) to select required measurement items. There are nine items for selection. Simple mode shows all measurement items on the display.

### Simple Mode

## B. REVERSE CURRENT DISPLAY



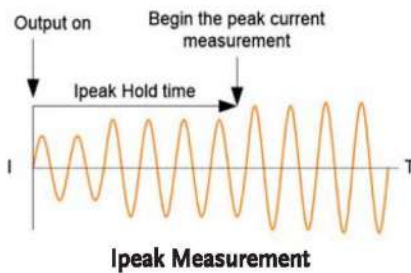
### Standard Mode

When output terminal detects 180 degree phase difference between voltage and current (reverse current), the front panel of APS-7000 Series will remind users the power and power factor measurement results in red numerical display. This feature can be applied to show the power and power factor measurement while testing inverter for feedback power grid. As shown on the above :

APS-7000 Series can withstand reverse current: 30% of the maximum effective current or maximum current output within three minutes.

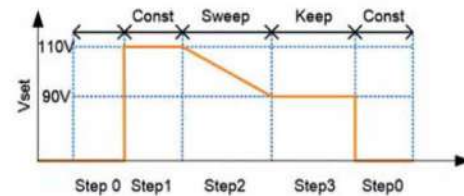
### Simple Mode

## C. T IPEAK, HOLD FUNCTION



T, Ipk Hold sets delay time (1ms~60 seconds) for measurement after the output of Ipeak value and the maximum value will be retrieved. Update will be proceeded only if measured value is greater than the original value. Ipk Hold is for measuring transient inrush current as soon as the equipment power is on that is usually done by oscilloscope and current probe. T, Ipk Hold delay time setting can be applied to measure inrush current of sequentially activated DUT.

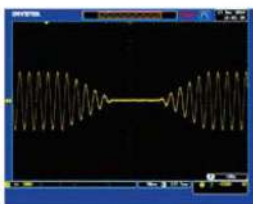
## D. SEQUENCE MODE



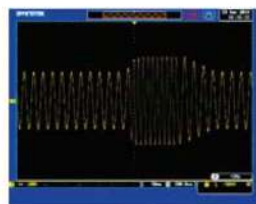
### Sequence Mode

There are ten sets of Sequence mode and each set has 0~255 steps. The time setting range for each step is 0.01 ~ 999.99 seconds. Combining many sets of steps to edit required waveforms can satisfy users' requirement of highly complicated waveforms.

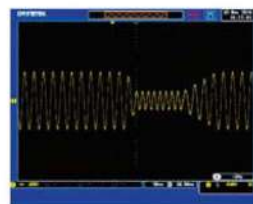
## E. SIMULATE MODE



Power Outage



Voltage Rise

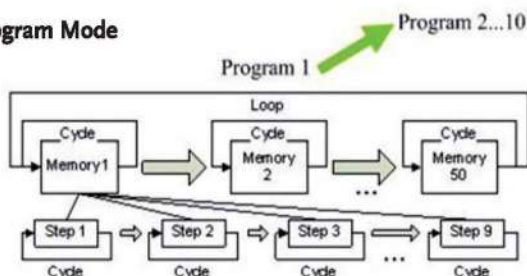


Voltage Fall

This mode can rapidly produce different simulated input transient waveforms such as power outage; voltage rise and voltage fall etc. for engineers to evaluate the impact on DUT posed by the transient phenomena. For instance, capacitor endurance test.

## F. PROGRAM MODE

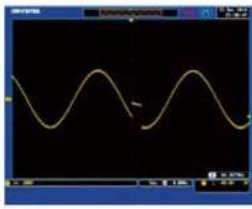
### Program Mode



This mode allows users to set ceiling and floor specifications to produce PASS/FAIL result after the measurement is done. It can also show test results for each test procedure or only show the last result.

There are ten sets of Program mode and each set has 50 sets of memory. Each memory comprises 9 steps. Each Program will operate according to memory sequence, self-defined loops or designated steps to stop.

## G SURGE/DIP CONTROL



Surge

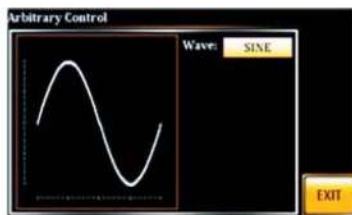


Dip

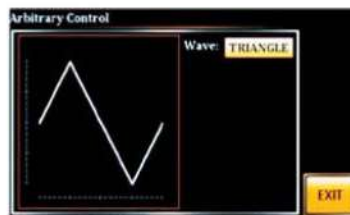
Overlapping a Surge/Dip voltage on a normal voltage as the input power for DUT allows users to simulate Surge/Dip situation and evaluate DUT characteristics.

## H. FUNCTION WAVEFORM (ARB) MODE

Provide waveforms in seven categories and 20,000 waveform combinations so as to rapidly simulate distorted AC voltage waveforms.



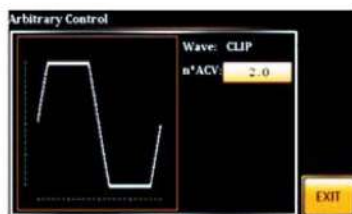
Sine Waveform  
Standard AC Waveform



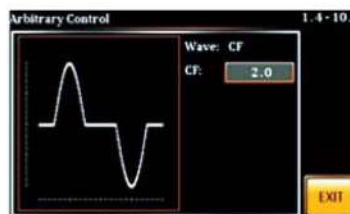
Triangle Waveform  
Power Harmonic Output Simulation  
Is Triangle Waveform



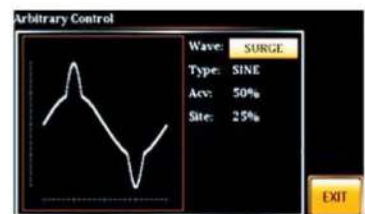
Staircase Waveform  
Simulate Square Waveform And Staircase  
Waveform For Commercial Ups



Clipped Sinewave  
Simulate Grid Power Supply Heavy  
Load Waveform



Crest Factor Waveform  
Simulate Rectified Filter Current  
Waveform By Capacitor Input



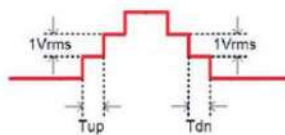
Surge Waveform  
Simulate Grid Power Supply's  
Peak Over-voltage



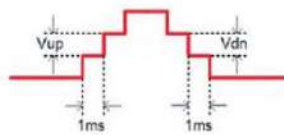
Fourier Series Synthesized Waveform

Simulate real output power waveform. Distorted power waveform is produced due to output impedance and non-linear effect such as inductance, capacitance, and parasitic capacitance effect. For example: motors.

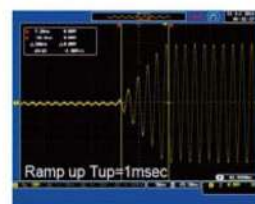
## I. RAMP CONTROL



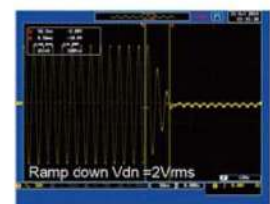
$T_{up} \rightarrow 0.1 \sim 999.9\text{ms}$   
 $T_{dn} \rightarrow 0.1 \sim 999.9\text{ms}$



$V_{up} \rightarrow 0.01 \sim 99.99\text{Vrms}$   
 $V_{dn} \rightarrow 0.01 \sim 99.99\text{Vrms}$



Mode=Time,  $T_{up}=1\text{msec}$ ,  
 $V_{AC}=100\text{V}$ ,  $\text{Freq}=50\text{Hz}$ ,  
Ramp output=on.



Mode=Voltage,  $V_{dn}=2\text{Vrms}$ ,  
 $V_{AC}=100\text{V}$ ,  $\text{Freq}=50\text{Hz}$ ,  
Ramp output=off.

Ramp control allows users to set output voltage rise or fall speed which is based on time (1ms) or voltage (1Vrms) unit.



# 500/1000 VA AC Power Source



**APS-7050E**



**APS-7100E**



## FEATURES

- \* 4.3" large LCD Display
- \* Output Capacity:  
APS-7050E (500VA, 310Vrms, 4.2/2.1Arms)  
APS-7100E (1000VA, 310Vrms, 8.4/4.2Arms)
- \* Measurement Function :  
Voltage, Current, Power, Frequency, Power Factor, Ipeak
- \* Reverse Current Alarm Function
- \* 10 Sets of The Test Mode Simulate Power Transient Output
- \* 10 Sets of Preset Allow Users to Store Ten Settings
- \* OCP/OPP/OTP Protection
- \* Variable Voltage, Frequency and Current Limiter
- \* Universal Power Inlet

GW Instek launches the APS-7000E series the economy version of the APS-7000 programmable AC power source. With the height of 2U, the maximum rated output for APS-7050E is 500VA, 310Vrms, 4.2Arms and APS-7100E is 1000VA, 310Vrms, 8.4Arms. The output frequency range of the series is 45~500Hz. The series is ideal for the test and development of DC power supply devices, consumer electronics, automotive electronics and electronic components.

The APS-7000E series comprises six measurement and test functions (Vrms, Irms, F, Ipk, W, PF), and provides user interface similar to that of AC Power Meter. The APS-7000E series, via switching many sets of current levels to increase small current measurement resolution, is ideal for the LED industry and standby mode power consumption test. Ten sets of Preset allow users to store ten settings.

To meet the test criteria of line voltage fluctuation often seen in consumer electronics, the APS-7000E series not only provides a stable AC power source but also features the Test mode to satisfy special or abnormal voltage and frequency variation demands. Ten sets of the Test mode simulate power outage, voltage rise, and voltage fall. The APS-7000E series that simulates waveforms of city power grid's transient changes is suitable for verifying electronics products operated under abnormal power source.

The APS-7000E series is the economy version of the APS-7000 series. If communications interface and larger voltage/frequency are required, please refer to the APS-7000 series.

## SPECIFICATIONS

Model		APS-7050E	APS-7100E
Power Rating		500VA	1000VA
Output Voltage		0 ~ 310.0 Vrms	0 ~ 310.0 Vrms
Output Frequency		45.00 ~ 500.0 Hz	45.00 ~ 500.0 Hz
Maximum Current (r.m.s)	0~155Vrms	4.2A	8.4A
	0~310Vrms	2.1A	4.2A
Maximum Current (peak)	0~155Vrms	16.8A	33.6A
	0~310Vrms	8.4A	16.8A
Total Harmonic Distortion (THD)		≤0.5% at 45 ~ 500Hz (Resistive Load)	
Crest Factor		≥ 4	
Line regulation		0.1% (% of full scale)	
Load regulation		0.5% (% of full scale)	
Response time		<100us	
SETTING			
Voltage	Range	155Vrms/310Vrms/Auto	
	Resolution	0.01V at 0.00 ~ 99.99Vrms; 0.1V at 100.0 ~ 310.0Vrms	
Frequency	Accuracy	±(0.5% of setting+2 counts)	
	Range	45 ~ 500Hz	
	Resolution	0.01Hz at 45.00 ~ 99.99Hz/0.1Hz at 100.0 ~ 500.0Hz	
	Accuracy	±0.02% of setting	
MEASUREMENT			
Voltage(RMS)	Range	0.20~38.75Vrms/38.76~77.50 Vrms/77.51~155.0Vrms/155.1~310.0Vrms	
	Resolution	0.01V at 0.00 ~ 99.99Vrms; 0.1V at 100.0 ~ 310.0Vrms	
Frequency	Accuracy	±(0.5% of reading + 2 counts)	
	Range	45 ~ 500Hz	
	Resolution	0.01Hz (at 45Hz~99.99Hz)/0.1Hz (at 100Hz~500.0Hz)	
	Accuracy	±0.1Hz	
Current(RMS)	Range	2.00 ~ 70.00mA/60.0 ~ 350.0mA/0.300 ~ 3.500A/3.00 ~ 17.5A	
	Resolution	0.01mA, 0.1mA, 0.001A, 0.01A	
	Accuracy	±(0.6% of reading+5 counts); 2.00~350.0mA/±(0.5% of reading+5 counts); 0.350~3.500A/±(0.5% of reading+3 counts); 3.500~17.50A	
Current(Peak)	Range	0.0 ~ 70.0A	
	Resolution	0.1A	
	Accuracy	±(1% of reading+1 count)	
Power(W)	Resolution	0.01W, 0.1W, 1W	
	Accuracy	±(0.6% of reading+5 counts); 0.20~99.99W; ±(0.6% of reading+5 counts); 100.0~999.9W ±(0.6% of reading+2 counts); 1000~9999W	
Power Factor	Resolution	0.001	
	Accuracy	±(2% of reading + 2 counts)	
GENERAL			
Number of Preset		10(0~9 Numeric keys)	
Protection		OCP, OPP, OTP and Alarm	



**APS-7050E**



**APS-7100E**

**APS-7050E Rear Panel**



**APS-7100E Rear Panel**



SPECIFICATIONS		
Model	APS-7050E	APS-7100E
ENVIRONMENT CONDITIONS		
Operation Temperature	0 ~ +40℃	
Storage Temperature	-10 ~ +70℃	
Operating Temperature	20 ~ 80% RH (No Condensation)	
Storage Humidity	80% RH or less(No Condensation)	
AC INPUT		
Input Power Source	1Φ AC 115/230Vac ±15%	
DIMENSIONS & WEICHT		
	430(W) x 88(H) x 400(D) mm; Approx. 24Kg	430(W) x 88(H) x 560(D) mm; Approx. 38Kg

### ORDERING INFORMATION

**APS-7050E** 500VA AC Power Source  
**APS-7100E** 1000VA AC Power Source

#### ACCESSORIES :

CD ROM (User Manual) x 1, Power Cord (Region Dependent), Mains Terminal Cover Set, GTL-123 Test Lead

#### OPTIONAL ASSESSORIES

**GRA-423** Rack Mount Kit (APS-7000E Series)

**Mains Terminal Cover Set**

For: APS-7100/7100E Series



For: APS-7050/7050E Series



**APS-7000E Series  
Europe Type Output Outlet**







## DC ELECTRONIC LOADS

Electronic loads provided by GW Instek are DC electronic loads which can be divided into three product series.

The PEL-3000 Series, a single channel programmable DC electronic load with 0.01mA current resolution and the current slew rate reaching 16A/ $\mu$ s, is ideal for server power tests, SPS for commercial and industrial computers such as 24 hour non-stop cloud ecosystem. A single unit of the PEL-3000 Series provides up to 1050W. Via series or parallel connections, the PEL-3000 series provides the maximum output of 9450W.

PEL-2000A programmable DC electronic load can be operated under C.C., C.V., and C.R. modes. It can also simulate various kinds of dynamic loads. The PEL-2000A Series was a modulation design which intends to assist users to reserve the augmentation capability of future higher power requirements. Via parallel connections, the maximum of five units can be connected to output the maximum power of 7kVA.

Additionally, PEL-303xE is a single channel, 300W DC electronic load. Inherited from the PEL-3000 series, PEL-3000E has an easy-to-read LCD panel and user-friendly interface. This model features high speed and accurate measurement capability for the electronic component, battery, portable charger and power products that require low to medium power consumption.

## PRODUCTS

- Programmable DC Electronic Loads (Includes High Power Capacity)
- Programmable DC Electronic Loads (Multi-channel)

# DC ELECTRONIC LOADS

## DC ELECTRONIC LOADS

Electronic load controls current, voltage and resistance. Electronic load is utilized to absorb power and its specifications are usually indicated by ampere, voltage and the maximum power.

Electronic loads are often categorized as resistant, inductive or capacitive. In the real tests, electronic load involves complex factors, including dynamic variation, C.V., C.C., C.R. or the control of power.

### PROGRAMMABLE DC ELECTRONIC LOADS

Model	Operation Voltage	Operation Current	Power	Channel	Weight(kg)	Page
PEL-3021	0~150V	35A	175W	1	6	D71-76
PEL-3041	0~150V	70A	350W	1	7	
PEL-3111	0~150V	210A	1050W	1	17	
PEL-3211	0~150V	420A	2100W	1	23	
PEL-3212	0~150V	420A	2100W	1	67.5	
PEL-3322	0~150V	630A	3150W	1	73	
PEL-3323	0~150V	630A	3150W	1	85.5	
PEL-3424	0~150V	840A	4200W	1	110	
PEL-3533	0~150V	1050A	5250W	1	96.5	
PEL-3535	0~150V	1050A	5250W	1	127.5	
PEL-3744	0~150V	1470A	7350W	1	125	
PEL-3955	0~150V	1890A	9450W	1	149	
PEL-3021H	0~800V	8.75A	175W	1	6	
PEL-3041H	0~800V	17.5A	350W	1	7	
PEL-3111H	0~800V	52.5A	1050W	1	17	
PEL-3211H	0~800V	105A	2100W	1	23	
PEL-3212H	0~800V	105A	2100W	1	67.5	
PEL-3322H	0~800V	157.5A	3150W	1	73	
PEL-3323H	0~800V	157.5A	3150W	1	85.5	
PEL-3424H	0~800V	210A	4200W	1	110	
PEL-3533H	0~800V	262.5A	5250W	1	96.5	
PEL-3535H	0~800V	262.5A	5250W	1	127.5	
PEL-3744H	0~800V	367.5A	7350W	1	125	
PEL-3955H	0~800V	472.5A	9450W	1	149	
PEL-3031E	0~150V	60A	300W	1	7.5	D77-82
PEL-3032E	0~500V	15A	300W	1	7.5	
PEL-2020A	0~80V	20A	100/100W	2	3.8	D83-86
PEL-2030A	0~80V	5/40A	30/250W	2	3.8	
PEL-2040A	0~80V	70A	350W	1	3.8	
PEL-2041A	0~500V	10A	350W	1	3.8	



# Programmable D.C. Electronic Load



PEL-3111/3111H



PEL-3041/3041H/3021/3021H



## FEATURES

- \* Operating Voltage (DC) : 0~150V(PEL-3000)/ 0~800V(PEL-3000H)
- \* Operating Mode : C.C/C.V/C.R/C.P/C.C+C.V/ C.R+C.V/C.P+C.V
- \* Parallel Connection of Inputs for Higher Capacity (Max : 9,450W)
- \* Support of High Slew Rate : Max 16A/ $\mu$ s (PEL-3000)/0.84A/ $\mu$ s (PEL-3000H)
- \* Run Program Function (Go/NoGo Test)
- \* Sequence Function for High Efficient Load Simulations
- \* Dynamic (Switching) Function : 0.0166Hz~20kHz
- \* Soft Start Function : Off/On (1~200ms, Res. 1ms)
- \* Adjustable OCP/OVP/OPP/UVP Setting
- \* Short Circuit Function
- \* Timer Function : Elapsed Time of Load on
- \* Cut Off Time (Auto Load Off Timer) : 1s to 999h 59min 59s or Off
- \* External Channel Control/Monitoring Via Analog Control Connector
- \* Setup Memories : 100 sets
- \* 3.5 Inch TFT LCD Display
- \* Multi Interface : USB 2.0 Device/Host, RS-232, GPIB/LAN (Optional)

## Rear Panel



The PEL-3000 Series, a single-channel, programmable D.C. electronic load with 0.01mA current resolution and 16A/ $\mu$ s current Slew Rate, is very ideal for testing server power supply and SPS(Switching Power Supply) for commercial and industrial computers. For a heavy-duty device like cloud ecosystem running 24-hour nonstop operations, a stable and high-power power supply, ranging from 350W to 1500W, is required to maintain the normal operation of server, Hub, and the equipment of data storage and internet communications. Owing to the increasing demand of data transmission and large scale data storage of telecommunications systems, the infrastructure of internet communications is in the pace of rapid expansion. This has greatly boosted the market demand of telecommunications equipment powered by power supply of 2000W and above. The flexible power combination of PEL-3000 Series meets the test requirements of present high-power power supply. The PEL-3000H Series programmable DC Electronic load, which not only inherited functions and features from the PEL-3000 Series but providing three current ranges for all PEL-3000H Series and adding voltage monitor BNC terminals on the front panel. The PEL-3000H Series, a single-channel, programmable D.C. electronic load with 800V and 0.84A/ $\mu$ s current Slew Rate, is ideal for the test of the high voltage devices such as the EV & HEV in-vehicle chargers, DC/DC converters or high-voltage batteries. With respect to battery testing applications such as rechargeable battery for electrical tools, battery module and automobile battery, PEL-3000(H) Series has three stand-alone models to offer including 175W, 350W, 1050W and Booster. By connecting Booster 2100W units with master units, the maximum load capacity of the whole system can reach 9,450W. Hence, the PEL-3000(H) Series fulfills various power testing requirements including medium to low power or high-power power supply.

The PEL-3000(H) Series has seven operating modes and three operating functions. Among the seven operating modes, four of them are basic operating modes, including constant current, constant voltage, constant resistance, and constant power, and the other three are advanced operating modes including constant current + constant voltage, constant resistance + constant voltage, and constant power + constant voltage. Users must first select operating mode and then operating function based upon the test requirements. Static, Dynamic and Sequence operating functions can be applied to different testing conditions including a fixed load level, switching between two levels or switching among more than two levels. Sequence function is divided into Fast Sequence and Normal Sequence according to the test time of each step. Both Dynamic and Sequence are to assist users to simulate the genuine load change. For instance, PEL-3000(H) Series can simulate HEV current consumption to make sure that automobile battery can supply HEV with sufficient power need on the road. By so doing, manufacturers can elevate product quality and reliability.

The Soft Start function of the PEL-3000(H) Series can set current rise time for the moment PEL-3000(H) Series is turned on to reduce the abnormal situation of the voltage drop of power supply under test. The adjustable Under Voltage Protection(UVP), GO/NO GO voltage input monitoring function, current monitoring function and Timer Function to control load activation time can be jointly applied to the characteristic tests of battery bleeding to avoid battery damage during bleeding operation. Based upon the functionalities described above, the PEL-3000(H) Series can test a vast variety of power supply ranging from the fundamental static sink current to complex dynamic load simulations so as to enhance product quality and reliability.

## The single unit D.C Electronic Load of PEL-3000(H) Series

The PEL-3000(H) Series is a high speed, single channel and programmable D.C. electronic load and its power, functionality, parallel combination and size are listed on the following chart :

MODEL	PEL-3021/3021H	PEL-3041/3041H	PEL-3111/3111H	PEL-3211/3211H
Power	175W	350W	1,050W	2,100W Booster
Function	Full-function Single Unit	Full-function Single Unit	Full-function Single Unit	No control panel, can not be operated alone
Parallel Combination	Parallel with same model, 5 units the maximum	Parallel with same model, 5 units the maximum	Parallel with same model, 5 units the maximum	Parallel with PEL-3111 (H)
			Parallel with the maximum of four PEL-3211 (H)s	
Size	Half Rack	Half Rack	Full Rack	Full Rack

Note:

- \*1. Full scale of H range
- \*2. Vin: input terminal voltage of electronic load
- \*3. M range applies to the full scale of H range
- \*4.  $\text{Siemens}[S] = \text{Input current}[A] / \text{Input voltage}[V] = 1/\text{resistance}[\Omega]$
- \*5. Converted value at the input current. At the input current. It is not applied for the condition of the parallel operation.
- \*6.  $\text{set} = \text{Vin}/\text{Rset}$
- \*7. At the sensing point during remote sensing under the operating range of the input voltage. It is also applied for the condition of the parallel operation.
- \*8. It is not applied for the condition of the parallel operation.
- \*9. Time to reach from 10 % to 90 % when the current is varied from 2 % to 100 % ( 20 % to 100 % in M range ) of the rated current.
- \*10. N = Number of units in parallel ( same model )
- \*11. N = Number of units in parallel ( same model ) or  $N = 1 + 2 \times (\text{Number of units in parallel [PEL-3211]})$



SPECIFICATIONS												
Model			PEL-3021			PEL-3041			PEL-3111			PEL-3211
Voltage			0V~150V			0V~150V			0V~150V			0V~150V
Current			35A			70A			210A			420A
Power			175W			350W			1050W			2100W
Input Resistance			500 kΩ			500 kΩ			500 kΩ			500 kΩ
Min. Operating Voltage(DC) (Typ.)			0.75V@17.5A 1.5V@35A			0.75V@35A 1.5V@70A			0.75V@105A 1.5V@210A			0.75V@210A 1.5V@420A
CONSTANT CURRENT MODE												
Operating Range		H, M, L	0~35A	0~3.5A	0~0.35A	0~70A	0~7A	0~0.7A	0~210A	0~21A	0~2.1A	420A
Accuracy of Setting		H, M	±(0.2 % of set + 0.1 % of f.s <sup>(1)</sup> ) + Vin <sup>(2)</sup> /500 kΩ									±(1.2% of set+1.1% of f.s)
Accuracy of Setting		L	±(0.2 % of set + 0.1 % of f.s <sup>(1)</sup> ) + Vin <sup>(2)</sup> /500 kΩ									N/A
Accuracy of Setting(Parallel)			±(1.2% of set+1.1% of f.s. <sup>(1)</sup> )									±(1.2% of set+1.1% of f.s)
Resolution		H, M, L	1mA	0.1mA	0.01mA	2mA	0.2mA	0.02mA	10mA	1mA	0.1mA	N/A
CR MODE												
Operating Range		Range	H	23.3336S~400μS (42.857mΩ~2.5kΩ)		46.6672S~800μS (21.428mΩ~1.25kΩ)		140.0016S~2.4mS (7.1427mΩ~416.6667Ω)		280.0032S~4.8mS (3.5714mΩ~208.3334Ω)		
			M	2.33336S~40μS (428.566mΩ~25kΩ)		4.6667S~80μS (214.28mΩ~12.5kΩ)		14.0001S~242.4μS (71.427mΩ~4.16667kΩ)		28.0032S~484.8μS (35.7135mΩ~2.083334Ω)		
			L	0.233336S~4μS (4.28566Ω~250kΩ)		0.46667S~8μS (2.1428Ω~125kΩ)		1.40001S~24.24μS (714.27mΩ~41.6667kΩ)		N/A		
Accuracy of Setting		H, M	±(0.5 % of set <sup>(1)</sup> + 0.5 % of f.s <sup>(1)</sup> ) + Vin <sup>(2)</sup> /500kΩ									±(1.2% of set <sup>(1)</sup> +1.1% of f.s <sup>(1)</sup> )
Accuracy of Setting		L	±(0.5 % of set <sup>(1)</sup> + 0.5 % of f.s <sup>(1)</sup> ) + Vin <sup>(2)</sup> /500kΩ									N/A
Parallel			±(1.2 % of set + 1.1 % of f.s <sup>(1)</sup> )									±(1.2% of set +1.1% of f.s <sup>(1)</sup> )
Resolution		H, M, L	400μS	40μS	4μS	800μS	80μS	8μS	2.4mS	240μS	24μS	N/A
CONSTANT VOLTAGE MODE												
Operating Range		Range	H	1.5V~150V								1.5V~150V
			L	1.5V~15V								1.5V~15V
Accuracy of Setting		H, L	±(0.1 % of set + 0.1 % of f.s)									N/A
Resolution		H, L	10mV/1mV									N/A
CONSTANT POWER MODE												
Operating Range		Range	H	17.5W~175W		35W~350W		105W~1050W		210W~2100W		
			M	1.75W~17.5W		3.5W~35W		10.5W~105W		21W~210W		
			L	0.175W~1.75W		0.35W~3.5W		1.05W~10.5W		N/A		
Accuracy of Setting		H, M, L	±(0.6 % of set <sup>(1)</sup> + 1.4 % of f.s <sup>(1)</sup> ) + Vin <sup>(2)</sup> /500kΩ									N/A
Resolution		H, M, L	10mW	1mW	0.1mW	10mW	1mW	0.1mW	100mW	10mW	1mW	N/A
PARALLEL Mode												
Capacity			875W			1750W			5250W			PEL-3111 with 4 booster units : Max 9.45kW
SLEW RATE												
Operation Mode			CC, CR			CC, CR			CC, CR			N/A
Setting Range (CC mode)		Range	H	2.5 x N <sup>(10)</sup> mA/μs~2.5A/μs		5 x N <sup>(10)</sup> mA/μs~5A/μs		16 x N <sup>(11)</sup> mA/μs~16A/μs		N/A		
			M	250 x N <sup>(10)</sup> μA/μs~250mA/μs		500 x N <sup>(10)</sup> μA/μs~500mA/μs		1.6 x N <sup>(11)</sup> mA/μs~1.6A/μs		N/A		
			L	25 x N <sup>(10)</sup> μA/μs~25mA/μs		50 x N <sup>(10)</sup> μA/μs~50mA/μs		160 x N <sup>(11)</sup> μA/μs~160mA/μs		N/A		
Setting Range (CR Mode)		Range	H	250 x N <sup>(10)</sup> μA/μs~250mA/μs		500 x N <sup>(10)</sup> μA/μs~500mA/μs		1.6 x N <sup>(11)</sup> mA/μs~1.6A/μs		N/A		
			M	25 x N <sup>(10)</sup> μA/μs~25mA/μs		50 x N <sup>(10)</sup> μA/μs~50mA/μs		160 x N <sup>(11)</sup> μA/μs~160mA/μs		N/A		
			L	2.5 x N <sup>(10)</sup> μA/μs~2.5mA/μs		5 x N <sup>(10)</sup> μA/μs~5mA/μs		16 x N <sup>(11)</sup> μA/μs~16mA/μs		N/A		
Accuracy of Setting		H, M, L	±(10 % of set <sup>(1)</sup> + 5μs)									N/A
Resolution (Setting Range)			1 x N <sup>(10)</sup> mA 250 x N <sup>(10)</sup> mA/μs~2.5A/μs 100 x N <sup>(10)</sup> μA 25 x N <sup>(10)</sup> mA/μs~250 x N <sup>(10)</sup> mA/μs 10 x N <sup>(10)</sup> μA 2.5 x N <sup>(10)</sup> mA/μs~25 x N <sup>(10)</sup> mA/μs 1 x N <sup>(10)</sup> μA 250 x N <sup>(10)</sup> μA/μs~2.5 x N <sup>(10)</sup> mA/μs 100 x N <sup>(10)</sup> nA 25 x N <sup>(10)</sup> μA/μs~250 x N <sup>(10)</sup> μA/μs 10 x N <sup>(10)</sup> nA 2.5 x N <sup>(10)</sup> μA/μs~25 x N <sup>(10)</sup> uA/μs		2 x N <sup>(10)</sup> mA 500 x N <sup>(10)</sup> mA/μs~5A/μs 200 x N <sup>(10)</sup> μA 50 x N <sup>(10)</sup> mA/μs~500 x N <sup>(10)</sup> mA/μs 20 x N <sup>(10)</sup> μA 5 x N <sup>(10)</sup> mA/μs~50 x N <sup>(10)</sup> mA/μs 2 x N <sup>(10)</sup> μA 500 x N <sup>(10)</sup> μA/μs~5 x N <sup>(10)</sup> mA/μs 200 x N <sup>(10)</sup> nA 50 x N <sup>(10)</sup> μA/μs~500 x N <sup>(10)</sup> μA/μs 20 x N <sup>(10)</sup> nA 5 x N <sup>(10)</sup> μA/μs~50 x N <sup>(10)</sup> μA/μs		6 x N <sup>(11)</sup> mA 1.6 x N <sup>(11)</sup> A/μs~16A/μs 600 x N <sup>(11)</sup> μA 160 x N <sup>(11)</sup> mA/μs~1.6 x N <sup>(11)</sup> A/μs 60 x N <sup>(11)</sup> μA 16 x N <sup>(11)</sup> mA/μs~160 x N <sup>(11)</sup> mA/μs 6 x N <sup>(11)</sup> μA 1.6 x N <sup>(11)</sup> mA/μs~16 x N <sup>(11)</sup> mA/μs 600 x N <sup>(11)</sup> nA 160 x N <sup>(11)</sup> μA/μs~1.6 x N <sup>(11)</sup> μA/μs 60 x N <sup>(11)</sup> nA 16 x N <sup>(11)</sup> μA/μs~160 x N <sup>(11)</sup> μA/μs		N/A			
METER												
Voltmeter		Accuracy	±(0.1 % of rdg + 0.1 % of f.s)									N/A
Ammeter		Accuracy	±(0.2 % of rdg + 0.3 % of f.s)									N/A
Ammeter(Parallel Operation)		Accuracy	±(1.2% of rdg +1.1% of f.s.)									N/A
DYNAMIC MODE												
Operation Mode T1 & T2			CC , CR and CP									
Accuracy			0.025mS~10mS/Res : 1μs ; 1ms~60s/Res : 1ms									
Slew Rate (CC Mode)		Range	H	2.5mA/μs~2.5A/μs		5mA/μs~5A/μs		16mA/μs~16A/μs		N/A		
			M	250μA/μs~250mA/μs		500μA/μs~500mA/μs		1.6mA/μs~1.6A/μs		N/A		
			L	25μA/μs~25mA/μs		50μA/μs~50mA/μs		160μA/μs~160mA/μs		N/A		
Slew Rate (CR Mode)		Range	H	250μA/μs~250mA/μs		500μA/μs~500mA/μs		1.6mA/μs~1.6A/μs		N/A		
			M	25μA/μs~25mA/μs		50μA/μs~50mA/μs		160μA/μs~160mA/μs		N/A		
			L	2.5μA/μs~2.5mA/μs		5μA/μs~5mA/μs		16μA/μs~16mA/μs		N/A		
Current Accuracy			±0.4%F.S.			±0.4%F.S.			±0.4%F.S.			±(1.2%of set+1.1% of F.S.)
PROTECTION FUNCTION												
Functions			Overvoltage protection(OVP), Overcurrent protection(OCP), Overpower protection(OPP), Overheat protection(OHP), Undervoltage protection(UVP), Reverse connection protection(REV)									
GENERAL												
Input Range			90VAC~132VAC/180VAC~250VAC Single-phase; 47Hz~63Hz									
Power(Max.)			90VA			110VA			190VA			230VA
Interface			USB/RS232/Analog Control (Standard) ; GPIB/LAN (Option)									
Dimensions & Weight			214.5(W)x124(H)x400(D)mm; Approx. 6kg			214.5(W)x124(H)x400(D)mm; Approx. 7kg			429.5(W)x128(H)x400(D)mm; Approx. 17kg			427.7(W)x128(H)x592.5(D)mm; Approx. 23kg



# Programmable D.C. Electronic Load

## SPECIFICATIONS

Model			PEL-3212	PEL-3232	PEL-3424	PEL-3535	PEL-3322	PEL-3533	PEL-3744	PEL-3955
Voltage			0V~150V	0V~150V	0V~150V	0V~150V	0V~150V	0V~150V	0V~150V	0V~150V
Current			0~420A	0~630A	0~840A	0~1050A	0~630A	0~1050A	0~1470A	0~1890A
Power			2100W	3150W	4200W	5250W	3150W	5250W	7350W	9450W
Input Resistance			250 kΩ	166.7 kΩ	125 kΩ	100 kΩ	500 kΩ	500 kΩ	500 kΩ	500 kΩ
Min. Operating Voltage(DC)(Typ.)			0.75V@210A 1.5V@420A	0.75V@315A 1.5V@630A	0.75V@420A 1.5V@840A	0.75V@525A 1.5V@1050A	0.75V@315A 1.5V@630A	0.75V@525A 1.5V@1050A	0.75V@735A 1.5V@1470A	0.75V@945A 1.5V@1890A
CONSTANT CURRENT MODE										
Operating Range	H,M,L		0~420A 0~42A 0~4.2A	0~630A 0~63A 0~6.3A	0~840A 0~84A 0~8.4A	0~1050A 0~105A 0~10.5A	0~630A 0~63A N/A	0~1050A 0~105A N/A	0~1470A 0~147A N/A	0~1890A 0~189A N/A
Accuracy of Setting	H,M,L		±(0.2 % of set + 0.1 % of f.s <sup>(1)</sup> ) + Vin <sup>(2)</sup> /(500/N <sup>(10)</sup> kΩ)							
Resolution	H,M,L		20mA 2mA 0.2mA	30mA 3mA 0.3mA	40mA 4mA 0.4mA	50mA 5mA 0.5mA	30mA 3mA N/A	50mA 5mA N/A	70mA 7mA N/A	90mA 9mA N/A
CR MODE										
Operating Range	Range	H	280.0032S~4.8mS (3.57138mΩ~ 208.333Ω)	420.0048S~7.2mS (2.38092mΩ~ 138.888Ω)	560.0064S~9.6mS (1.78569mΩ~ 104.166Ω)	700.008S~12mS (1.42855mΩ~ 83.3333Ω)	420.0048S~7.2mS (2.38092mΩ~ 138.888Ω)	700.008S~12mS (1.42855mΩ~ 83.3333Ω)	980.0112S~16.8mS (1.02039mΩ~ 59.5238Ω)	1260.0144S~21.6mS (793.641uΩ~ 46.2963Ω)
		M	28.00032S~480μS (35.7138mΩ~ 2083.33Ω)	42.00048S~720μS (23.8092mΩ~ 1388.88Ω)	56.00064S~960μS (17.8569mΩ~ 1041.66Ω)	70.0008S~1.2mS (14.2855mΩ~ 833.333Ω)	42.00048S~720μS (23.8092mΩ~ 1388.88Ω)	70.0008S~1.2mS (14.2855mΩ~ 833.333Ω)	98.00112S~1.68mS (10.2039mΩ~ 595.238Ω)	126.00144S~2.16mS (7.93641mΩ~ 462.963Ω)
		L	2.800032S~48μS (357.138mΩ~ 20.8333kΩ)	4.200048S~72μS (238.092mΩ~ 13.8888kΩ)	5.600064S~96μS (178.569mΩ~ 10.4166kΩ)	7.00008S~120μS (142.855mΩ~ 8.33333kΩ)	N/A	N/A	N/A	N/A
Accuracy of Setting	H,M,L		±(0.5 % of set <sup>(8)</sup> + 0.5 % of f.s <sup>(1)</sup> ) + Vin <sup>(2)</sup> /(500/N <sup>(10)</sup> kΩ)							
Resolution	H,M,L		4.8mS 480μS 48μS	7.2mS 720μS 72μS	9.6mS 960μS 96μS	12mS 1.2mS 120μS	7.2mS 720μS -	12mS 1.2mS -	16.8mS 1.68mS -	21.6mS 2.16mS -
CONSTANT VOLTAGE MODE										
Operating Range	Range	H	1.5V~150V							
		L	1.5V~15V							
Accuracy of Setting	H,L		±(0.1 % of set + 0.1 % of f.s)							
Resolution	H,L		10mV/1mV							
CONSTANT POWER MODE										
Operating Range	Range	H	210W~2100W	315W~3150W	420W~4200W	525W~5250W	315W~3150W	525W~5250W	735W~7350W	945W~9450W
		M	21W~210W	31.5W~315W	42W~420W	52.5W~525W	31.5W~315W	52.5W~525W	93.5W~735W	94.5W~945W
		L	2.1W~21W	3.15W~31.5W	4.2W~42W	5.25W~52.5W	N/A	N/A	N/A	N/A
Accuracy of Setting	H,M,L		±(0.6 % of set + 1.4 % of f.s <sup>(1)</sup> ) + Vin x Vin / (500/N <sup>(10)</sup> MΩ): alone operation specifications							
Resolution	H,M,L		200mW 20mW 2mW	300mW 30mW 3mW	400mW 40mW 4mW	500mW 50mW 5mW	300mW 30mW -	500mW 50mW -	700mW 70mW -	900mW 90mW -
PARALLEL Mode										
Capacity			-	-	-	-	-	-	-	-
SLEW RATE										
Operation Mode			CC, CR		CC, CR	CC, CR	CC, CR	CC, CR	CC, CR	CC, CR
Setting Range (CC mode)	Range	H	32mA/μs~16A/μs	48mA/μs~16A/μs	64mA/μs~16A/μs	80mA/μs~16A/μs	48mA/μs~16A/μs	80mA/μs~16A/μs	112mA/μs~16A/μs	144mA/μs~16A/μs
		M	3.2mA/μs~1.6A/μs	4.8mA/μs~1.6A/μs	6.4mA/μs~1.6A/μs	8mA/μs~1.6A/μs	4.8mA/μs~1.6A/μs N/A	8mA/μs~1.6A/μs N/A	11.2mA/μs~1.6A/μs N/A	14.4mA/μs~1.6A/μs N/A
		L	320μA/μs~160mA/μs	480μA/μs~160mA/μs	640μA/μs~160mA/μs	800μA/μs~160mA/μs	N/A	N/A	N/A	N/A
Setting Range (CR Mode)	Range	H	3.2mA/μs~1.6A/μs	4.8mA/μs~1.6A/μs	6.4mA/μs~1.6A/μs	8mA/μs~1.6A/μs	4.8mA/μs~1.6A/μs	8mA/μs~1.6A/μs	11.2mA/μs~1.6A/μs	14.4mA/μs~1.6A/μs
		M	320μA/μs~160mA/μs	480μA/μs~160mA/μs	640μA/μs~160mA/μs	800μA/μs~160mA/μs	480μA/μs~160mA/μs	800μA/μs~160mA/μs	1.12mA/μs~160mA/μs	1.44mA/μs~160mA/μs
		L	32μA/μs~16mA/μs	48μA/μs~16mA/μs	64μA/μs~16mA/μs	80μA/μs~16mA/μs	N/A	N/A	N/A	N/A
Accuracy of Setting	H,M,L		±(10 % of set <sup>(9)</sup> + 5μs)							
Resolution (Setting Range)		12mA	18mA	24mA	30mA	18mA	30mA	42mA	54mA	
		1.6A/μs~16A/μs	1.6A/μs~16A/μs	1.6A/μs~16A/μs	1.6A/μs~16A/μs	1.6A/μs~16A/μs	1.6A/μs~16A/μs	1.6A/μs~16A/μs	1.6A/μs~16A/μs	
		1.2mA	1.8mA	2.4mA	3mA	1.8mA	3mA	4.2mA	5.4mA	
		160mA/μs~1.6A/μs	160mA/μs~1.6A/μs	160mA/μs~1.6A/μs	160mA/μs~1.6A/μs	160mA/μs~1.6A/μs	160mA/μs~1.6A/μs	160mA/μs~1.6A/μs	160mA/μs~1.6A/μs	
		120μA	180μA	240μA	300μA	180μA	300μA	420μA	540μA	
		16mA/μs~160mA/μs	16mA/μs~160mA/μs	16mA/μs~160mA/μs	16mA/μs~160mA/μs	16mA/μs~160mA/μs	16mA/μs~160mA/μs	16mA/μs~160mA/μs	16mA/μs~160mA/μs	
		12μA	18μA	24μA	30μA	18μA	30μA	42μA	54μA	
		1.6mA/μs~16mA/μs	1.6mA/μs~16mA/μs	1.6mA/μs~16mA/μs	1.6mA/μs~16mA/μs	1.6mA/μs~16mA/μs	1.6mA/μs~16mA/μs	1.6mA/μs~16mA/μs	1.6mA/μs~16mA/μs	
		1.2μA	1.8μA	2.4μA	3μA	1.8μA	3μA	4.2μA	5.4μA	
		160μA/μs~1.6mA/μs	160μA/μs~1.6mA/μs	160μA/μs~1.6mA/μs	160μA/μs~1.6mA/μs	160μA/μs~1.6mA/μs	160μA/μs~1.6mA/μs	160μA/μs~1.6mA/μs	160μA/μs~1.6mA/μs	
		120nA	180nA	240nA	300nA	160μA/μs~1.6mA/μs	160μA/μs~1.6mA/μs	160μA/μs~1.6mA/μs	160μA/μs~1.6mA/μs	
		16μA/μs~160μA/μs	16μA/μs~160μA/μs	16μA/μs~160μA/μs	16μA/μs~160μA/μs	N/A	N/A	N/A	N/A	
METER										
Voltmeter Ammeter	Accuracy		±(0.1 % of rdg + 0.1 % of f.s)							
	Accuracy		±(0.2 % of rdg + 0.3 % of f.s)							
DYNAMIC MODE										
Operation Mode T1 & T2 Accuracy			CC and CR 0.025mS~10mS/Res : 1μs ; 1mS~30S/Res : 1mS 1μS/1ms ± 100ppm							
Slew Rate (CC Mode)	Range	H	32mA/μs~16A/μs	48mA/μs~16A/μs	64mA/μs~16A/μs	80mA/μs~16A/μs	48mA/μs~16A/μs	80mA/μs~16A/μs	112mA/μs~16A/μs	144mA/μs~16A/μs
		M	3.2mA/μs~1.6mA/μs	4.8mA/μs~1.6A/μs	6.4mA/μs~1.6A/μs	8mA/μs~1.6A/μs	4.8mA/μs~1.6A/μs	8mA/μs~1.6A/μs	11.2mA/μs~1.6A/μs	14.4mA/μs~1.6A/μs
		L	320μA/μs~160mA/μs	480μA/μs~160mA/μs	640μA/μs~160mA/μs	800μA/μs~160mA/μs	N/A	N/A	N/A	N/A
Slew Rate (CR Mode)	Range	H	3.2mA/μs~1.6A/μs	4.8mA/μs~1.6A/μs	6.4mA/μs~1.6A/μs	8mA/μs~1.6A/μs	4.8mA/μs~1.6A/μs	8mA/μs~1.6A/μs	11.2mA/μs~1.6A/μs	14.4mA/μs~1.6A/μs
		M	320μA/μs~160mA/μs	480μA/μs~160mA/μs	640μA/μs~160mA/μs	800μA/μs~160mA/μs	480μA/μs~160mA/μs	800μA/μs~160mA/μs	1.12mA/μs~160mA/μs	1.44mA/μs~160mA/μs
		L	32μA/μs~16mA/μs	48μA/μs~16mA/μs	64μA/μs~16mA/μs	80μA/μs~16mA/μs	N/A	N/A	N/A	N/A
Current Accuracy			±0.4%F.S.							
PROTECTION FUNCTION										
Functions			Overvoltage protection (OVP), Overcurrent protection (OCP), Overpower protection (OPP), Overheat protection (OHP), Undervoltage protection (UVP), Reverse connection protection (REV)							
GENERAL										
Input Range			90VAC~132VAC/180VAC~250VAC Single-phase; 47Hz~63Hz							
Power(Max.)			380VA	570VA	760VA	950VA	420VA	650VA	880VA	1110VA
Interface			USB/RS232/Analog Control (Standard) ; GPIB/LAN (Option)							
Dimensions & Weight			598(W)x877(H)x 706(D)mm; Approx. 67.5kg	598(W)x877(H)x 706(D)mm; Approx. 85.5kg	598(W)x877(H)x 706(D)mm; Approx. 110kg	598(W)x877(H)x 706(D)mm; Approx. 127.5kg	598(W)x877(H)x 706(D)mm; Approx. 73kg	598(W)x877(H)x 706(D)mm; Approx. 96.5kg	598(W)x877(H)x 706(D)mm; Approx. 125kg	598(W)x877(H)x 706(D)mm; Approx. 149kg



SPECIFICATIONS														
Model			PEL-3021H			PEL-3041H			PEL-3111H			PEL-3211H		
Voltage			0V~800V			0V~800V			0V~800V			0V~800V		
Current			8.75A			17.5A			52.5A			105A		
Power			175W			350W			1050W			2100W		
Input Resistance			3.24MΩ			3.24MΩ			3.24MΩ			3.24MΩ		
Min. Operating Voltage(DC)(Typ.)			5V@8.75A			5V@17.5A			5V@52.5A			5V@105A		
			2.5V@4.375A			2.5V@8.75A			2.5V@26.25A			2.5V@52.5A		
CONSTANT CURRENT MODE														
Operating Range		H, M, L	0~8.75A 0~875mA 0~87.5mA			0~17.5A 0~1.75A 0~175mA			0~52.5A 0~5.25A 0~525mA			0~105A 0~10.5A 0~1.05A		
Accuracy of Setting		H, M	±(0.2 % of set + 0.1 % of f.s <sup>(1)</sup> ) + Vin <sup>(2)</sup> /3.24MΩ										±(1.2% of set+1.1% of f.s)	
Accuracy of Setting		L	±(0.2 % of set + 0.1 % of f.s <sup>(1)</sup> ) + Vin <sup>(2)</sup> /3.24MΩ										N/A	
Accuracy of Setting(Parallel)			±(1.2% of set +1.1% of f.s <sup>(1)</sup> )										N/A	
Resolution		H, M, L	300μA	30μA	3μA	0.6mA	60μA	6μA	2mA	200μA	20μA	4mA	400μA	40μA
CR MODE														
Operating Range		Range	H	1.75S~30μS (571mΩ~33.3kΩ)			3.5S~60μS (285mΩ~16.6kΩ)			10.5S~180μS (95.2mΩ~5.55kΩ)			21S~360μS (47.6mΩ~2.777kΩ)	
			M	175mS~3μS (5.71Ω~333kΩ)			350mS~6μS (2.85Ω~166kΩ)			1.05S~18μS (952mΩ~55.5kΩ)			2.1S~36μS (476mΩ~27.77kΩ)	
			L	17.5mS~0.3μS (57.1Ω~3.33MΩ)			35mS~0.6μS (28.5Ω~1.66MΩ)			105mS~1.8μS (9.52Ω~555kΩ)			210mS~3.6μS (4.762Ω~277.7kΩ)	
Accuracy of Setting		H, M	±(0.5% set + 0.5% f.S <sup>(1)</sup> ) + Vin <sup>(2)</sup> /3.24MΩ										±(1.2% of set +1.1% of f.s)TYP	
Accuracy of Setting		L	±(0.5% set + 0.5% f.S <sup>(1)</sup> ) + Vin <sup>(2)</sup> /3.24MΩ										N/A	
Parallel			±(1.2 % of set + 1.1 % of f.s <sup>(1)</sup> )										N/A	
Resolution		H, M, L	30μS	3μS	0.3μS	60μS	6μS	0.6μS	180μS	18μS	1.8μS	N/A		
CONSTANT VOLTAGE MODE														
Operating Range		Range	H	5V~800V								5V~800V		
			L	5V~80V								5V~80V		
Accuracy of Setting		Range	H, L	±(0.2% of set + 0.2% of f.s)								±(0.2% of set + 0.2% of f.s)		
			Parallel	TYP ±(0.2% of set + 0.2% of f.s)								±(0.2% of set + 0.2% of f.s)		
Resolution		Range	H, L	20mV/2mV								N/A		
CONSTANT POWER MODE														
Operating Range		Range	H	17.5W~175W			35W~350W			105W~1050W			210W~2100W	
			M	1.75W~17.5W			3.5W~35W			10.5W~105W			21W~210W	
			L	0.175W~1.75W			0.35W~3.5W			1.05W~10.5W			2.1W~21W	
Accuracy of Setting		H, M	±(0.6 % of set + 1.4 % of f.s.)+Vin/3.24MΩ										±(5 % of f.s)TYP	
Resolution		H, M, L	10mW	1mW	0.1mW	10mW	1mW	0.1mW	100mW	10mW	1mW	N/A		
PARALLEL Mode														
Capacity			875W			1750W			5250W			PEL-3111H with 4 booster units : Max 9.45kW		
SLEW RATE														
Operation Mode			CC, CR			CC, CR			CC, CR			N/A		
Setting Range (CC mode)		Range	H	0.14 x N <sup>100</sup> mA/μs~140mA/μs			0.280 x N <sup>100</sup> mA/μs~280.0mA/μs			0.840 x N <sup>100</sup> mA/μs~840mA/μs			N/A	
			M	0.014 x N <sup>100</sup> mA/μs~14mA/μs			0.0280 x N <sup>100</sup> mA/μs~28.00mA/μs			0.0840 x N <sup>100</sup> mA/μs~84.00mA/μs				
			L	1.4 x N <sup>100</sup> μA/μs~1400μA/μs			2.80 x N <sup>100</sup> μA/μs~2800μA/μs			0.00840 x N <sup>100</sup> μA/μs~8.400mA/μs				
Setting Range (CR Mode)		Range	H	0.014 x N <sup>100</sup> mA/μs~14mA/μs			0.0280 x N <sup>100</sup> mA/μs~28.00mA/μs			0.0840 x N <sup>100</sup> mA/μs~84.00mA/μs			N/A	
			M	0.0014 x N <sup>100</sup> mA/μs~1.4mA/μs			0.00280 x N <sup>100</sup> mA/μs~2.800mA/μs			0.00840 x N <sup>100</sup> μA/μs~8.400mA/μs				
			L	0.14 x N <sup>100</sup> μA/μs~140μA/μs			0.280 x N <sup>100</sup> μA/μs~280.0μA/μs			0.000840 x N <sup>100</sup> μA/μs~0.8400mA/μs				
Accuracy of Setting		H, M, L	±(10 % of set + 25μs)										N/A	
Resolution (Setting Range)			50 x N <sup>100</sup> μA			100 x N <sup>100</sup> μA			300 x N <sup>100</sup> μA			N/A		
			14 x N <sup>100</sup> mA/μs~140mA/μs			28 x N <sup>100</sup> mA/μs~280mA/μs			84 x N <sup>100</sup> mA/μs~840mA/μs					
			5 x N <sup>100</sup> μA			10 x N <sup>100</sup> μA			30 x N <sup>100</sup> μA					
			1.4 x N <sup>100</sup> mA/μs~14 x N <sup>100</sup> mA/μs			2.8 x N <sup>100</sup> mA/μs~28 x N <sup>100</sup> mA/μs			8.4 x N <sup>100</sup> mA/μs~84 x N <sup>100</sup> mA/μs					
			0.5 x N <sup>100</sup> μA			1 x N <sup>100</sup> μA			3 x N <sup>100</sup> μA					
			140 x N <sup>100</sup> μA/μs~1.4 x N <sup>100</sup> mA/μs			280 x N <sup>100</sup> μA/μs~2.8 x N <sup>100</sup> mA/μs			840 x N <sup>100</sup> μA/μs~8.4 x N <sup>100</sup> mA/μs					
			50 x N <sup>100</sup> nA			0.1 x N <sup>100</sup> μA			0.3 x N <sup>100</sup> μA					
			14 x N <sup>100</sup> μA/μs~140 x N <sup>100</sup> μA/μs			28 x N <sup>100</sup> μA/μs~280 x N <sup>100</sup> μA/μs			84 x N <sup>100</sup> μA/μs~840 x N <sup>100</sup> μA/μs					
			5 x N <sup>100</sup> nA			10 x N <sup>100</sup> nA			30 x N <sup>100</sup> nA					
			1.4 x N <sup>100</sup> μA/μs~14 x N <sup>100</sup> μA/μs			2.8 x N <sup>100</sup> μA/μs~28 x N <sup>100</sup> μA/μs			8.4 x N <sup>100</sup> μA/μs~84 x N <sup>100</sup> μA/μs					
			0.5 x N <sup>100</sup> nA			1 x N <sup>100</sup> nA			3 x N <sup>100</sup> nA					
			0.14 x N <sup>100</sup> μA/μs~1.4 x N <sup>100</sup> μA/μs			0.28 x N <sup>100</sup> μA/μs~2.8 x N <sup>100</sup> μA/μs			0.84 x N <sup>100</sup> μA/μs~8.4 x N <sup>100</sup> μA/μs					
METER														
Voltmeter		Accuracy	±(0.1 % of rdg + 0.1 % of f.s)										±(0.1 % of rdg + 0.1 % of f.s)TYP	
Ammeter		Accuracy	±(0.2 % of rdg + 0.3 % of f.s)										N/A	
Ammeter(Parallel Operation)		Accuracy	±(1.2% of rdg +1.1% of f.s.)										±(1.2% of rdg +1.1% of f.s.)TYP	
DYNAMIC MODE														
Operation Mode			CC, CR, CP									N/A		
T1 & T2			0.025mS~10mS/Res : 1μs ; 10ms~30s/Res : 1ms										N/A	
Accuracy			± 100ppm of setting										± 100ppm of setting	
Slew Rate (CC Mode)		Range	H	0.140mA/μs~140.0mA/μs			0.280mA/μs~280.0mA/μs			0.840mA/μs~840.0mA/μs			N/A	
			M	0.014mA/μs~14.00mA/μs			0.028mA/μs~28.00mA/μs			0.084mA/μs~84.00mA/μs				
			L	1.400μA/μs~1400.0μA/μs			2.800μA/μs~2800μA/μs			0.0084mA/μs~8.400mA/μs				
Slew Rate (CR Mode)		Range	H	0.014mA/μs~14.000mA/μs			0.028mA/μs~28.00mA/μs			0.084mA/μs~84.00mA/μs			N/A	
			M	0.0014mA/μs~1.4000mA/μs			2.8μA/μs~2.800mA/μs			0.0084mA/μs~8.400mA/μs				
			L	0.1400μA/μs~140.00μA/μs			0.280μA/μs~280.0μA/μs			0.00084mA/μs~0.8400mA/μs				
Current Accuracy			±0.4%F.S.			±0.4%F.S.			±0.4%F.S.			±0.4%F.S.		
PROTECTION FUNCTION														
Functions			Overvoltage protection(OVP), Overcurrent protection(OCP), Overpower protection(OPP), Overheat protection(OHP), Undervoltage protection(UVP), Reverse connection protection(REV)											
GENERAL														
Input Range			90VAC~132VAC/180VAC~250VAC Single-phase; 47Hz~63Hz											
Power(Max.)			90VA			110VA			190VA			230VA		
Interface			Std : USB/RS232/Analog Control ; Opt : GPIB/LAN											
Dimensions & Weight			213.8(W)x124(H)x400.5(D)mm; Approx. 6kg			213.8(W)x124(H)x400.5(D)mm; Approx. 7kg			427.8(W)x124(H)x400.5(D)mm; Approx. 17kg			427.7(W)x127.8(H)x553.5(D)mm; Approx. 23kg		



# Programmable D.C. Electronic Load

## SPECIFICATIONS

Model	PEL-3212H			PEL-3323H			PEL-3424H			PEL-3535H			PEL-3322H			PEL-3533H			PEL-3744H			PEL-3955H				
Voltage	0V~800V			0V~800V			0V~800V			0V~800V			0V~800V			0V~800V			0V~800V			0V~800V				
Current	0~105A			0~157.5A			0~210A			0~262.5A			0~157.5A			0~262.5A			0~367.5A			0~472.5A				
Power	2100W			3150W			4200W			5250W			3150W			5250W			7350W			9450W				
Input Resistance	1.62MΩ			1.08MΩ			0.81MΩ			0.648MΩ			3.24MΩ			3.24MΩ			3.24MΩ			3.24MΩ				
Min. Operating Voltage(DC)(Typ.)	5V@105A			5V@157.5A			5V@210A			5V@262.5A			5V@157.5A			5V@262.5A			5V@367.5A			5V@472.5A				
	2.5V@52.5A			2.5V@78.75A			2.5V@105A			2.5V@131.25A			2.5V@78.75A			2.5V@131.25A			2.5V@183.75A			2.5V@236.25A				
CONSTANT CURRENT MODE																										
Operating Range	H,M,L		0~105A	0~10.5A	0~1.05A	0~157.5A	0~15.75A	0~1.575A	0~210A	0~21A	0~2.1A	0~262.5A	0~26.25A	0~2.625A	0~157.5A	0~15.75A	0~1.575A	0~262.5A	0~26.25A	0~2.625A	0~367.5A	0~36.75A	0~3.675A	0~472.5A	0~47.25A	0~4.725A
Accuracy of Setting	H,M,L		$\pm(0.2\% \text{ of set} + 0.1\% \text{ of f.s.}^{*}) + \text{Vin}^{*2}/(3.24/\text{N}^{*16}) \text{ M}\Omega^3$																							
Resolution	H,M,L		4mA	0.4mA	0.04mA	6mA	0.6mA	0.06mA	8mA	0.8mA	0.08mA	10mA	1mA	0.1mA	6mA	0.6mA	0.06mA	10mA	1mA	0.1mA	14mA	1.4mA	0.14mA	18mA	1.8mA	0.18mA
CR MODE																										
Operating Range <sup>64</sup>	Range	H	215~360μS (47.619mΩ~2.778kΩ)			31.55~540μS (31.746mΩ~1.85185kΩ)			425~0.72mS (23.8095mΩ~1.3889kΩ)			52.55~0.9mS (19.0476mΩ~1.1111kΩ)			31.55~540μS (31.746mΩ~1.85185kΩ)			52.55~0.9mS (19.0476mΩ~1.1111kΩ)			73.55~1.26mS (13.6054mΩ~793.651kΩ)			94.55~1.62mS (10.582mΩ~617.284kΩ)		
		M	2.15~36μS (476.19mΩ~2.778kΩ)			3.155~54μS (317.46mΩ~18.5185kΩ)			4.25~72μS (238.095mΩ~13.8889kΩ)			5.255~90μS (190.476mΩ~11.1111kΩ)			3.155~54μS (317.46mΩ~18.5185kΩ)			5.255~90μS (190.476mΩ~11.1111kΩ)			7.355~126μS (136.054mΩ~7.93651kΩ)			9.455~162μS (105.82mΩ~6.17284kΩ)		
		L	210mS~3.6μS (4.7619Ω~277.78kΩ)			315mS~5.4μS (3.1746Ω~185.185kΩ)			420mS~7.2μS (2.38095Ω~138.888kΩ)			525mS~9μS (1.90476Ω~111.111kΩ)			315mS~5.4μS (3.1746Ω~185.185kΩ)			525mS~9μS (1.90476Ω~111.111kΩ)			735mS~12.6μS (1.36054Ω~79.365kΩ)			945mS~16.2μS (1.0582Ω~61.7284kΩ)		
Accuracy of Setting <sup>35</sup>	H,M,L		$\pm(0.5\% \text{ of set}^{*} + 0.5\% \text{ of f.s.}^{*1}) + \text{Vin}^{*2}/(3.24/\text{N}^{*16}) \text{ M}\Omega$ : Alone operation specifications																							
Resolution			360μS	36μS	3.6μS	540μS	54μS	5.4μS	720μS	72μS	7.2μS	900μS	90μS	9μS	540μS	54μS	5.4μS	900μS	90μS	9μS	1.26mS	126μS	12.6μS	1.62mS	162μS	16.2μS
CONSTANT VOLTAGE MODE																										
Operating Range	Range	H	5V~800V																							
		L	5V~80V																							
Accuracy of Setting <sup>7</sup>	Range	H,L	$\pm(0.2\% \text{ of set} + 0.2\% \text{ of f.s.})$																							
Resolution	Range	H,L	20mV/2mV																							
CONSTANT POWER MODE																										
Operating Range	Range	H	210W~2100W			315W~3150W			420W~4200W			525W~5250W			315W~3150W			525W~5250W			735W~7350W			945W~9450W		
		M	21W~210W			31.5W~315W			42W~420W			52.5W~525W			31.5W~315W			52.5W~525W			73.5W~735W			94.5W~945W		
		L	2.1W~21W			3.15W~31.5W			4.2W~42W			5.25W~52.5W			3.15W~31.5W			5.25W~52.5W			7.35W~73.5W			9.45W~94.5W		
Accuracy of Setting <sup>8</sup>	H,M,L		$\pm(0.6\% \text{ of set} + 1.4\% \text{ of f.s.}^{*3}) + \text{Vin} \times \text{Vin}^{*3}/(3.24/\text{N}^{*16}) \text{ M}\Omega$ : Alone operation specifications																							
Resolution			200mW	20mW	2mW	300mW	30mW	3mW	400mW	40mW	4mW	500mW	50mW	5mW	300mW	30mW	3mW	500mW	50mW	5mW	700mW	70mW	7mW	900mW	90mW	9mW
PARALLEL Mode																										
Capacity			-			-			-			-			-			-			-			-		
SLEW RATE																										
Operation Mode			CC, CR			CC, CR			CC, CR			CC, CR			CC, CR			CC, CR			CC, CR			CC, CR		
Setting Range (CC mode)	Range	H	1.68mA/μs~840mA/μs			252mA/μs~839.7mA/μs			336mA/μs~840mA/μs			4.2mA/μs~840mA/μs			252mA/μs~839.70mA/μs			4.2mA/μs~840mA/μs			5.88mA/μs~840mA/μs			7.56mA/μs~839.7mA/μs		
		M	168μA/μs~84mA/μs			25.2μA/μs~83.97mA/μs			33.6μA/μs~84mA/μs			420μA/μs~84mA/μs			25.2μA/μs~83.97mA/μs			420μA/μs~84mA/μs			58.8μA/μs~84mA/μs			75.6μA/μs~83.97mA/μs		
		L	16.8μA/μs~8.4mA/μs			25.2μA/μs~8.397mA/μs			33.6μA/μs~8.4mA/μs			42μA/μs~8.4mA/μs			25.2μA/μs~8.397mA/μs			42μA/μs~8.4mA/μs			58.8μA/μs~8.4mA/μs			75.6μA/μs~8.397mA/μs		
Setting Range (CR Mode)	Range	H	168μA/μs~84mA/μs			25.2μA/μs~83.97mA/μs			33.6μA/μs~84mA/μs			420μA/μs~84mA/μs			25.2μA/μs~83.97mA/μs			420μA/μs~84mA/μs			58.8μA/μs~84mA/μs			75.6μA/μs~83.97mA/μs		
		M	16.8μA/μs~8.4mA/μs			25.2μA/μs~8.397mA/μs			33.6μA/μs~8.4mA/μs			42μA/μs~8.4mA/μs			25.2μA/μs~8.397mA/μs			42μA/μs~8.4mA/μs			58.8μA/μs~8.4mA/μs			75.6μA/μs~8.397mA/μs		
		L	1.68μA/μs~840μA/μs			2.52μA/μs~839.7μA/μs			3.36μA/μs~840μA/μs			4.2μA/μs~840μA/μs			2.52μA/μs~839.7μA/μs			4.2μA/μs~840μA/μs			5.88μA/μs~840μA/μs			7.56μA/μs~839.7μA/μs		
Accuracy of Setting <sup>9</sup>	H,M,L		$\pm(10\% \text{ of set} + 25\mu\text{s})$																							
Resolution (Setting Range)			600μA	900μA			1.2mA			1.5mA			900μA			1.5mA			2.1mA			2.7mA				
			1.68mA/μs~840mA/μs	252mA/μs~842.4mA/μs			336mA/μs~840mA/μs			420mA/μs~840mA/μs			252mA/μs~842.4mA/μs			420mA/μs~840mA/μs			588mA/μs~840mA/μs			756mA/μs~842.4mA/μs				
			60μA	90μA			120μA			150μA			90μA			150μA			210μA			270μA				
			16.8mA/μs~168mA/μs	25.2mA/μs~252mA/μs			33.6mA/μs~336mA/μs			42mA/μs~420mA/μs			25.2mA/μs~252mA/μs			42mA/μs~420mA/μs			58.8mA/μs~588mA/μs			75.6mA/μs~756mA/μs				
			6μA	9μA			12μA			15μA			9μA			15μA			21μA			27μA				
			1.68mA/μs~16.8mA/μs	2.52mA/μs~25.2mA/μs			3.36mA/μs~33.6mA/μs			4.2mA/μs~42mA/μs			2.52mA/μs~25.2mA/μs			4.2mA/μs~42mA/μs			5.88mA/μs~58.8mA/μs			7.56mA/μs~75.6mA/μs				
			600nA	900nA			1.2μA			1.5μA			900nA			1.5μA			2.1μA			2.7μA				
			0.168mA/μs~1.68mA/μs	0.252mA/μs~2.52mA/μs			0.336mA/μs~3.36mA/μs			0.42mA/μs~4.2mA/μs			0.252mA/μs~2.52mA/μs			0.42mA/μs~4.2mA/μs			0.588mA/μs~5.88mA/μs			0.756mA/μs~7.56mA/μs				
			60nA	90nA			120nA			150nA			90nA			150nA			210nA			270nA				
			0.0168mA/μs~0.168mA/μs	0.0252mA/μs~0.252mA/μs			0.0336mA/μs~0.336mA/μs			0.042mA/μs~0.42mA/μs			0.0252mA/μs~0.252mA/μs			0.042mA/μs~0.42mA/μs			0.0588mA/μs~0.588mA/μs			0.0756mA/μs~0.756mA/μs				
			6nA	9nA			12nA			15nA			9nA			15nA			21nA			27nA				
			0.00168mA/μs~0.0168mA/μs	0.00252mA/μs~0.0252mA/μs			0.00336mA/μs~0.0336mA/μs			0.0042mA/μs~0.042mA/μs			0.00252mA/μs~0.0252mA/μs			0.0042mA/μs~0.042mA/μs			0.00588mA/μs~0.0588mA/μs			0.00756mA/μs~0.0756mA/μs				
METER																										
Voltmeter	Accuracy		$\pm(0.1\% \text{ of rdg} + 0.1\% \text{ of f.s.})$																							
Ammeter	Accuracy		$\pm(1.2\% \text{ of rdg} + 1.1\% \text{ of f.s.})$																							
DYNAMIC MODE																										
Operation Mode			CC and CR																							
T1 & T2			0.025mS~10mS/Res : 1μs; 10mS~30S/Res : 1mS																							
Accuracy			1μS/1ms $\pm 100\text{ppm}$																							
Slew Rate (CC Mode)	Range	H	1.68mA/μs~840mA/μs			252mA/μs~839.7mA/μs			336mA/μs~840mA/μs			4.2mA/μs~840mA/μs			252mA/μs~839.7mA/μs			4.2mA/μs~840mA/μs			5.88mA/μs~840mA/μs			7.56mA/μs~839.7mA/μs		
		M	168μA/μs~84mA/μs			25.2μA/μs~83.97mA/μs			33.6μA/μs~84mA/μs			420μA/μs~84mA/μs			25.2μA/μs~83.97mA/μs			420μA/μs~84mA/μs			58.8μA/μs~84mA/μs			75.6μA/μs~83.97mA/μs		
		L	16.8μA/μs~8.4mA/μs			25.2μA/μs~8.397mA/μs			33.6μA/μs~8.4mA/μs			42μA/μs~8.4mA/μs			25.2μA/μs~8.397mA/μs			42μA/μs~8.4mA/μs			58.8μA/μs~8.4mA/μs			75.6μA/μs~8.397mA/μs		
Slew Rate (CR Mode)	Range	H	168μA/μs~8.4mA/μs			25.2μA/μs~83.97mA/μs			33.6μA/μs~84mA/μs			420μA/μs~84mA/μs			25.2μA/μs~83.97mA/μs			420μA/μs~84mA/μs			58.8μA/μs~84mA/μs			75.6μA/μs~83.97mA/μs		
		M	16.8μA/μs~8.4mA/μs			25.2μA/μs~8.397mA/μs			33.6μA/μs~8.4mA/μs			42μA/μs~8.4mA/μs			25.2μA/μs~8.397mA/μs			42μA/μs~8.4mA/μs			58.8μA/μs~8.4mA/μs			75.6μA/μs~8.397mA/μs		
		L	1.68μA/μs~840μA/μs			2.52μA/μs~839.7μA/μs			3.36μA/μs~840μA/μs			4.2μA/μs~840μA/μs			2.52μA/μs~839.7μA/μs			4.2μA/μs~840μA/μs			5.88μA/μs~840μA/μs			7.56μA/μs~839.7μA/μs		
Current Accuracy			$\pm 0.4\% \text{ F.S.}$																							
PROTECTION FUNCTION																										
Functions			Overvoltage protection(OVP), Overcurrent protection(OCP), Overpower protection(OPP), Overheat protection(OHP), Undervoltage protection(UVP), Reverse connection protection(REV)																							
GENERAL																										
Input Range			90VAC~132VAC/180VAC~250VAC Single-phase; 47Hz~63Hz																							
Power(Max.)			380VA	570VA			760VA			950VA			420VA			650VA			880VA			1110VA				
Interface			Std : USB/RS232/Analog Control; Opt. : GPIB/LAN																							
Dimensions & Weight			598(W)x877(H)x706(D)mm; Approx. 67.5kg			598(W)x877(H)x706(D)mm; Approx. 85.5kg			598(W)x877(H)x706(D)mm; Approx. 110kg			598(W)x877(H)x706(D)mm; Approx. 127.5kg			598(W)x877(H)x706(D)mm; Approx. 73kg			598(W)x877(H)x706(D)mm; Approx. 96.5kg			598(W)x877(H)x706(D)mm; Approx. 125kg			598(W)x877(H)x706(D)mm; Approx. 149kg		



## ORDERING INFORMATION

**PEL-3021** (150V/35A/175W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3041** (150V/70A/350W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3111** (150V/210A/1050W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3211** (150V/420A/2100W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3212** (150V/420A/2100W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3322** (150V/630A/3150W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3323** (150V/630A/3150W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3424** (150V/840A/4200W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3533** (150V/1050A/5250W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3535** (150V/1050A/5250W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3744** (150V/1470A/7350W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3955** (150V/1890A/9450W) Single-Channel Programmable D.C. Electronic Load

**PEL-3021H** (800V/8.75A/175W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3041H** (800V/17.5A/350W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3111H** (800V/52.5A/1050W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3211H** (800V/105A/2100W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3212H** (800V/105A/2100W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3322H** (800V/157.5A/3150W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3323H** (800V/157.5A/3150W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3424H** (800V/210A/4200W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3533H** (800V/262.5A/5250W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3535H** (800V/262.5A/5250W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3744H** (800V/367.5A/7350W) Single-Channel Programmable D.C. Electronic Load  
**PEL-3955H** (800V/472.5A/9450W) Single-Channel Programmable D.C. Electronic Load

### ACCESSORIES :

Quick Start Guide, CD(User Manual/Programming Manual), Power Cord  
**PEL-011** Load Input Terminal Cover      **PEL-012** Terminal Fittings Kits

**GTL-255** Frame Link Cable 300mm  
**PEL-013** Flexible Terminal Cover

Front Terminal Washers  
**PEL-014** J1/J2 Protection Plug

### OPTIONAL ACCESSORIES

**CR123A** 3V Lithium Battery for Clock.  
**GRA-413** Rack Mount Bracket for Booster PEL-3211(H) (EIA+JIS)  
**GRA-414-E** Rack Mount Frame for PEL-3021(H), PEL-3041(H), PEL-3111(H)/EIA  
**GRA-414-J** Rack Mount Frame for PEL-3021(H), PEL-3041(H), PEL-3111(H)/JIS

**GTL-120** Test Lead (Max. 40A)  
**GTL-248** GPIB Cable, 2.0m  
**GTL-246** USB Cable Type A- Type B  
**PEL-010** Dust Filter

**PEL-004** GPIB Option  
**PEL-005** Connect Cu Plate  
**PEL-006** Connect Cu Plate  
**PEL-007** Connect Cu Plate

**PEL-008** Connect Cu Plate  
**PEL-009** Connect Cu Plate  
**PEL-018** LAN Card

### FREE DOWNLOAD

Driver      LabView Driver

**PEL-005** Connect Cu Plate    **PEL-006** Connect Cu Plate    **PEL-007** Connect Cu Plate    **PEL-008** Connect Cu Plate    **PEL-009** Connect Cu Plate    **PEL-018** LAN Card



**PEL-011** Load Input Terminal Cover    **PEL-012** Terminal Fittings Kits    **PEL-013** Flexible Terminal Cover    **PEL-014** J1/J2 Protection Plug    **GTL-255** Frame Link Cable    **GTL-120** Test Lead



PEL-3322(H)

PEL-3533(H)

PEL-3744(H)

PEL-3955(H)



PEL-3212(H)

PEL-3323(H)

PEL-3424(H)

PEL-3535(H)

### GRA-413 Rack Mount Kit (EIA+JIS)

For : PEL-3211(H)



### GRA-414-J Rack Mount Kit (JIS)

For : PEL-3021/3021H/3041/3041H/3111/3111H



### GRA-414-E Rack Mount Kit (EIA)

For : PEL-3021/3021H/3041/3041H/3111/3111H





# Programmable D.C. Electronic Load



PEL-3031E



PEL-3032E



## FEATURES

- \* 0~150V(PEL-3031E)Min. Operating Voltage(dc) : 1V at 60A, 0.5V at 30A
- \* 0~500V(PEL-3032E)Min. Operating Voltage(dc) : 2.5V at 15A, 1.25V at 7.5A
- \* 7 Operating Modes : CC, CV, CR, CP, CC+CV, CR+CV, CP+CV
- \* Normal Sequence Function: Max Steps: 1000 steps/Step Time:1ms~999h 59min 59s(3599940 sec)Fast Sequence Function: Max Steps:1000 steps/Step Time:25us~600ms
- \* Soft Start
- \* BATT Test Automation:Max Test Time:999h: 59min 59s(3599940 sec):Max Test AH:9999.99Ah
- \* OCP, OPP Test Automation
- \* Max. Slew Rate : 2.5A/ $\mu$ s
- \* Dynamic Mode
- \* Protection : OVP, OCP, OPP, OTP, RVP, UVP
- \* Remote Sense
- \* Integrate Voltage, Current and Power Measurement Functions
- \* External Voltage or Resistance Control
- \* Rear Panel BNC, Trigger IN/OUT
- \* Analog External Control
- \* USB/GPIB/LAN(Optional)

GW Instek launches new PEL-3000E series programmable single-channel electronic load. In the series, PEL-3031E provides 300W (1V~150V/60A) and PEL-3032E provides 300W(2.5V~500V/15A) current sink capability. Inherited from the PEL-3000 series, PEL-3000E has an easy-to-read LCD panel and user-friendly interface. This model features high speed and accurate measurement capability for electronic component, battery, portable charger and power products that require low to medium power consumption.

The PEL-3000E series is designed for current sink operation starting from 60mA and aims at measurement applications, including charger, adapter, various power supply equipment, and portable charger.

The PEL-3000E has seven operating modes. Among them, four basic operating modes are constant current, constant voltage, constant resistance, and constant power. Three other combined operating modes are constant current + constant voltage, constant resistance + constant voltage, constant power + constant voltage. Users can select operating modes based upon products' test requirements. For C.C. mode, electronic load will sink a constant current according to the set current value; for C.V. mode, electronic load will attempt to sink sufficient current to control the source voltage to the programmed value; for C.R. mode, electronic load will sink a current linearly proportional to input voltage according to the set resistance value; for C.P. mode, electronic load will initiate load power sinking operation(load voltage x load current) in accordance with the programmed power setting.

To meet the requirements of different test conditions, the Static function is to sink a constant current; the Dynamic function is to periodically switch between two sink conditions, and the Sequence function is to provide tests for more than two sink conditions. The sequence function can be divided into Normal Sequence and Fast Sequence. Normal Sequence is the most flexible mean of generating complex sequences that can facilitate users to establish a set of changing current sink conditions based upon different sinking conditions (CC, CR, CV or CP mode) and time(adjustable range: 1ms to 999h 59min 59s). Fast sequence allows time resolution of 25us to be set for the smallest step. Setting parameters for multiple steps can simulate consecutive current changes of various real load conditions. For instance, while using an electronic load to test a power-driven tool's power supply, we can first obtain waveforms by an oscilloscope and a current probe from the tool, and subsequently, use the obtained waveforms to edit simulated current waveforms, via electronic load's sequence function, to test the power-driven tool and to analyze its operational status. The Soft Start function allows users to determine the rise time of current sink that is to decide the required time to reach electronic load's set current, resistance or power value. Setting a proper rise time for Soft Start is effective to counter output voltage fluctuation caused by DUT's (power supply) transient output current. It is worth noting, General DC loads do not have the soft start function. When conducting high speed current sink operation, the inductance effect on the cable connecting electronic load and DUT will lead to transient voltage drop on electronic load's input terminal, therefore, that will result in Voltage Non-monotonic increase. PEL-3000E's soft start function not only allows output voltage to be Monotonic increase, but also prevents inrush current and surge voltage from happening on DUT. For instance, tests using a power supply, LED and a DC load (activate the soft start function) can prevent inrush current and surge voltage from causing damages on LED.

The built-in BATT Test Automation of PEL-3000E provides battery discharge applications with more flexible discharge stop setting as well as rise and fall Slew Rate for discharge current settings. OCP, OPP test Automation for DUT (ex. Power Supply), provide users with high resolution measurement values to verify DUT's activation point. Provide users with measurement results so as to help them determine whether DUT's actual over protection activation point meets the regulations. Other than that, PEL-3000E provides users with analog control terminal to control PEL-3000E from external voltage, external resistance and switch. Analog control terminal can also monitor electronic load's status and display protective alarms.

## SPECIFICATIONS

Specifications		PEL-3031E		PEL-3032E	
Model					
Power	300W	300W	300W	300W	
Range	Low	High	Low	High	
Voltage	0 ~ 150V	0 ~ 150V	0 ~ 500V	0 ~ 500V	
Current	0 ~ 6A	0 ~ 60A	0 ~ 1.5A	0 ~ 15A	
Min. Operating Voltage(dc)	1V ~ 6A	1V ~ 60A	2.5V ~ 1.5A	2.5V ~ 15A	
STATIC MODE					
Constant Current Mode					
Range	0 ~ 6A	0 ~ 60A	0 ~ 1.5A	0 ~ 15A	
Setting Range	0 ~ 6.12A	0 ~ 61.2A	0 ~ 1.53A	0 ~ 15.3A	
Resolution	0.2mA	2mA	0.05mA	0.5mA	
Accuracy	(T <sup>+</sup> )±(0.1% of set +0.1% of FS)+ Vin/500kΩ (Full scale of High range)	(T <sup>+</sup> )±(0.1% of set +0.2% of FS)+ Vin/500kΩ (Full scale of High range)	(T <sup>+</sup> )±(0.1% of set +0.1% of FS)+ Vin/500kΩ (Full scale of High range)	(T <sup>+</sup> )±(0.1% of set +0.2% of FS)+ Vin/500kΩ (Full scale of High range)	
Constant Resistance Mode					
Range	60s~0.002s(0.01666Ω~500Ω)(300W/15V) 6s~0.0002s(0.1666Ω~5kΩ)(300W/150V) 60s~0.002s(0.01666Ω~500Ω)(300W/15V) 6s~0.0002s(0.1666Ω~5kΩ)(300W/150V)		6s~0.0002s(0.16666Ω~5kΩ)(300W/50V) 0.6s~0.00002s(1.6666Ω~0kΩ)(300W/500V) 6s~0.0002s(0.16666Ω~5kΩ)(300W/50V) 0.6s~0.00002s(1.6666Ω~50kΩ)(300W/500V)		
Setting Range	0.002s(15V) ; 0.0002s(150V)		0.0002s(50V) ; 0.00002s(500V)		
Resolution(30000 Steps)					
Accuracy	(T <sup>+</sup> )±(0.3% of set + 0.6s) + 0.002ms		(T <sup>+</sup> )±(0.3% of set + 0.06s) + 0.002ms		
Constant Voltage Mode					
Range	1 ~ 15V	1 ~ 150V	2.5 ~ 50V	2.5 ~ 500V	
Setting Range	0 ~ 15.3V	0 ~ 153V	0 ~ 51V	0 ~ 510V	
Resolution	0.5mV	5mV	1mV	10mV	
Accuracy	(T <sup>+</sup> )±(0.1% of set+ 0.1% of FS) (Full scale of High range)	(T <sup>+</sup> )±(0.1% of set+ 0.1% of FS) (Full scale of High range)	(T <sup>+</sup> )±(0.1% of set+ 0.1% of FS) (Full scale of High range)	(T <sup>+</sup> )±(0.1% of set+ 0.1% of FS) (Full scale of High range)	
Constant Power Mode					
Range	0W ~ 30W(6A)	0W ~ 300W(60A)	0W ~ 30W(1.5A)	0W ~ 300W(15A)	
Setting Range	0W ~ 30.6W	0W ~ 306W	0W ~ 30.6W	0W ~ 306W	
Resolution	1mW	10mW	1mW	10mW	
Accuracy	(T <sup>+</sup> )±(0.6 % of set + 1.4 % of FS (Full scale of H range) + Vin <sup>2</sup> /500 kΩ				





PEL-3032E

Rear Panel



SPECIFICATIONS				
Model	PEL-3031E		PEL-3032E	
DYNAMIC MODE				
General	0.05ms~30ms/Res:1μs;30ms~30s/Res:1ms		0.05ms~30ms/Res:1μs;30ms~30s/Res:1ms	
TI& T2	1μs/1ms±200ppm		1μs/1ms±200ppm	
Accuracy	1μs/1ms±200ppm		1μs/1ms±200ppm	
Slew Rate(Accuracy 10%)	0.001 ~ 0.25A/μs		0.25 ~ 62.5mA/μs	
Slew Rate Resolution	0.001A/μs		0.25mA/μs	
Slew Rate Accuracy of Setting	±(10% + 15μs)		±(10% + 15μs)	
Constant Current Mode	*1 Time to reach from 10 % to 90 % when the current is varied from 2 % to 100 % (20 % to 100 % in L range) of the rated current.			
Current	0 ~ 6A	0 ~ 60A	0 ~ 1.5A	0 ~ 15A
Setting Range	0 ~ 6.12A	0 ~ 61.2A	0 ~ 1.53A	0 ~ 15.3A
Current Resolution	0.2mA	2mA	0.05mA	0.5mA
Current Accuracy	±0.8% FS	±0.8% FS	±0.8% FS	±0.8% FS
Constant Resistance Mode				
Range	60s~0.002s(0.01666Ω~500Ω)(300W/15V) 6s~0.0002s(0.1666Ω~5kΩ)(300W/150V) 60s~0.002s(0.01666Ω~500Ω)(300W/15V) 6s~0.0002s(0.1666Ω~5kΩ)(300W/150V)		6s~0.0002s(0.1666Ω~5kΩ)(300W/50V) 0.6s~0.00002s(1.6666Ω~50kΩ)(300W/500V) 6s~0.0002s(0.1666Ω~5kΩ)(300W/50V) 0.6s~0.00002s(1.6666Ω~50kΩ)(300W/500V)	
Setting Range				
Resistance Resolution	30000 steps		30000 steps	
Resistance Accuracy	(T <sup>∞</sup> )±(1%set + 0.6s) + 0.002ms		(T <sup>∞</sup> )±(1%set + 0.06s) + 0.002ms	
MEASUREMENT				
Voltage Readback	0 ~ 15V	0 ~ 150V	0 ~ 50V	0 ~ 500V
Range	0.5mV	5mV	2mV	20mV
Resolution	(T <sup>∞</sup> )±(0.1% of rdg + 0.1% of FS)	(T <sup>∞</sup> )±(0.1% of rdg + 0.1% of FS)	(T <sup>∞</sup> )±(0.1% of rdg + 0.1% of FS)	(T <sup>∞</sup> )±(0.1% of rdg + 0.1% of FS)
Accuracy	(Full scale of Low range)	(Full scale of High range)	(Full scale of Low range)	(Full scale of High range)
Current Readback	0 ~ 6A	0 ~ 60A	0 ~ 1.5A	0 ~ 15A
Range	0.2mA	2mA	0.05mA	0.5mA
Resolution	(T <sup>∞</sup> )±(0.1% of rdg+ 0.1% of FS)	(T <sup>∞</sup> )±(0.1% of rdg+ 0.2% of FS)	(T <sup>∞</sup> )±(0.1% of rdg+ 0.1% of FS)	(T <sup>∞</sup> )±(0.1% of rdg+ 0.2% of FS)
Accuracy	(Full scale of High range)	(Full scale of High range)	(Full scale of High range)	(Full scale of High range)
Power Read back H&L Range	0 ~ 300W	0 ~ 300W	0 ~ 300W	0 ~ 300W
CP Mode L Range	0 ~ 30W	0 ~ 30W	0 ~ 30W	0 ~ 30W
FUNCTION				
Sequence(Normal/Fast)	Normal sequence function: Max steps: 1000 steps/Step time: 1ms ~ 999h 59min 59s(3599940 sec) Fast sequence function: Max steps: 1000 steps/Step time: 25us ~ 600ms			
BATT Test Automation	Max test time: 999h: 59m: 59s(3599940sec) Max test AH: 9999.99Ah OCP Autotest function, OPP Autotest Function			
Test Function	Yes			
Soft Start	Yes			
In/Out Terminal	Analog External Control, Current Monitor Output, Trigger In/Out Terminal(BNC)			
Preset Data	10 Sets			
Protection	OCP, OPP, UVP, OVP, OTP, RVP			
OTHER				
Power Source	100 ~ 120VAC/200 ~ 240VAC, 47 ~ 63Hz			
Interface	USB, GPIB/LAN(Optional), Analog control			
Dimensions & Weight	213.8(W) x 124.0(H) x 400.5(D)mm, Approx. 7.5Kg			

Note : \*1 - If the ambient temperature is over 30 °C or below 20 °C, then T = ± | t - 25 °C | x 100ppm/°C x Set  
If the ambient temperature is in the range of 20°C~30°C, then T = 0 (t is the ambient temperature)

## ORDERING INFORMATION

**PEL-3031E** 150V/60A/300W Programmable Single-channel D.C. Electronic Load  
**PEL-3032E** 500V/15A/300W Programmable Single-channel D.C. Electronic Load

### ACCESSORIES :

Quick Start Guide, CD ROM (User Manual, Programming Manual)x1, Power Cord (Region dependent), Front Terminal Washers-spring Washer(M6)x2, GTL-105A Remote Sense Cables(Red x 1, Black x 1)

### OPTIONAL ACCESSORIES

GTL-248 GPIB Cable, 2m	PEL-010 Dust Filter	GRA-414-J Rack Mount Kit (JIS)
GTL-246 USB Cable, Type A – Type B	PEL-004 GPIB Option	GRA-414-E Rack Mount Kit (EIA)
PEL-018 LAN Card		

PEL-018 LAN Card



GRA-414-J Rack Mount Kit (JIS)

For : PEL-3031E/3032E



GRA-414-E Rack Mount Kit (EIA)

For : PEL-3031E/3032E



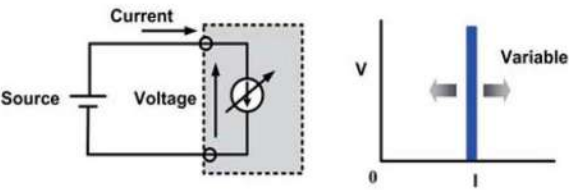


# Programmable D.C. Electronic Load

## A. OPERATING MODE

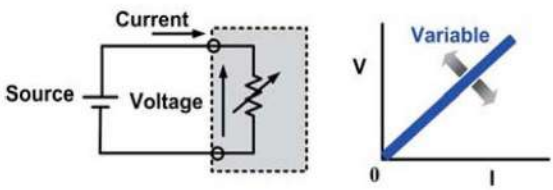
The PEL-3000E series provides four fundamental operating modes and three add-on modes of CC, CR and CP separately combining with CV. Users can set different load condition under different operating modes such as setting operating range for load level, Current Slew Rate, input voltage and load current. The input

voltage range has two levels - high and low. The load current operating range has two levels - high and low current levels which possess different resolution to meet test requirements of different power product specifications.



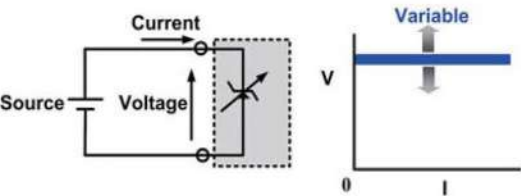
CC Mode

Under constant current mode, electronic load will sink the amount of current users has set. Different current settings via CC mode allow users to test the voltage changes of DC power supply which is called load regulation test.



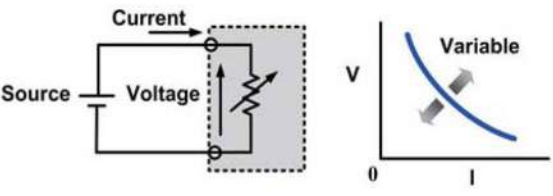
C.R Mode

Under constant resistance mode, electronic load will sink load current, which is linearly direct proportion to input voltage. This mode can be utilized in testing voltage or the activation and current limit of power supply.



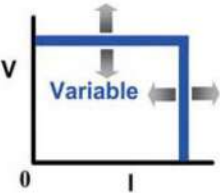
C.V Mode

Under constant voltage mode, electronic load will sink sufficient current to regulate the voltage source to the set value. This mode allows users not only to test current limit function of power supply, but also to simulate battery operation in testing battery chargers.



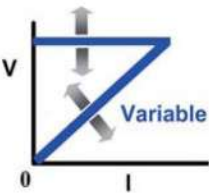
C.P Mode

Under constant power mode, electronic load will sink load current, which is indirect proportion to input voltage to reach preset constant power requirement. Hence, the changes of input voltage will have indirect proportion effect on current sinking so as to reach constant power control.



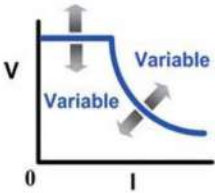
CC+CV Mode

+CV mode can be selected under CC, CR or CP mode. When +CV mode function is turned on and electronic load sinks more current than the maximum current of power supply under test, electronic load will automatically switch to CV mode. It is because that the current sunk is the maximum current of power device. Therefore,



CR+CV Mode

power supply will switch to CC mode and PEL-3000 will switch to CV mode to limit electronic load from sinking the total current of power supply so as to prevent power supply under test from damaging. Electronic load will cease operation once the voltage of DUT is lower than the set voltage under +CV mode.



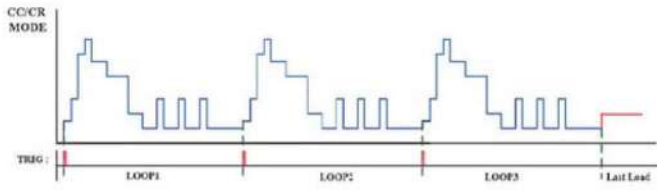
CP+CV Mode

## B. STATIC/DYNAMIC/SEQUENCE MODE

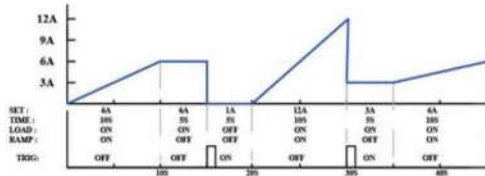
Operation Function	Static	Dynamic	Sequence	
			Fast	Normal
Operating Condition Selection	Single fixed condition	Selection between two conditions	Selection from more than two conditions	Selection from more than two conditions
Operating Modes	All modes	• Two conditions using same mode • Support CC or CR	• Each condition must use same mode • Support CC or CR mode	• Each condition is able to be used in different mode • All modes
Adjustable Condition Setting	• Value A/ Value B • Slew Rate	• Level 1/Level 2 • Timer 1/Timer 2 • Slew Rate 1/Slew Rate 2	• Level • Timer • Slew Rate • Others...	• Level • Timer • Slew Rate • Others...
Sequence Step Combination	N/A	N/A	• 1 Sequence • 1,000 steps • 25μs/step	• 10 Sequence • 1,000 steps • 1ms/step
Other Functions	N/A	Trigger Out function	• Trigger Out function	• Trigger Out function • Ramp function

The PEL-3000E series, according to different test conditions, step or continuous changes, test speeds, and selectable modes, has three operating functions: Static, Dynamic and Sequence.

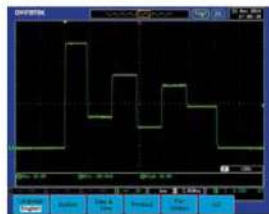
## C. FAST SEQUENCE & NORMAL SEQUENCE



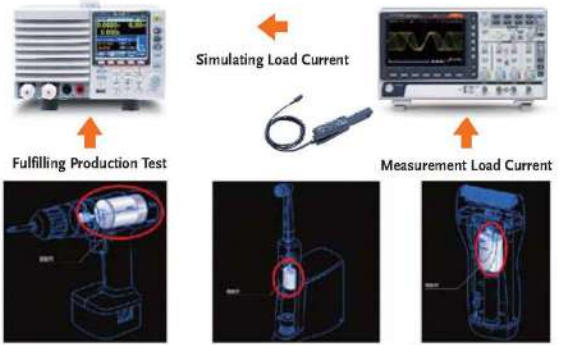
Fast Sequence Diagram



Normal Sequence Diagram



When operating the Sequence Function, PEL-3000E Series follows the time and load settings of step1, step2, step3, etc. so as to realize different load current variation.



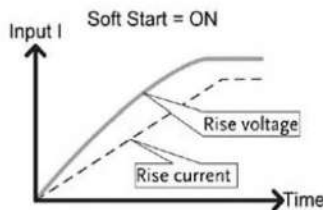
Power-driven Tools Simulation Test

Set a complete sequence editing function to obtain following waveforms. Users can save development cost and time without using a PC to control electronic load and writing programs.

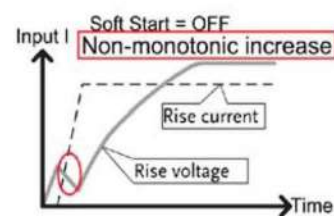


Ramp function of PEL-3000E Series is able to set the current transition. When turned on, the current takes on a slope form; when turned off, the current takes on a step form.

## D. SOFT START

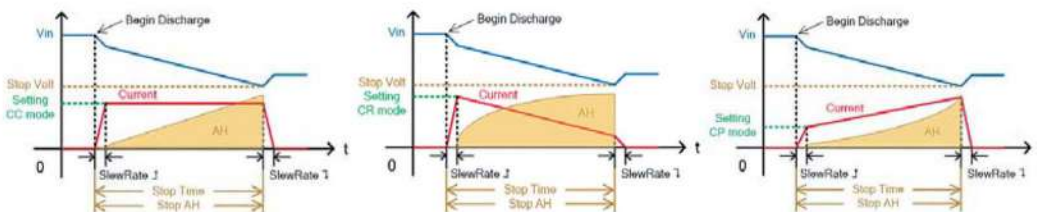


The Soft Start function of PEL-3000E Series allows users to determine the rise time of current sink that is to decide how much time is required to reach electronic load's set current, resistance or power value. PEL-3000E's soft start function prevents inrush current and surge voltage from happening on DUT.



For instance, test applications using a power supply, LED and a DC load (activate the soft start function) can prevent inrush current and surge voltage from causing damages on LED.

## E. BATT TEST AUTOMATION



CC Mode

CR Mode

CP Mode

BATT Test Automation Editing

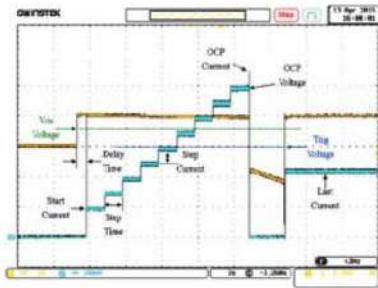


The built-in BATT Test Automation of PEL-3000E provides battery discharge applications with more flexible discharge stop condition setting as well as rise and fall Slew Rate for discharge current settings. Under CP, CC or CR mode, the

conditions for stop discharge can be set respectively. For instance, set the input voltage for stop discharge current, the execution time for discharge current or total discharge current\*time(AH) to satisfy the verification of battery capability.

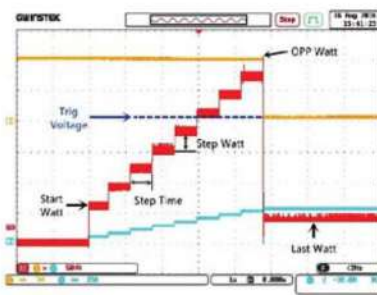


F. OCP TEST AUTOMATION



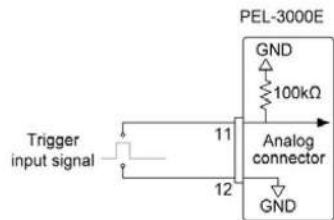
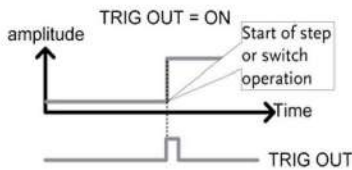
OCP test Automation for DUT(Power Supply), Provide users with high resolution OCP measurement values to verify DUT's OCP activation point. Provide users with measurement results so as to help them determine whether DUT's actual OCP activation point meets the regulations. Test the value of OCP by setting load current increment from start current to stop current. OCP's activation point can be accurately measured.

G. OPP TEST AUTOMATION



OPP test Automation for DUT(Power Supply), Provide users with high resolution OPP measurement values to verify DUT's OPP activation point. Provide users with measurement results so as to help them determine whether DUT's actual OPP activation point meets the regulations. Test the value of OPP by setting power increment from start power to stop power. OPP's activation point can be accurately measured.

H. TRIGGER IN/OUT BNC



Trigger In/Out function could be turned on or off by CONFIGURE setting of PEL-3000E. The Trigger Input can be set the delay time while the Trigger Out Pulse Width can be set as well.

The trigger output signal is generated every time a switching operation is performed such as Dynamic mode or Fast/Normal sequence is executed when the trig out parameter is enabled. The trigger output signal from TRIG OUT BNC is a 4.5V pulse of at least 2us with an impedance of 500ohm. The common

potential is connected to the chassis potential. The signal threshold level is TTL.

The TRIG IN BNC on the rear panel is used to resume a sequence after a pause. This action is useful to synchronize the execution of a sequence with another device. To resume a pause sequence, apply a high signal for 10us or more. The TRIG IN BNC is pulled down to earth internally using a 100Kohm resistor.

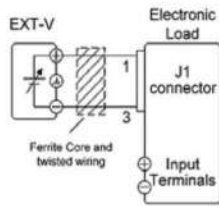
I. PROTECTION MODES

Function \ Protection	OCP	OVP	OPP	OTP	UVP
Adjustable Thresholds	✓	✓	✓	N/A	✓
Load Off	✓	✓	✓	Fixed	✓
Limit Function	✓	N/A	✓	N/A	N/A

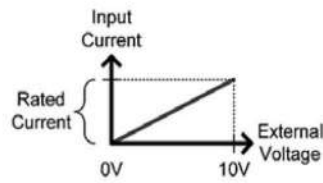
The PEL-3000E series provides many protective functions including over current protection (OCP), over voltage protection (OVP), over power protection (OPP), over temperature protection (OTP) and under voltage protection (UVP). Except for OTP, all thresholds

of protective functions are adjustable. When protective function is activated, electronic load will send out warning signal and terminate operation. Other than protective functions, Limit function can also be utilized to maintain electronic load in operation at a preset value.

## J. ANALOG EXTERNAL CONTROL

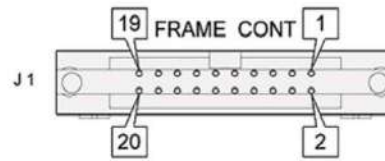


External Voltage Control

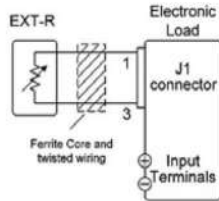


CC Mode

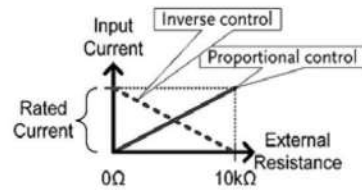
$$\text{Input current} = \text{rated current} \times (\text{external voltage}/10)$$



J1 Connector



External Resistance Control



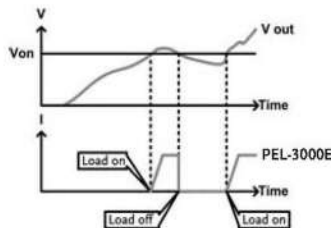
CC Mode

$$\text{Proportional Control: Input current} = \text{rated current} \times (\text{external resistance}/10\text{k ohm})$$

$$\text{Inverse Control: Input current} = \text{rated current} \times (1 - \text{external resistance}/10\text{k ohm})$$

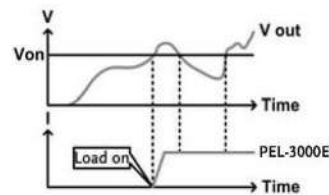
The PEL-3000E series provides the external analog channel control function, which allows users to connect J1 connectors on the rear panel to input voltage or to connect resistance to control electronic load operation. Users can integrate this function into test system and utilize signals generated from the test system to control PEL-3000E.

## K. VonN VOLTAGE AND Von LATCH FUNCTION



Von Latch = OFF

Von Voltage is the threshold voltage for electronic load to activate or terminate sinking current. When Von Latch is set to off, electronic load operation will be activated if input voltage is higher than Von Voltage and electronic load operation will be terminated if input voltage is lower than Von Voltage. When Von



Von Latch = ON

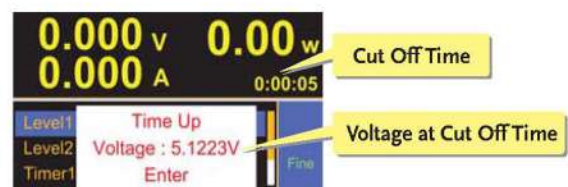
Latch is set to on, electronic load operation will be activated if input voltage is higher than Von Voltage and will continue operation even input voltage is lower than Von Voltage. Von Voltage function can test the transient maximum current capability provided by power supply.

## L. TIMER FUNCTIONS



Elapsed Time

The PEL-3000E series provides count time and cut off time functions. The display screen will show present activation time when electronic load is activated. When electronic load operation is terminated count time will stop and the total operation time will be shown on the display screen. The activation time of cut off time can be set to the maximum length of 999h 59min 59s. When electronic load is activated



Voltage at Cut Off Time

this function will start counting time. Electronic load will cease operation (load off) and show the final input voltage on the screen when preset time is reached. Timer function can provides information and application related to time. Users can obtain the total time of limiting electronic load operation to increase the agility of electronic load tests.



# Programmable D.C. Electronic Load



PEL-2004A



PEL-2002A



## FEATURES

- \* Sequence Function to do High Speed Load Simulations
- \* Flexible Configuration with Mainframes and Plug-in Modules
- \* Multiple Independent Load Inputs up to 8 Channels in a Mainframe
- \* Parallel Connection of Inputs for Higher Load Capacity
- \* Program Mode to Create Work Routines for Repetitive Tests
- \* OPP/OCV/OVP/OTR/RVP/UVP Protections
- \* External Channel Control/Monitoring via Analog Control Connector
- \* Multiple-Interface USB Device/Host, RS-232C, and GPIB/LAN (Optional)

The PEL-2004A and PEL-2002A are multiple channel, programmable DC electronic loads with a modularized structure. The PEL-2000A Series is designed to meet the continuing shift toward high speed operation in today's semiconductor market. As the power supply units, DC-DC converters, and batteries that drive semiconductor circuits need to follow this shift, power supply design, quality inspection and characteristic certification using high-speed performance loads have become necessary. The PEL-2000A Series includes two types of mainframes and 4 types of load modules to accommodate users' requirements in a flexible manner. Any load module combination can be used with a mainframe to tailor a test system based on the number of channels, and the maximum load power, voltage and current of each channel. Multiple loads can be connected in parallel to provide a higher-power load to test higher power supply outputs. This flexibility significantly reduces the investment needed for future projects that have differed power requirements. PEL-2004A is a 4-slot mainframe with a master control unit to hold 4 load modules, while PEL-2002A is a 2-slot mainframe with master control unit to hold 2 load modules. When PEL-2004A is configured with 4 load modules rated at 350W each, the PEL-2000A series is able to sink up to 1.4kVA of power. For higher load capacities, mainframes can be linked together in parallel with standard MIL 20-pin connectors. A maximum of 5 mainframes, including one master and 4 slaves can be chained together to create a total load capacity of 7kW for high current and high power applications. Using 4 dual channel load modules, PEL-2004A is able to test 8 power supply outputs simultaneously. The Sequence function allows each channel to change its load sink according to a predefined sequence at a rate of up to 100 s per step. Each sequence is able to run concurrently, under the control of one clock. This is one of the most powerful features of the PEL-2000A Series as it is able to realistically simulate a multi-output power supply load. Under Dynamic mode, the load current or load resistance pulses between two preset levels at a pre-defined speed up to 25 s per step. This is often used as the standard test procedure to verify the response of a power supply to quick load changes. Most remarkably, multiple load channels can be connected in parallel to run Dynamic tests synchronously under a single clock. This Parallel Dynamic functionality gives the flexibility to perform dynamic tests for a high-power power supply without the need of another high-power load. The PEL-2000A Series includes a number of protection modes: Over Current Protection (OCP), Over Voltage Protection (OVP), Over Power Protection (OPP), Reverse Voltage Protection (RVP), and Under Voltage Protection (UVP). The protection modes are useful to protect both the load modules and the DUT(s). A buzzer can be set for when a protection setting has been tripped. When a protection mode has been tripped, the load unit will display an alarm and stop sinking current/voltage. When a load unit is operating in CR or CV mode, the unit may need Over Current Protection to prevent excessive current being sunk. Over Current Protection stops the load from sinking more current than its recommended limit and prevents the load from burn-out damage. Over Voltage Protection is used to limit the amount of voltage sunk. If the OVP trips, the PEL-Series load will stop sinking voltage. Over Power Protection is used when the input power exceeds the specifications of the load. When OPP is tripped, the power will cease to be sunk. Reverse Voltage Protection prevents reverse voltage damage to the PEL-2000A Series up to the specified rating. When Reverse Voltage Protection has been tripped, an alarm tone will sound until the reverse voltage is removed. Under Voltage Protection will turn off the load when the voltage drops below a set limit. The Go/NoGo function is available to monitor test results all the time. When a test result goes beyond a preset limit range, a "No Go" indication will be shown on the display and a "No Go" signal can be sent out through the D-SUB interface for external device control. This Go/NoGo function is available for CC mode, CV mode and CR mode. Under "Program" mode, 12 programs each containing 10 panel-setup memories, can be edited to create work routines for repetitive tests. After a program has been executed, the results of all test steps, along with the Go/NoGo judgments, will be shown on the screen. For external control and system configuration, the PEL series has USB and RS232 interfaces as standard and LAN as well as GPIB as an option. The LabView driver and Data Logging PC software are both supported for all the available interfaces. Each channel has an analog control/monitoring connector on the rear panel to externally turn a load on/off and to externally monitor load input current and voltage.

## SPECIFICATIONS

	PEL-2020A		PEL-2030A		
CHANNEL	L/R	L/R	Left	Right	Right
POWER	100W	100W	30W	250W	250W
RANGE	Low	High	N/A	Low	High
CURRENT	0-2A	0-20A	0-5A	0-4A	0-40A
VOLTAGE	0-80V	0-80V	0-80V	0-80V	0-80V
MIN.OPERATING VOLTAGE (DC)(Typ.)	0.4V at 2A 0.2V at 1A	0.8V at 20A 0.4V at 10A	0.8V at 5A 0.4V at 2.5A	0.4V at 4A 0.2V at 2A	0.8V at 40A 0.4V at 20A
STATIC MODE					
CONSTANT CURRENT MODE	Operating Range	0-2A	0-20A	0-5A	0-4A
	Setting Range	0-2.04A	0-20.4A	0-5.1A	0-4.08A
	Resolution	0.1mA	1mA	0.125mA	0.1mA
	Accuracy	±(0.1%set + 0.1%F.S.)	±(0.1%set + 0.2%F.S.)	±(0.1%set + 0.1%F.S.)	±(0.1%set + 0.2%F.S.)
CONSTANT RESISTANCE MODE	Operating Range	0.075Ω-300Ω(100W/16V) 3.75Ω-15K(100W/80V)	0.3Ω-1.2KΩ(30W/16V) 15Ω-60K(30W/80V)	0.0375Ω-150Ω(250W/16V) 1.875Ω-7.5K(250W/80V)	0.0375Ω-150Ω(250W/16V) 1.875Ω-7.5K(250W/80V)
	Setting Range	0.075Ω-300Ω(100W/16V) 3.75Ω-15K(100W/80V)	0.3Ω-1.2KΩ(30W/16V) 15Ω-60K(30W/80V)	0.0375Ω-150Ω(250W/16V) 1.875Ω-7.5K(250W/80V)	0.0375Ω-150Ω(250W/16V) 1.875Ω-7.5K(250W/80V)
	Resolution	0.333mS(100W/16V) 6.667μS(100W/80V)	83.333μS(30W/16V) 1.666μS(30W/80V)	0.666mS(250W/16V) 13.333μS(250W/80V)	0.666mS(250W/16V) 13.333μS(250W/80V)
	Accuracy	300Ω: ±(0.2%set+0.1S) 15KΩ: ±(0.1%set+0.01S)	1.2KΩ: ±(0.2%set+0.1S) 60KΩ: ±(0.1%set+0.01S)	150Ω: ±(0.2%set+0.1S) 7.5KΩ: ±(0.1%set+0.01S)	150Ω: ±(0.2%set+0.1S) 7.5KΩ: ±(0.1%set+0.01S)
	Accuracy	±(0.1%set + 0.2%F.S.)	±(0.1%set + 0.2%F.S.)	±(0.1%set + 0.2%F.S.)	±(0.1%set + 0.2%F.S.)
CONSTANT VOLTAGE+ CONSTANT CURRENT MODE	Operating Range	1-80V	0-81.6V	0-81.6V	0-81.6V
	Setting Range	0-81.6V	0-81.6V	0-81.6V	0-81.6V
	Resolution	2mV	2mV	2mV	2mV
	Accuracy	±(0.05%set + 0.1%F.S.)	±(0.05%set + 0.1%F.S.)	±(0.05%set + 0.1%F.S.)	±(0.05%set + 0.1%F.S.)
	Current Setting Range	0-20A	0-5A	0-5A	0-40A
Resolution	1mA	1mA	0.125mA	0.125mA	1mA
	Accuracy	±(0.1%set + 0.2%F.S.)	±(0.1%set + 0.2%F.S.)	±(0.1%set + 0.2%F.S.)	±(0.1%set + 0.2%F.S.)



CONSTANT POWER MODE					
Operating Range*	1~10W	1~100W	1~30W	1~25W	1~250W
Setting Range	0~10.2W	0~102W	0~30.6W	0~25.5W	0~255W
Resolution	1mW	10mW	1mW	1mW	10mW
Accuracy	±(0.5%set + 0.5%F.S.)	±(0.5%set + 0.5%F.S.)	±(0.5%set + 0.5%F.S.)	±(0.5%set + 0.5%F.S.)	±(0.5%set + 0.5%F.S.)
DYNAMIC MODE					
T1&T2	0.025mS~10mS/Res:1μS			0.025mS~10mS/Res:1μS	
Accuracy	10mS~30S/Res:1mS 1μS/1mS ± 100ppm			10mS~30S/Res:1mS 1μS/1mS ± 100ppm	
CONSTANT CURRENT MODE					
Slew Rate (±10%set+15μS)	0.32~80mA/μS	3.2~800mA/μS	0.8~200mA/μS	0.64~160mA/μS	6.4~1600mA/μS
Slew Rate Resolution	0.32mA/μS	3.2mA/μS	0.8mA/μS	0.64mA/μS	6.4mA/μS
Slew Rate Accuracy of Setting	±(10%+15μs)	±(10%+15μs)	±(10%+15μs)	±(10%+15μs)	±(10%+15μs)
Current Setting Range	0~2A	0~20A	0~5A	0~4A	0~40A
Current Resolution	0.1mA	1mA	0.125mA	0.1mA	1mA
Current Accuracy	±0.4% F.S.	±0.4% F.S.	±0.4%F.S.	±0.4%F.S.	±0.4%F.S.
CONSTANT RESISTANCE MODE					
Slew Rate	0.32~80mA/μS	3.2~800mA/μS	0.8~200mA/μS	0.64~160mA/μS	6.4~1600mA/μS
Slew Rate Resolution	0.32mA/μS	3.2mA/μS	0.8mA/μS	0.64mA/μS	6.4mA/μS
Slew Rate Accuracy of setting	±(10%+15μs)	±(10%+15μs)	±(10%+15μs)	±(10%+15μs)	±(10%+15μs)
Resistance Setting Range	0.075Ω~300KΩ(100W/16V) 3.75Ω~15K(100W/80V)		0.3Ω~1.2KΩ(30W/16V) 15Ω~60K(30W/80V)	0.0375Ω~150KΩ(250W/16V) 1.875Ω~7.5K(250W/80V)	
Resistance Resolution	0.333mS(100W/16V) 6.667μS(100W/80V)		83.333μS(30W/16V) 1.666μS(30W/80V)	0.666mS(250W/16V) 13.333μS(250W/80V)	
Resistance Resolution	300Ω:±(0.5%set+0.1S)		1.2KΩ:±(0.5%set+0.1S)	150Ω:±(0.5%set+0.1S)	
Resistance Accuracy	15KΩ:±(0.5%set+0.01S)		60KΩ:±(0.5%set+0.01S)	7.5KΩ:±(0.5%set+0.01S)	
MEASUREMENT					
VOLTAGE READBACK					
Range	0~16V	0~80V	0~16V,0~80V	0~16V	0~80V
Resolution	0.32mV	1.6mV	0.32mV,1.6mV	0.32mV	1.6mV
Accuracy	±(0.025%set + 0.025%F.S.)				
CURRENT READBACK					
Range	0~2A	0~20A	0~5A	0~4A	0~40A
Resolution	0.04mA	0.4mA	0.1mA	0.08mA	0.8mA
Accuracy	±(0.05%set + 0.05%F.S.)				
POWER READBACK					
Range	0~10W	0~100W	0~30W	0~25W	0~250W
Accuracy	±(0.1%set + 0.1%F.S.*1)				
*1 : Power F.S.=Vrange F.S. x Irange F.S.					
PROTECTION					
OVER POWER PROTECTION					
Range	1~102W		1~30.6W	1~255W	
Resolution	0.5W		0.15W	1.25W	
Accuracy	±(2%set+0.25%F.S.)		±(2%set+0.25%F.S.)	±(2%set+0.25%F.S.)	
OVER CURRENT PROTECTION					
Range	0~20.4A		0~5.1A	0~40.8A	
Resolution	0.05A		0.0125A	0.1A	
Accuracy	±(2%set+0.25%F.S.)		±(2%set+0.25%F.S.)	±(2%set+0.25%F.S.)	
OVER VOLTAGE PROTECTION					
Range	1~81.6V		1~81.6V	1~81.6V	
Resolution	0.2V		0.2V	0.2V	
Accuracy	±(2%set+0.25%F.S.)		±(2%set+0.25%F.S.)	±(2%set+0.25%F.S.)	
Over Temperature Protection	≒85℃		≒85℃	≒85℃	
RATED POWER PROTECTION					
Value	110W		33W	275W	
Accuracy	±(2%set)		±(2%set)	±(2%set)	
GENERAL					
SHORT CIRCUIT					
Current(CC)	≒2.2/2A	≒22/20A	≒5.5/5A	≒4.4/4A	≒44/40A
Voltage(CV)	0V	0V	0V	0V	0V
Resistance(CR)	≒3.75Ω	≒0.075Ω	≒15Ω, ≒0.3Ω	≒1.875Ω	≒0.0375Ω
INPUT RESISTANCE(LOAD OFF)					
	500KΩ(Typical)				
POWER SOURCE					
	AC100V ~ 230V ± 10% ; 50Hz / 60Hz ± 2Hz				
WEIGHT					
	Approx. 3.8 kg				
DIMENSIONS & WEIGHT (PEL-2002A)					
	272(W) x 200(H) x 581(D) mm ; Approx. 17.1kg(full modules)				
DIMENSIONS & WEIGHT (PEL-2004A)					
	435(W) x 200(H) x 581(D) mm ; Approx. 28.4kg(full modules)				

PEL-001 GPIB Card



PEL-002 Rack Mount Kit



PEL-003 Panel Cover



PEL-016 LAN Card





# Programmable D.C. Electronic Load

PEL-2004A Rear Panel



PEL-2002A Rear Panel



PEL-2000A Series

## SPECIFICATIONS

	PEL-2040A		PEL-2041A	
CHANNEL	One channel	One channel	One channel	One channel
RANGE	Low	High	Low	High
POWER	350W	350W	350W	350W
CURRENT	0~7A	0~70A	0~1A	0~10A
VOLTAGE	0~80V	0~80V	0~500V	0~500V
MIN.OPERATING VOLTAGE (DC)(Typ.)	0.4V at 7A 0.2V at 3.5A	0.8V at 70A 0.4V at 35A	0.4V at 1A 0.2V at 0.5A	0.8V at 10A 0.4V at 5A
STATIC MODE				
CONSTANT CURRENT MODE				
Operating Range	0~7A	0~70A	0~1A	0~10A
Setting Range	0~7.14A	0~71.4A	0~1.02A	0~10.2A
Resolution	0.2mA	2mA	0.05mA	0.5mA
Accuracy	±(0.1%set + 0.1%F.S.)	±(0.1%set+ 0.2%F.S.)	±(0.1%set+ 0.1%F.S.)	±(0.1%set+ 0.2%F.S.)
CONSTANT RESISTANCE MODE				
Operating Range	0.025Ω~100Ω(350W/16V) 1.25Ω~5K(350W/80V)		1.25Ω~5KΩ(350W/125V) 50Ω~200K(350W/500V)	
Setting Range	0.025Ω~100Ω(350W/16V) 1.25Ω~5K(350W/80V)		1.25Ω~5Ω(350W/125V) 50Ω~200K(350W/500V)	
Resolution	1mS(350W/16V) 20μS(350W/80V)		20μS(350W/125V) 0.5μS(350W/500V)	
Accuracy (with≥ 2.5V at input)	100Ω: ±(0.2%set+0.1S) 5KΩ: ±(0.1%set+0.01S)		5KΩ: ±(0.2%set+0.02S) 200KΩ: ±(0.1%set+0.005S)	
CONSTANT VOLTAGE+CONSTANT CURRENT MODE				
Operating Range	1~80V		2.5~500V	
Setting Range	0~81.6V		0~510V	
Resolution	2mV		10mV	
Accuracy	±(0.05%set + 0.1%F.S.)		±(0.05%set + 0.1%F.S.)	
Current Setting Range	0~70A		0~10A	
Resolution	2mA		0.5mA	
Accuracy	±(0.1%set + 0.2%F.S)			
CONSTANT POWER MODE				
Operating Range*	1~35W	1~350W	1~35W	1~350W
Setting Range	0~35.7W	0~357W	0~35.7W	0~357W
Resolution	1mW	10mW	1mW	10mW
Accuracy	±(0.5%set+ 0.5%F.S)	±(0.5%set+ 0.5%F.S)	±(0.5%set+ 0.2%F.S)	±(0.5%set+ 0.5%F.S)
DYNAMIC MODE				
T1&T2	0.025mS~10mS/Res:1μS 10mS~30S/Res:1mS		0.025mS~10mS/Res:1μS 10mS~30S/Res:1mS	
Accuracy	1μS/1mS±100ppm		1μS/1mS±100ppm	
CONSTANT CURRENT MODE				
Slew Rate (±10%set+15μS)	0.001~0.28A/μS	0.01~2.8A/μS	0.16~40mA/μS	1.6~400mA/μS
Slew Rate Resolution	0.001A/μS	0.01A/μS	0.16mA/μS	1.6mA/μS
Slew Rate Accuracy of Setting	±(10%+15μs)	±(10%+15μs)	±(10%+15μs)	±(10%+15μs)
Current Settong Range	0~7A	0~70A	0~1A	0~10A
Current Resolution	0.2mA	2mA	0.05mA	0.5mA
Current Accuracy	±0.4% F.S.	±0.4% F.S.	±0.4%F.S.	±0.4%F.S.
CONSTANT RESISTANCE MODE				
Slew Rate	0.001~0.28A/μS	0.01~2.8A/μS	0.16~40mA/μS	1.6~400mA/μS
Slew Rate Resolution	0.001A/μS	0.01A/μS	0.16mA/μS	1.6mA/μS
Slew Rate Accuracy of setting	±(10%+15μs)	±(10%+15μs)	±(10%+15μs)	±(10%+15μs)
Resistance Setting Range	0.025Ω~100Ω(350W/16V) 1.25Ω~5K(350W/80V)		1.25Ω~5KΩ(350W/125V) 50Ω~200K(350W/500V)	
Resistance Resolution	1mS(350W/16V) 20μS(350W/80V)		20μS(350W/125V) 0.5μS(350W/500V)	
Resistance Resolution	100Ω: ±(0.5%set + 0.1S)		5KΩ: ±(0.5%set + 0.02S)	
Resistance Accuracy	5KΩ: ±(0.5%set + 0.01S)		200KΩ: ±(0.5%set + 0.005S)	

SPECIFICATIONS				
	PEL-2040A		PEL-2041A	
MEASUREMENT				
VOLTAGE READBACK				
Range	0~16V	0~80V	0~125V	0~500V
Resolution	0.32mV	1.6mV	2.5mV	10mV
Accuracy	±(0.025%set + 0.025%F.S.)			
CURRENT READBACK				
Range	0~7A	0~70A	0~1A	0~10A
Resolution	0.14mA	1.4mA	0.02mA	0.2mA
Accuracy	±(0.05%set + 0.05%F.S.)			
POWER READBACK				
Range	0~35W	0~350W	0~35W	0~350W
Accuracy	±(0.1%set + 0.1%F.S. )      *1 : Power F.S.=Vrange F.S. x Irange F.S.			
PROTECTION				
OVER POWER PROTECTION				
Range	1~357W		1~357W	
Resolution	1.75W		1.75W	
Accuracy	±(2%set+0.25%F.S.)		±(2%set+0.25%F.S.)	
OVER CURRENT PROTECTION				
Range	0~71.4A		0~10.2A	
Resolution	0.175A		0.025A	
Accuracy	±(2%set+0.25%F.S.)		±(2%set+0.25%F.S.)	
OVER VOLTAGE PROTECTION				
Range	1~81.6V		1~510V	
Resolution	0.2V		1.25V	
Accuracy	±(2%set+0.25%F.S.)		±(2%set+0.25%F.S.)	
Over Temperature Protection	≒ 85℃		≒ 85℃	
RATED POWER PROTECTION				
Value	385W		385W	
Accuracy	±(2%set)		±(2%set)	
GENERAL				
SHORT CIRCUIT				
Current(CC)	≒ 7.7/7A	≒ 77/70A	≒ 1.1/1A	≒ 11/10A
Voltage(CV)	0V	0V	0V	0V
Resistance(CR)	≒ 1.25Ω	≒ 0.025Ω	≒ 15Ω , ≒ 50Ω	≒ 1.25Ω
INPUT RESISTANCE(LOAD OFF)				
	500KΩ(Typical)			
POWER SOURCE	AC100V ~ 230V ± 10% ; 50Hz / 60Hz ± 2Hz			
WEIGHT	Approx. 3.8 kg			
DIMENSIONS & WEIGHT (PEL-2002A)	272(W) x 200(H) x 581 (D) mm ; Approx. 17.1kg(full modules)			
DIMENSIONS & WEIGHT (PEL-2004A)	435(W) x 200(H) x 581 (D) mm ; Approx. 28.4kg(full modules)			

## ORDERING INFORMATION

PEL-2020A	Dual Channel Module, (0~80V, 0~20A, 100W) x 2
PEL-2030A	Dual Channel Module, (1~80V, 0~5A, 30W)+(1~80V, 0~40A, 250W)
PEL-2040A	Single Channel Module, (0~80V, 0~70A, 350W)
PEL-2041A	Single Channel Module, (0~500V, 0~10A, 350W)
PEL-2004A	4-Slot Programmable D.C. Electronic Load Mainframe
PEL-2002A	2-Slot Programmable D.C. Electronic Load Mainframe

Note : Load module cannot be used without a mainframe

### ACCESSORIES :

PEL-2002A/2004A	User Manual x1, Power Cord x1
PEL-2020A/2030A/2040A/2041A	GTL-120 Test Lead x 1, GTL-121 Sense Lead x 1

\* PEL-003 x 3 (PEL-2004A); PEL-003 x 1 (PEL-2002A)

### OPTIONAL ACCESSORIES

PEL-001	GPIB Card
PEL-002	PEL-2000A Series Rack Mount Kit
PEL-003	Panel Cover
PEL-016	LAN Card
GTL-248	GPIB Cable (2m)
GTL-249	Frame Link Cable
GTL-246	USB Cable, USB 2.0 A-B TYPE CABLE, 4P
GTL-232	RS-232C Cable, 9-pin, F-F Type, null modem, 2000mm

### GTL-249 Frame Link Cable



### GTL-120 Test Lead



### GTL-121 Sense Lead





# ACCESSORIES

MODEL	DESCRIPTION	APPLICABLE DEVICE
APS-001	GPIO interface card	APS-7000 Series
APS-002	RS-232 / USB interface card	APS-7050, APS-7100
APS-003	Output Voltage Capacity (0 ~ 600Vrms)	APS-7000 Series
APS-004	Output Frequency Capacity (45~999.9Hz)	APS-7000 Series
APS-007	RS-232 interface card	APS-7200, APS-7300
GET-001	Extended terminal with max.30A for 30V/80V/160V models	PSW-Series
GET-002	Extended terminal with max.10A for 250V/800V models	PSW-Series
GET-005	Extended European Terminal with max.20A for 30V/80V/160V models	PSW-Series
GPS-001	Knob, Voltage/Current Protection Knob	GPS-x303 Series, SPD-3606
GPW-001	UL/CSA Power Cord, 3000mm	PSU-Series
GPW-002	VDE Power Cord, 3000mm	PSU-Series
GPW-003	PSE Power Cord, 3000mm	PSU-Series
GRA-401	Rack Mount Kit, 19", 4U Size	GPC-Series, GPR-M Series, PPE-3323, PPS-3635, PPT-Series, PEL-300
GRA-403	Rack Mount Kit, 19", 4U Size	PSH-Series
GRA-407	Rack Mount Kit, 19", 4U Size	PSM-Series, PST-Series
GRA-408	Rack Mount Kit, 19", 4U Size	PSS-Series
GRA-409	Rack Mount Kit, 19", 5U Size	APS-1102A
GRA-410-E	Rack Mount Kit (EIA), 19", 3U Size	PSW-Series
GRA-410-J	Rack Mount Kitt (JIS), 19", 3U Size	PSW-Series
GRA-413-E	Rack Mount Kitt (EIA), 19", 3U Size	PEL-3211/3211H
GRA-413-J	Rack Mount Kitt (JIS), 19", 3U Size	PEL-3211/3211H
GRA-414-E	Rack Mount Kit (EIA), 19", 3U Size	PEL-3021(H)/3041(H)/3111(H), PEL-3000E Series
GRA-414-J	Rack Mount Kit (JIS), 19", 3U Size	PEL-3021(H)/3041(H)/3111(H), PEL-3000E Series
GRA-418-E	Rack Mount Kit (EIA), 19", 3U Size	PSB-1000 Series
GRA-418-J	Rack Mount Kit (JIS), 19", 3U Size	PSB-1000 Series
GRA-419-E	Rack Mount Kit (EIA), 19", 2U Size	PCS-1000I
GRA-419-J	Rack Mount Kit (JIS), 19", 2U Size	PCS-1000I
GRA-423	Rack Mount Kit, 19", 2U Size	APS-7000/7000E Series
GRA-424	Rack Mount Kit, 19", 3U Size	PSB-2000 Series
GRA-427	Rack Mount Kit, 19", 3U Size	PLR-Series
GRA-428	Rack Mount Kit (EIA), 19", 3U Size	PSP-Series
GRA-429	Rack Mount Kit, 7U Size	APS-7200 Series
GRA-430	Rack Mount Kit, 9U Size	APS-7300 Series
GRA-431-J	Rack Mount Kit (JIS)	PFR-Series
GRA-431-E	Rack Mount Kit (EIA)	PFR-Series
GRA-437-J	Rack Mount Kit (JIS), 19", 3U Series	GPP-Series
GRA-437-E	Rack Mount Kit (EIA), 19", 3U Series	GPP-Series
GRA-439-J	Rack Mount Kit (JIS), 19", 3U Series	ASR-2000 Series
GRA-439-E	Rack Mount Kit (EIA), 19", 3U Series	ASR-2000 Series
GRJ-1101	Module Cable (0.5m)	PSB-2000 Series, PLR-Series
GRJ-1102	Module Cable (1.5m)	PLR-Series
GRM-001	Slide bracket 2pcs/set	PSU-Series
GTL-104A	Test Lead, U-type to Alligator Test Lead, Max. Current 10A, 1000mm	PFR/PSM/PSP/PSS/PST/GPC/GPD/GPP/GPR/GPS/GPE/PPT-Series, PPS-3635, SPD-3606
GTL-105A	Test Lead, Alligator to Banana Test Lead, Max. Current 3A, 1000mm	PFR/PSS/PST/GPC/GPD/GPP/GPR/GPS/GPE/PPT-Series, PEL-2000A, PPE-3323, SPD-3606, PCS-1000I
GTL-117	Test Lead, Banana to Probe Test Lead, 1200mm	PPH-1503/1503D/1506D
GTL-120	Test Lead, O-type to O-type Test Lead, Max. 40A, 1200mm	PEL-3000/3000H Series, PEL-2000A Series
GTL-121	Sense Lead, O-type to free Lead, 1200mm	PEL-2000A Series
GTL-122	Test Lead, U-type to Alligator Test Lead, Max. Current 40A, 1200mm	PSH-Series, GPR-U Series, GPR-H Series
GTL-123	Test Lead, O-type to O-type Test Lead, 1200mm	PSW-Series, APS-7000 Series, PSB-1000 Series
GTL-130	Test leads: 2 x red, 2 x black, for 250V/800V models, 1200mm	PSW-Series
GTL-134	Test leads for rear panel, 1200mm, 10A, 16 AWG	PFR-Series
GTL-201A	Ground Lead, Banana to Banana, European Terminal, 200mm	AFG-200/100 Series, PSM Series, GPD-Series, GPP-Series, GPS-X303 Series, SPD-3606
GTL-202	Sense Lead, Banana to Banana Lead, European Terminal, 200mm	PSM-Series
GTL-203A	Test Lead, Banana to Alligator, European Terminal, Max. Current 3A, 1000mm	PSS/PST/GPD/GPP/GPS/GPE/PPT-Series, SPD-3606, PPH-1503/1503D/1506D
GTL-204A	Test Lead, Banana to Alligator, European Terminal, Max. Current 10A, 1000mm	PFR/PSM/PSP/PSS/GPS/GPE/PPT/PST/GPD/GPP-Series, SPD-3606, PPH-1503/1503D/1506D
GTL-207A	Test Lead, Banana to Probe Test Lead, 800mm	PCS-1000I
GTL-232	RS-232C Cable, 9-pin, F-F Type, null modem, 2000mm	PSH/PSM/PSS/PST-Series, APS-7000 Series, PEL-2000A Series
GTL-232A	RS-232C Cable, 9-pin, F-F Type, null modem, 2000mm	PSP-Series
GTL-234	RS-232C Cable, 9-pin, F-F Type, 2000mm	APS-1102A
GTL-240	USB Cable, USB 2.0, A-B Type (L Type), 1200mm	PSW-Series, PSU-Series, APS-1102A, APS-7000 Series, PCS-1000I
GTL-246	USB Cable, USB 2.0, A-B Type, 1200mm	PFR-Series, PSU-Series, PSB-2000 Series, PPH-1503/1503D, GPD-Series, GPP-Series, APS-1102A, APS-7000 Series, PEL-3000/3000H Series, PEL-3000E, PEL-2000A Series, PLR-Series
GTL-248	GPIO Cable, Double Shielded, 2000mm	PSB-2000 Series, PPH-1503, PSW/PSU/PSH/PSM/PSS/PST/PPT-Series, PPS-3635, APS-7000 Series, PEL-3000/3000H Series, PEL-3000E Series, PEL-2000A Series, PLR-Series
GTL-249	Frame Link Cable, 300mm	PEL-2000A Series
GTL-250	GPIO Cable, Double Shielded, 600mm	PSW/PSU/PSH-Series, PSB-2000 Series, APS-7000 Series
GTL-255	Frame Link Cable, 300mm	PEL-3000/3000H Series
GTL-258	GPIO Cable, 25 pins Micro-D Connector	PFR-Series
GUG-001	GPIO-USB Adaptor, GPIO to USB adaptor	GDS-3000 Series, PSW-Series
GUR-001A	RS232-USB Cable, 300mm	PSW-Series
PCS-001	Basic Accessory Kit	PCS-1000I
PEL-001	GPIO Card	PEL-2000A Series
PEL-002	Rack Mount Kit, PEL-2000 Series Rack Mount Kit	PEL-2000A Series
PEL-003	Panel Cover	PEL-2000A Series

# ACCESSORIES

MODEL	DESCRIPTION	APPLICABLE DEVICE
PEL-004	GPIO Card	PEL-3000/3000H Series, PEL-3000E Series
PEL-005	Connect Cu Plate	PEL-3000/3000H Series
PEL-006	Connect Cu Plate	PEL-3000/3000H Series
PEL-007	Connect Cu Plate	PEL-3000/3000H Series
PEL-008	Connect Cu Plate	PEL-3000/3000H Series
PEL-009	Connect Cu Plate	PEL-3000/3000H Series
PEL-010	Dust filter	PEL-3000/3000H Series, PEL-3000E Series
PEL-011	Load Input Terminal Cover	PEL-3000/3000H Series
PEL-012	Terminal Fittings Kits	PEL-3000/3000H Series
PEL-013	Flexible Terminal Cover	PEL-3000/3000H Series
PEL-014	J1/J2 Protection Plug	PEL-3000/3000H Series
PEL-016	LAN Card	PEL-2000A Series
PEL-018	LAN Card	PEL-3000/3000H Series, PEL-3000E Series
PLR-GU	GPIO/USB Interface Card	PLR-Series
PLR-LU	LAN/USB Interface Card	PLR-Series
PLR-ARC	External Analog Control Interface Card	PLR-Series
PLR-001	Parallel Connection Signal Cable(2~3 units)	PLR-Series
PLR-002	Series Connection Signal Cable	PLR-Series
PSB-001	GPIO Card	PSB-2000 Series, PSB-1000 Series
PSB-003	Parallel connection kit (for horizontal installation), Kit includes: (PSB-007 Joint Kit,Horizontal bus bar x 2, PSB-005 x1)	PSB-2000 Series, PSB-1000 Series
PSB-004	Parallel connection kit (for vertical installation) Kit includes: (PSB-007 Joint Kit, Vertical bus bar x 2, PSB-005 x 1)	PSB-2000 Series, PSB-1000 Series
PSB-005	Parallel Connection Signal Cable	PSB-2000 Series, PSB-1000 Series
PSB-006	Serial Connection Signal Cable	PSB-2000 Series, PSB-1000 Series
PSB-007	Joint Kit: Includes 4 joining plates, [M3x6]screws x 4; [M3x8]screw x 2	PSB-2000 Series
PSB-008	RS232C Cable (PSB-2000 Only)	PSB-2000 Series
PSB-101	Cable for 2 units of PSB-1000 units in parallel mode connection	PSB-1000 Series
PSB-102	Cable for 3 units of PSB-1000 units in parallel mode connection	PSB-1000 Series
PSB-103	Cable for 4 units of PSB-1000 units in parallel mode connection	PSB-1000 Series
PSB-104	Cable for 2 units of PSB-1000 units in series mode connection	PSB-1000 Series
PSB-105	GPIO card	PSB-1000 Series
PSB-106	basic accessory kit : M4 terminal screws and washers x 2, M8 terminal bolts, nuts and washers x 2, analog control protection dummy x 1, analog control lock level x 2, short bar x 1	PSB-1000 Series
PSU-01A	Joins a vertical stack of 2 PSU units together. 2U-sized handles x2, joining plates x2	PSU-Series
PSU-01B	Bus Bar for 2 units in parallel operation	PSU-Series
PSU-01C	Cable for 2 units in parallel operation	PSU-Series
PSU-02A	Joins a vertical stack of 3 PSU units together. 3U-sized handles x2, joining plates x2	PSU-Series
PSU-02B	Bus Bar for 3 units in parallel operation	PSU-Series
PSU-02C	Cable for 3 units in parallel operation	PSU-Series
PSU-03A	Joins a vertical stack of 4 PSU units together. 4U-sized handles x2, joining plates x2	PSU-Series
PSU-03B	Bus Bar for 4 units in parallel operation	PSU-Series
PSU-03C	Cable for 4 units in parallel operation	PSU-Series
PSU-232	RS232 Cable with DB9 connector kit	PSU-Series, PFR-Series
PSU-485	RS485 Cable with DB9 connector kit	PSU-Series, PFR-Series
PSU-GPIB	PSU GPIB Interface Card (Factory Installed)	PSU-Series
PSU-ISO-I	Isolated Current Remote Control Card (Factory Installed)	PSU-Series
PSU-ISO-V	Isolated Voltage Remote Control Card (Factory Installed)	PSU-Series
PSW-001	Accessory Kits	PSW-Series, PSB-1000 Series
PSW-002	Simple IDC Tool	PSW-Series, PSB-1000 Series
PSW-003	Contact Removal Tool	PSW-Series, PSB-1000 Series
PSW-004	Basic Accessory Kit for 30V/80V/160V models	PSW-Series
PSW-005	Series Operation Cable for 2 units. (30V/80V/160V models moly)	PSW-Series
PSW-006	Parallel Operation Cable for 2 units.	PSW-Series
PSW-007	Parallel Operation Cable for 3 units.	PSW-Series
PSW-008	Basic Accessory Kit for 250V/800V models	PSW-Series
PSW-009	Output terminal cover for 30V/80V/160V models	PSW-Series
PSW-010	Large filter (Type II/III)	PSW-Series
PSW-011	Output terminal cover for 250V/800V models	PSW-Series
PSW-012	High voltage output terminal for 250V/800V model	PSW-Series



# ACCESSORIES

GTL-101



GTL-105A



GTL-104A



GTL-120



GTL-121



GTL-122



GTL-123



GTL-201A



GTL-202



GTL-203A



GTL-204A



GTL-232



GTL-232A



GTL-240



GTL-246



GTL-248



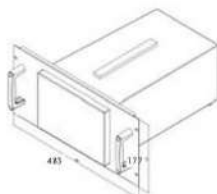
GTL-250



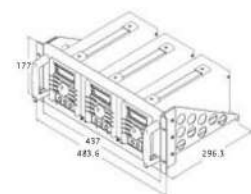
GTL-253



GRA-401 Rack Mount Kit



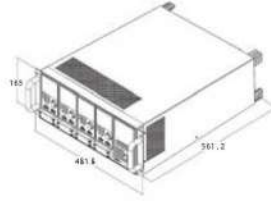
GRA-408 Rack Mount Kit



# ACCESSORIES

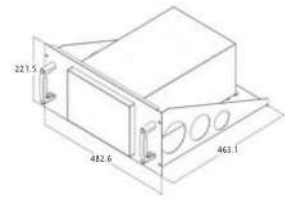
## PEL-002 Rack Mount Kit

For: PEL-2000A Series



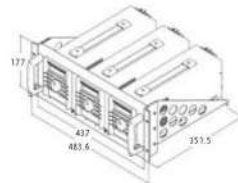
## GRA-409 Rack Mount Kit

For: APS-1102A



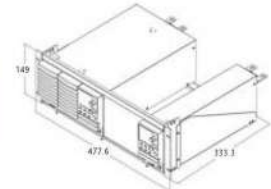
## GRA-403 Rack Mount Kit

For: PSH-Series



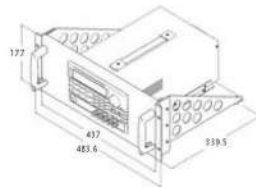
## GRA-410-J Rack Mount Kit (JIS)

For: PSW-Series



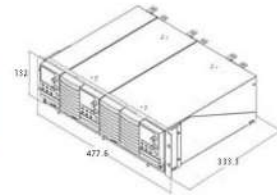
## GRA-407 Rack Mount Kit

For: PSM-Series, PST-Series



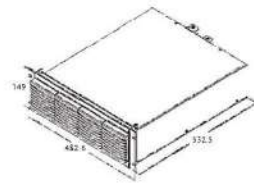
## GRA-410-E Rack Mount Kit (EIA)

For: PSW-Series



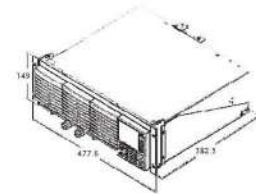
## GRA-413-J Rack Mount Kit (JIS)

For: PEL-3211/3211H



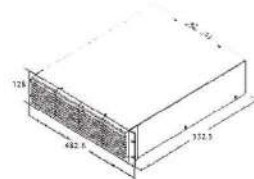
## GRA-414-J Rack Mount Kit (JIS)

For: PEL-3021/3021H/3041/3041H/3111/3111H  
PEL-3031E/3032E



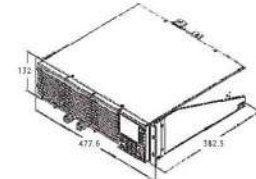
## GRA-413-E Rack Mount Kit (EIA)

For: PEL-3211/3211H



## GRA-414-E Rack Mount Kit (EIA)

For: PEL-3021/3021H/3041/3041H/3111/3111H  
PEL-3031E/3032E



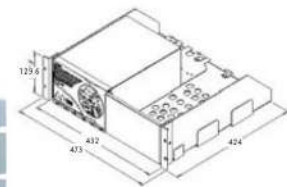
## GRA-423 Rack Mount Kit

For: APS-7050/7100/7050E/7100E Series



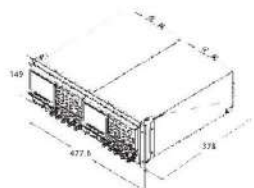
## GRA-424 Rack Mount Kit

For: PSB-2000 Series



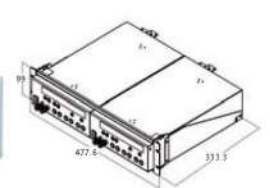
## GRA-418-J Rack Mount Kit (JIS)

For: PSB-1000 Series



## GRA-419 Rack Mount Kit (JIS)

For: PCS-1000I

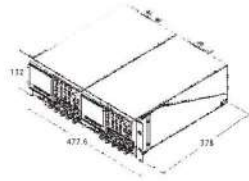




# ACCESSORIES

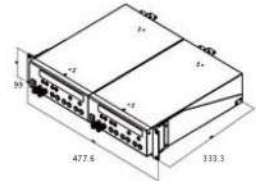
## GRA-418-E Rack Mount Kit (EIA)

For : PSB-1000 Series



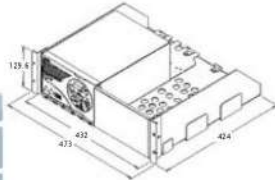
## GRA-419 EIA Rack Mount Kit

For : PCS-1000



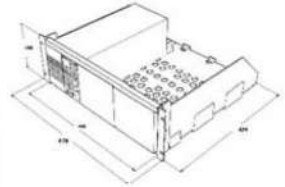
## GRA-424 Rack Mount Kit

For : PSB-2000 Series



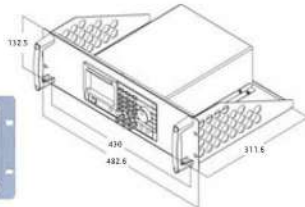
## GRA-427 Rack Mount Kit (EIA+JIS)

For : PLR-Series



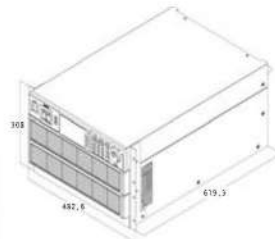
## GRA-428 Rack Mount Kit (EIA)

For : PSP-Series



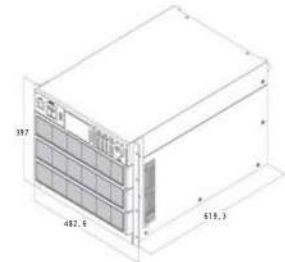
## GRA-429 Rack Mount Kit

For : APS-7200 Series



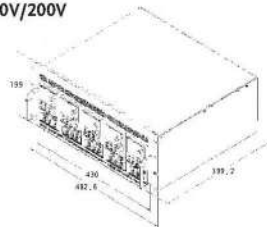
## GRA-430 Rack Mount Kit

For : APS-7300 Series



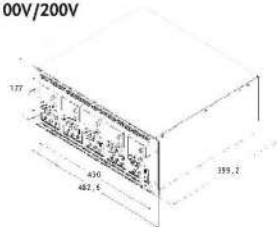
## GRA-431-J Rack Mount Kit (JIS)with AC 100V/200V

For : PFR-Series



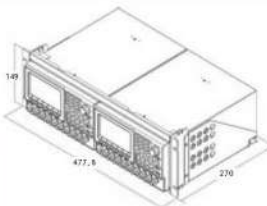
## GRA-431-E Rack Mount Kit (EIA)with AC 100V/200V

For : PFR-Series



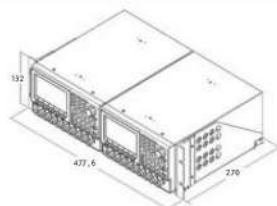
## GRA-437-J Rack Mount Kit (JIS)

For : GPP-Series



## GRA-437-E Rack Mount Kit (EIA)

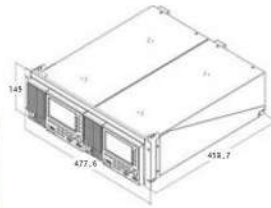
For : GPP-Series



# ACCESSORIES

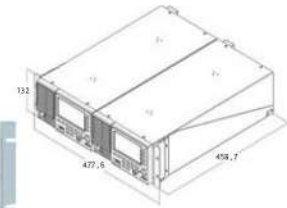
## GRA-439-J Rack Mount Kit (JIS)

For : ASR-2050/ASR-2100/ASR-2050R/ASR-2100R



## GRA-439-E Rack Mount Kit (EIA)

For : ASR-2050/ASR-2100/ASR-2050R/ASR-2100R







## DIGITAL MULTIMETER

GW Instek provides bench-top, hand-held digital multimeter and digital clamp meter to meet customers' needs under different circumstances.

For bench-top multimeter, GDM-9000/8000 Series, selections are available with 6  $\frac{1}{2}$  digit, 5  $\frac{1}{2}$  digit and 4  $\frac{3}{4}$  digit (50000 counts) models. With the design focused on superior performance, the GDM-9000/8000 series has become some of the best assets for engineers and technicians in service & repair, production testing and in educational institutions.

As regards the GDM-300/400 Series hand-held multimeter, 4  $\frac{1}{2}$  and lower digit options with fundamental functions and easy operation are for your pick. Digital clamp meters designed for cable measurement are also available.

## PRODUCTS

- Benchtop Digital Multimeter
- Handheld Digital Multimeter
- Digital Clamp Meter

## DIGITAL MULTIMETER OVERVIEW

From 6 1/2 to 4 3/4 digits, the GDM-9000/8000 Series can deliver a measurement accuracy of up to 0.0035% and with high current fuse protection can withstand up to 12A. With the design focused on superior performance and ease of use, the GDM-9000/8000 Series has become some of the best assets for engineers and technicians in service & repair, production testing and educational institutions. USB, RS-232C, GPIB, LAN and Scanner card interfaces all make the series ideal for PC controlled applications.

### BENCH-TOP DIGITAL MULTIMETER

MAIN FUNCTION / MODEL	GDM-9061	GDM-9060	GDM-8261A	GDM-8255A
Display	6 1/2 (1200000 Counts) TFT LCD Dual Measurement	6 1/2 (1200000 Counts) TFT LCD Dual Measurement	6 1/2 (1200000 Counts) VFD Dual Measurement	5 1/2 (199999 Counts) VFD Dual Measurement
Autoranging	✓	✓	✓	✓
DCV Basic Accuracy	0.0035%	0.0075%	0.0035%	0.012%
Major Measurement Functions	AC & DC Voltage AC & DC Current (3A/10A) 2- & 4-wires resistance Continuity & Diode Frequency & Period Temperature (RTD/ Thermocouple/Thermistor) Capacitance	AC & DC Voltage AC & DC Current (3A) 2- & 4-wires resistance Continuity & Diode Frequency & Period Temperature (RTD/ Thermocouple/Thermistor) Capacitance	AC & DC Voltage AC & DC Current 2- & 4-wires resistance Continuity & Diode Frequency & Period Temperature (RTD/Thermocouple)	AC & DC Voltage AC & DC Current 2- & 4-wires resistance Continuity & Diode Frequency & Period Temperature (Thermocouple)
Advanced Functions	Math. (REL, dB, dBm, Compare, MA+B, Percent, 1/X); STAT (Min/Max/Average/P-P, STDEV); Display (Number, Trend Chart, Bar Meter, Histogram); Rear Input	Math. (REL, dB, dBm, Compare, MA+B, Percent, 1/X); STAT (Min/Max/Average/P-P, STDEV); Display (Number, Trend Chart, Bar Meter, Histogram); Rear Input	REL, dB, dBm, Hold, Math, Max./Min., Compare, Store, Recall, AC+DC True RMS	REL, dB, dBm, Hold, Math, Max./Min., Compare, Store, Recall, AC+DC True RMS
Interface (Std.)	USB device (USBTMC/USB CDC) RS-232C, LAN, Digital I/O USB host	USB device (USBTMC/USB CDC) RS-232C, LAN, Digital I/O USB host	USB device (USB CDC) RS-232C, Digital I/O	USB device (USB CDC) RS-232C, Digital I/O
Optional	GPIB	GPIB	Scanner Card/GPIB/LAN	Scanner Card
Page	E3-6	E3-6	E7-8	E9-10

### BENCH-TOP DIGITAL MULTIMETER

MAIN FUNCTION / MODEL	GDM-8351	GDM-8342	GDM-8341	GDM-8245
Display	5 1/2 (120000 Counts) VFD Dual Measurement	50000 Counts VFD Dual Measurement	50000 Counts VFD Dual Measurement	50000 Counts LED Dual Display
Autoranging	✓	✓	✓	✓
DCV Basic Accuracy	0.012%	0.02%	0.02%	0.03%
Major Measurement Functions	AC & DC Voltage AC & DC Current 2- & 4-wires resistance Continuity & Diode Frequency & Period Capacitance Temperature (Thermocouple)	AC & DC Voltage AC & DC Current 2- wires resistance Continuity & Diode Frequency & Period Capacitance Temperature (Thermocouple)	AC & DC Voltage AC & DC Current 2-wires resistance Continuity & Diode Frequency & Period Capacitance	AC & DC Voltage AC & DC Current 2-wires resistance Continuity & Diode Frequency Capacitance
Advanced Measurement Functions	REL, dB, dBm, Hold, Math, Max./Min., Compare, AC+DC True RMS	REL, dB, dBm, Hold, Math, Max./Min., Compare, AC+DC True RMS	REL, dB, dBm, Hold, Math, Max./Min., Compare, AC+DC True RMS	REL, dBm, Hold, Max./Min., AC+Hz, AC+DC True RMS
Interface (Std.)	USB device (support USBTMC/ USB CDC) RS-232C, Digital I/O	USB device(USB CDC) USB host	USB device (USB CDC)	—
Optional	—	GPIB	—	—
Page	E11-12	E13-14	E13-14	E15



## DIGITAL METERS



- \* 6 ½ Digit Display: 1,200,000 Counts
- \* 4.3" TFT Graphic LCD
- \* DCV Basic Accuracy: 0.0035%(GDM-9061)/0.0075%(GDM-9060)
- \* 12 Measurement Functions: DCV, ACV, DCI, ACI, 2-wire and 4-wire Resistance, Frequency, Period, Diode, Continuity, Temperature and Capacitance
- \* Sampling Rate up to 10k SPS (GDM-9061)
- \* Dual Measurements to Perform Two Selected Measurement Simultaneously
- \* Offer Graphical Capabilities Including Histogram, Bar Meter and Trend
- \* Temperature Measurement Support RTD, Thermistor as well as Thermocouple
- \* Standard Interface: USB Host/Device, RS-232C, LAN, Digital I/O
- \* Optional Interface: GPIB

The series adopts a 4.3-inch TFT graphical display and a fast sampling rate (GDM-9061: 10k/s, GDM-9060: 1k/s max.). In addition to the conventional digital display, displays can be collocated with bar meter, trend chart or histogram to make the panoramic view of the entire measurement process more completely and quickly presented. At the same time, the internal memory capacity (GDM-9061: 100k, GDM-9060: 10k) can simultaneously facilitate the trend plot or histogram measurement process and perform statistical calculations to simplify the complex trend analysis.

For user-friendly, the GDM-906X series incorporates some ingenious operational ideas, such as numeric soft keys for settings that require numerical input, upper/lower limits, LAN IP operational interfaces or messages, and multiple languages (English / Traditional Chinese/ Simplified Chinese/ Japanese / Korean) to shorten the operational and learning time of the meter.

For ATS measurement or remote control applications, the GDM-906X series provides GPIB (option can be installed at customer site) other than standard communications interfaces: USB, RS-232 and LAN. With respect to software supports, the GDM-906X series provides DMM-Viewer2 to assist users in observing or recording the data from the measurement process. In addition, LabVIEW driver is also provided to facilitate the program requirements of different system integrations.

**E3** Good Will Instrument Co., Ltd. | Simply Reliable





## GDM-906X Series

### SPECIFICATIONS

	1.000000 V to 750.000 V	1μV ~ 1mV	3Hz ~ 5Hz 5Hz ~ 10Hz 10Hz ~ 20kHz 20kHz ~ 50kHz 50kHz ~ 100kHz 100kHz ~ 300kHz	1.00 ± 0.04 0.35 ± 0.04 0.06 ± 0.04 0.12 ± 0.05 0.60 ± 0.08 4.00 ± 0.50	1.00 ± 0.04 0.38 ± 0.04 0.09 ± 0.04 0.15 ± 0.05 0.63 ± 0.08 4.00 ± 0.50	
AC Current (True RMS)	Range	Resolution	Frequency	Accuracy(1Year)(TCAL±5°C)		
				GDM-9061	GDM-9060	
	100.0000 μA 10.00000 mA	100pA 10nA	3Hz ~ 5Hz 5Hz ~ 10Hz 10Hz ~ 5kHz 5kHz ~ 10kHz	1.00 ± 0.04 0.35 ± 0.04 0.10 ± 0.04 0.18 ± 0.04	1.00 ± 0.04 0.38 ± 0.04 0.13 ± 0.04 0.20 ± 0.04	
	1.000000 mA 100.0000 mA	1nA 100nA	3Hz ~ 5Hz 5Hz ~ 10Hz 10Hz ~ 5kHz 5kHz ~ 10kHz	1.00 ± 0.04 0.30 ± 0.04 0.10 ± 0.04 0.15 ± 0.04	1.00 ± 0.04 0.33 ± 0.04 0.13 ± 0.04 0.18 ± 0.04	
	1.000000 A	1μA	3Hz ~ 5Hz 5Hz ~ 10Hz 10Hz ~ 5kHz 5kHz ~ 10kHz	1.00 ± 0.04 0.30 ± 0.04 0.10 ± 0.04 0.15 ± 0.04	1.00 ± 0.04 0.33 ± 0.04 0.13 ± 0.04 0.18 ± 0.04	
	3.000000 A	1μA	3Hz ~ 5Hz 5Hz ~ 10Hz 10Hz ~ 5kHz 5kHz ~ 10kHz	1.00 ± 0.04 0.35 ± 0.04 0.23 ± 0.04 0.23 ± 0.04	1.00 ± 0.04 0.38 ± 0.04 0.23 ± 0.04 0.23 ± 0.04	
	10.00000 A	10μA	3Hz ~ 5Hz 5Hz ~ 10Hz 10Hz ~ 5kHz 5kHz ~ 10kHz	1.10 ± 0.04 0.35 ± 0.04 0.15 ± 0.04 0.35 ± 0.04	----- ----- ----- -----	
	CAPACITANCE CHARACTERISTICS					
	Accuracy : ± ( % of reading + % of range )					
	Capacitance	Range	Resolution	Accuracy(1 Year)(TCAL±5°C)		
		1.000 nF	0.001nF	2.00 ± 2.00		
		10.00 nF	0.01nF	2.00 ± 1.00		
		100.0 nF	0.1nF	2.00 ± 0.40		
		1.000 μF	0.001μF	2.00 ± 0.40		
		10.00 μF	0.01μF	2.00 ± 0.40		
		100.0 μF	0.1μF	2.00 ± 0.40		
	FREQUENCY AND PERIOD CHARACTERISTICS					
	Accuracy : ± ( % of reading )					
	Frequency/Period	Range	Frequency	Accuracy(1 Year)(TCAL±5°C)		
		100.0000mV to 750.000V	3Hz ~ 5Hz 5Hz ~ 10Hz 10Hz ~ 40Hz 40Hz ~ 1MHz	0.1 0.05 0.03 0.006		
		GENERAL INFORMATION				
		Display	4.3" Color TFT WQVGA (480 x 272)			
Standard Interface		RS-232C, USB Host/Device, LAN, Digital I/O				
Power Source	AC 100 V/120 V/220 V/240 V±10%					
Power Line Frequency	50 Hz/60 Hz/400 Hz±10%					
Power Consumption	Max. 25VA					
Dimension & Weight	267(W) x 107(H) x 302(D) mm, Approx. 3.5kg					

### ORDERING INFORMATION

GDM-9061 6 ½ (1200000 counts) Digit Dual Measurement Multimeter  
GDM-9060 6 ½ (1200000 counts) Digit Dual Measurement Multimeter

#### ACCESSORIES:

Safety Instructions x 1, Power cord x 1, USB cable GTL-246 x 1, Test lead GTL-217 x 1,  
CD x 1(including the complete user manual, upgrade program and PC software, DMM-Viewer2)

#### OPTION

Opt.1 GPIB card (\*) GPIB can be installed at customer site

#### OPTIONAL ACCESSORIES

GTL-205A Temperature Probe Adapter with Thermal Coupling (K-type), approx. 1000mm  
GTL-234 RS-232C Cable, 9-pin female-female cable, approx. 2000mm  
GTL-248 GPIB Cable, approx. 2000mm **GRA-422** Rack Mount Kit(19",2U)  
GTL-308 4Wire Type (+shield) Test lead, approx. 1500mm **GDM-TL1** Test Lead Set  
**GSC-014** Soft Carrying Case for DMM Accessory

#### GDM-9061 Rear Panel



#### GDM-9060 Rear Panel



#### GTL-217 Test Lead



#### GSC-014 Soft Carrying Case for DMM Accessory



#### GDM-TL1 Test Lead Set



#### GTL-205A Temperature probe adaptor with thermocouple (K type)

Approx. 1m





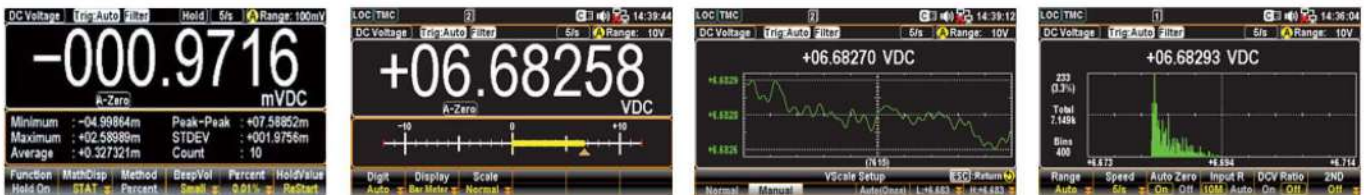
# 6 ½ Digit Dual Measurement Multimeter

## A. IDEAL BENCHTOP PARTNER

	GDM-9061	GDM-9060
DCV Accuracy	0.0035%	0.0075%
Sampling Rate	10k/sec	1k/sec
Memory	100k	10k
Rear Input	Yes	No
Current Terminal (Front)	3A, 10A	3A
Current Terminal (Rear)	3A	—
Display Function	Number, Trend Chart, Bar Meter, Histogram	
Math.	Voltage/Current : AC, DC Resistance : 2-Wire, 4-Wire Diode, Continuity, Temperature Frequency, Period, Capacitance	
STAT.	REL, dB, dBm, Compare, MX+B, Percent, 1/X	
Interface	Min/Max/Average/ P-P, STDEV RS-232C, USB Host/Device, LAN	

The GDM-906X series provides all fundamental measurement functions engineers require to design, develop, and test electronic circuits or products, including voltage, current, resistance, diode, and continuity beeper, frequency, temperature and capacitance. In addition, the series also features mathematical functions (dB, dBm, Compare, MX+B, 1/X and Percent), statistical functions (Min/Max/Average/P-P/STDEV), and a variety of standard communications interfaces. The series can meet specific measurement requirements and complex measurement applications whether for the benchtop operation or to be installed in the system.

## B. DIVERSE DISPLAY MODE



In addition to the standard numeric display mode, it also provides a variety of graphical functions such as bar meter, trend chart and

histogram, so that the measurement results are no longer just a series of numbers, but a swift insight into the panoramic measurement.

## C. DUAL MEASUREMENT AND DUAL TREND LINE



The dual measurement function has always been a unique feature of GW Instek digital multimeters, allowing two measurement functions to be performed simultaneously and displaying the test results separately so as to greatly improve the test speed of the multi-functional measurement tasks.

## D. HIGH MEASUREMENT RESOLUTION AND HIGH SAMPLING RATE

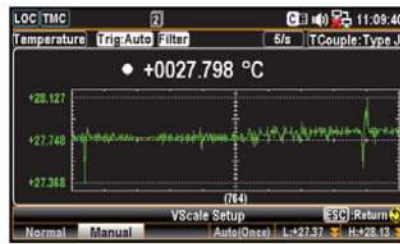
GDM-9061 MEASUREMENT TYPE – DCV/DCI/2W/4W									
Refresh Rate Available									
6½ Resolution			5½ Resolution			4½ Resolution			
5/s	20/s	60/s	100/s	400/s	1.2k/s	2.4k/s	4.8k/s	7.2k/s	10k/s

GDM-9060 MEASUREMENT TYPE – DCV/DCI/2W/4W									
Refresh Rate Available									
6½ Resolution			5½ Resolution			4½ Resolution			
5/s	20/s	60/s	100/s	400/s	1k/s	—	—	—	—

The GDM-906X series provides high resolution of 0.1µV for voltage measurement, 100pA for current measurement, and 100µΩ for resistance measurement to meet the necessary requirements for precision measurement in specific applications. In addition, GDM-9061 is capable of achieving 10k readings per second with a display resolution of 4½ digits, while GDM-9060 achieves 1k measurement readings per second with a display resolution of 5½ digits; such a fast sampling rate is sufficient for current measurement needs.

## E. TEMPERATURE MEASUREMENT



The GDM-906X series conducts temperature measurement and is ideal for a variety of temperature sensors, such as thermistors, RTDs, and thermocouples. The GDM-906X's temperature measurement supports commonly used thermocouple types (e.g. J / T / K..., etc.), using voltage

measurement terminals as thermocouple inputs, and calculating temperature based on voltage fluctuations; the function can be used as a temperature recorder if collocated with internal memory capacity and the trend chart function.

## F. DIVERSE COMMUNICATIONS INTERFACE AND FAST TRANSFER RATE



For system integration applications, the GDM-906X series is equipped with RS232, USB and LAN as standard communications interfaces, and GPIB is an option (can be installed by customer) to meet the

requirements of different system integrations. Data transfer rate is up to 10k readings per second (GDM-9061) or 1k readings per second (GDM-9060) via USB/LAN/GPIB interfaces.

## G. CONVENIENT PC SOFTWARE



The PC software DMM-Viewer2 is suitable for any computer communications interfaces (RS232C/LAN/USB/ GPIB) provided by the GDM-906X series for long-term data acquisition. The software not only allows users to control the settings of the GDM-906X series but also provides the observation mode or the recording mode for the captured data. For the observation mode, the measurement result is directly presented as the result of the trend plot or the histogram and the result is

not saved. For the recording mode, the measurement result is directly saved into the log file, but only the current display is shown in the process. The measured data and trend plot can be viewed after the recording mode is stopped. In addition, the GDM-906X series also provides LabVIEW driver to meet the software application requirements of system integration.



# 6 1/2 Digit Dual Measurement Multimeter



## GDM-8261A



### FEATURES

- \* 6 1/2 Digit Display : 1,200,000 Counts
- \* DCV Basic Accuracy : 0.0035%
- \* Dual Measurements to Perform Two Selected Measurements Simultaneously
- \* Bright Vacuum Fluorescent Display (VFD)
- \* 11 Measurement Functions & 10 Math Functions
- \* High Resolution : Up to 100pA Resolution with DCI and 1nA with ACI Measurements
- \* Temperature Measurement (RTD & Thermocouple) From -200°C ~ +1820°C
- \* High Data Transmission Speed : Up to 2,400 readings/s Through USB Interface
- \* Standard Interfaces : USB, RS-232C, Digital I/O
- \* Optional Interfaces : GPIB or LAN
- \* Optional Scanner Card : GDM-SC1A (V ch x 16, I ch x 2)
- \* Free PC Software : DMM-Viewer, LabVIEW Driver

### GDM-SC1A Scanner card

Multipoint Testing can be facilitated by simple insertion of scanner card.



### GTL-247 USB Cable

A-A type cable, Approx. 1.8m



### GDM-01 Calibration key



GDM-8261A is a high precision 6 1/2 digit Digital Multimeter with dual measurement displays, 11 measurement functions and 10 math functions at high accuracy (35ppm DC voltage accuracy) to accommodate the most frequently performed parameter measurements in various application fields today. GDM-8261A adopts a scanner card, which carries 16 V-Channels and 2 I-Channels, to facilitate the measurements of multiple-test points on either a device or multiple devices all at a press of a button. With this multi-point measurement capability, GDM-8261A can be used as a semi-auto ATE System to increase the throughput of manufacturing test or as a data logger to perform long term monitoring or characterization of a DUT. A PC Software, ExcelADDINS, is available with GDM-8261A to support multi-channel panel setting and data logging of the scanner card. Besides, a LabVIEW driver is also supported to help user create his/her own virtual instrument on the PC screen for easy programming. For ATE system measurements or remote control applications, both USB and RS-232C Interfaces are provided as standard, and either GPIB or LAN can be selected as optional interface for GDM-8261A.

SPECIFICATIONS Accuracy : ± (% of reading + % of range) for 1 hour warm-up at 6 1/2 digits, slow mode						
FUNCTION						
Range <sup>(*1)</sup>	Resolution	Test Current or etc.	24 Hours 23°C ± 1°C	90 Days 23°C ± 5°C	1 Year 23°C ± 5°C	Temperature Coefficient 0°~18°C / 28°~55°C
<b>DC VOLTAGE</b>						
100.0000 mV	0.1 μV	10MΩ or >10GΩ	0.0030 + 0.0030	0.0040 + 0.0035	0.0050 + 0.0035	0.0005 + 0.0005
1.000000 V	1 μV	10MΩ or >10GΩ	0.0015 + 0.0004	0.0020 + 0.0005	0.0035 + 0.0005	0.0005 + 0.0001
10.00000 V	10 μV	11.11MΩ±1%	0.0020 + 0.0006	0.0030 + 0.0007	0.0048 + 0.0007	0.0005 + 0.0001
100.0000 V	0.1mV	10.1MΩ±1%	0.0020 + 0.0006	0.0035 + 0.0006	0.0081 + 0.0006	0.0005 + 0.0001
1000.000 V	1mV	10.1MΩ±1%	0.0025 + 0.0006	0.0044 + 0.0010	0.0090 + 0.0010	0.0005 + 0.0001
<b>RESISTANCE<sup>(*2)</sup></b>						
100.0000 Ω	100 μΩ	1 mA	0.0030 + 0.0030	0.008 + 0.004	0.010 + 0.004	0.0008 + 0.0005
1.000000 kΩ	1mΩ	1 mA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0008 + 0.0001
10.00000 kΩ	10mΩ	100 μA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0008 + 0.0001
100.0000 kΩ	100mΩ	10 μA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0008 + 0.0001
1.000000 MΩ	1Ω	3.5 μA	0.0020 + 0.0010	0.008 + 0.001	0.010 + 0.001	0.0010 + 0.0002
10.00000 MΩ	10Ω	350 nA	0.0150 + 0.0010	0.020 + 0.001	0.040 + 0.001	0.0030 + 0.0004
100.0000 MΩ	100Ω	350 nA / 10 MΩ	0.3000 + 0.0100	0.800 + 0.010	0.800 + 0.010	0.1500 + 0.0002
<b>DC CURRENT</b>						
100.0000 μA	100pA	< 0.015 V	0.010 + 0.020	0.04 + 0.025	0.05 + 0.025	0.002 + 0.0030
1.000000 mA	1nA	< 0.15 V	0.007 + 0.005	0.03 + 0.005	0.05 + 0.005	0.002 + 0.0005
10.00000 mA	10nA	< 0.07 V	0.005 + 0.010	0.03 + 0.020	0.05 + 0.020	0.002 + 0.0020
100.0000 mA	0.1 μA	< 0.7 V	0.010 + 0.004	0.03 + 0.005	0.05 + 0.005	0.002 + 0.0005
1.000000 A	1 μA	< 0.8 V	0.050 + 0.006	0.08 + 0.010	0.10 + 0.010	0.005 + 0.0010
10.00000 A	10 μA	< 0.5 V	0.100 + 0.008	0.12 + 0.008	0.15 + 0.008	0.005 + 0.0008
<b>CONTINUITY</b>						
1000.000 Ω	0.001 Ω	1 mA	0.002 + 0.030	0.008 + 0.030	0.010 + 0.030	0.001 + 0.002
<b>DIODE TEST<sup>(*3)</sup></b>						
1.000000 V	1 μV	1 mA <sup>(*4)</sup>	0.002 + 0.010	0.008 + 0.020	0.010 + 0.020	0.001 + 0.002

SPECIFICATIONS		Accuracy : ± (% of reading + % of range) for 1-hour warm-up at 6 1/2 digits, slow mode				
FUNCTION						
Range (*1)	Resolution	Frequency or etc.	24 Hours 23°C ± 1°C	90 Days 23°C ± 5°C	1 Year 23°C ± 5°C	Temperature Coefficient 0°~18°C / 28°~55°C
TRUE RMS AC VOLTAGE (*5)						
100.0000mV	0.1 μV	3Hz~5Hz	1.00 + 0.03	1.00 + 0.04	1.00 + 0.04	0.100 + 0.004
		5Hz~10Hz	0.35 + 0.03	0.35 + 0.04	0.35 + 0.04	0.035 + 0.004
		10Hz~20kHz	0.04 + 0.03	0.05 + 0.04	0.06 + 0.04	0.005 + 0.004
		20kHz~50kHz	0.10 + 0.05	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
		50kHz~100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100 kHz~300kHz(*7)	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.200 + 0.020
1.000000V~ 750.000 V (*6)	1 μV~ 1mV	3Hz~5Hz	1.00 + 0.02	1.00 + 0.03	1.00 + 0.03	0.100 + 0.003
		5Hz~10Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
		10Hz~20kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005 + 0.003
		20kHz~50kHz	0.10 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
		50kHz~100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100kHz~300kHz(*7)	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.200 + 0.020
TRUE RMS AC CURRENT (*5)						
1.000000 mA	1nA	3Hz~5Hz	1.00 + 0.04	1.00 + 0.04	1.0 + 0.04	0.100 + 0.006
		5Hz~10Hz	0.30 + 0.04	0.30 + 0.04	0.3 + 0.04	0.035 + 0.006
		10Hz~5kHz	0.10 + 0.04	0.10 + 0.04	0.1 + 0.04	0.015 + 0.006
		5kHz~10kHz	0.20 + 0.25	0.20 + 0.25	0.2 + 0.25	0.030 + 0.006
10.00000 mA	10nA	3Hz~5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.200 + 0.006
		5Hz~10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.100 + 0.006
		10Hz~5kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.006
		5kHz~10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.006
100.0000 mA	100nA	3Hz~5Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100 + 0.006
		5Hz~10Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035 + 0.006
		10Hz~5kHz	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.015 + 0.006
		5kHz~10kHz	0.20 + 0.25	0.20 + 0.25	0.20 + 0.25	0.030 + 0.006





## GDM-8261A

SPECIFICATIONS						
Accuracy : ± (% of reading + % of range )for 1-hour warm-up at 6 ½ digits, slow mode						
TRUE RMS AC CURRENT (*5)						
Range (*1)	Resolution	Frequency or etc.	24 Hours 23°C ± 1°C	90 Days 23°C ± 5°C	1 Year 23°C ± 5°C	Temperature Coefficient 0°~18°C/28°~55°C
1.000000 A	1μA	3Hz~5Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100 + 0.006
		5Hz~10Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035 + 0.006
		10Hz~5kHz	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.015 + 0.006
		5kHz~10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.006
10.00000 A	10μA	3Hz~5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.100 + 0.006
		5Hz~10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.035 + 0.006
		10Hz~5kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.006
		5kHz~10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.006
FREQUENCY PERIOD (*8)						
100.0000 mV~ 750.0000 V(*6)	—	3 Hz~5 Hz	0.1	0.1	0.1	0.005
		5 Hz~10 Hz	0.05	0.05	0.05	0.005
		10 Hz~40 Hz	0.03	0.03	0.03	0.001
		40 Hz~300 kHz	0.006	0.01	0.01	0.001
TEMPERATURE (RTD) (*9)						
-200 °C~600 °C	0.002 °C	—	—	—	0.06 °C (typical)	0.005 °C/°C (typical)
TEMPERATURE (THERMOCOUPLES) (*9)						
-200 ~ +1372 °C	0.003 °C	(J/K/N/T/E Type)	—	—	0.2 °C (typical)	0.004 °C/°C (typical)
-50 ~ +1820 °C	0.01 °C	(R/S/B Type)			1.0 °C	0.14 °C/°C
DISPLAY						
VFD, Two Colors Display						
INTERFACE						
RS-232C, USB, Digital I/O						
POWER SOURCE						
AC 100V/120V/220V/240V±10%, 45 Hz ~ 66 Hz and 360 Hz ~ 440 Hz; Power Consumption : Max. 25VA						
DIMENSIONS & WEIGHT						
265(W) x 107(H) x 350(D) mm, Approx. 3.1 kg						

Note : (\*1) 20% overrange on all ranges, except 1000 Vdc/750Vac, 10A range and Continuity.  
 (\*2) Specifications are for 4-wire ohms function, or 2-wire ohms using REL function.  
 (\*3) Accuracy specifications are for the voltage measured at the input terminals only.  
 (\*4) Variation in the current source will create some variation in the voltage drop across a diode junction.  
 (\*5) Specifications are for sinewave input >5% of range.  
 (\*6) 750 Vac range limited to 100 kHz  
 (\*7) Typically 30% of reading error at 1 MHz.  
 (\*8) Input > 100 mV. For 10 mV to 100 mV inputs, multiply % of reading error x10.  
 (\*9) Specifications do not include probe accuracy and relative to simulated junction

## ORDERING INFORMATION

### GDM-8261A 6 1/2 Digit Dual Measurement Multimeter

#### ACCESSORIES :

Quick star guide x 1, Power cord x 1, Test lead GTL-207A x 1, USB cable GTL-247 x 1, CD x 1 (including complete user manual, upgrade program and PC software DMM-Viewer), Calibration key GDM-01 x 1 (for firmware upgrade)

#### OPTION

Opt. 01 GDM-SC1A Scanner Card (V ch x 16, I ch x 2)  
 Opt. 02 GPIB Card  
 Opt. 03 LAN Card

\* Either GPIB or LAN can be installed on each GDM-8261A.

#### OPTIONAL ACCESSORIES

GTL-108A 4W Type test lead  
 GTL-232 RS-232C Cable, 9-pin female to 9-pin, null modem for computer, Approx. 2m  
 GTL-248 GPIB Cable, Approx. 2m  
 GRA-422 Rack Mount Kit  
 GDM-TL1 Test Lead Set  
 GSC-014 Soft Carrying Case for DMM Accessory  
 GTL-205A Temperature probe adaptor with thermocouple (K type)

#### FREE DOWNLOAD

PC Software ExcelADDINS, RS-232C/USB Interface Supported Driver USB Driver  
 LabVIEW Driver, RS-232C/USB/GPIB Interface Supported

\* Three-year warranty, excluding accessories.

## Rear Panel



## GTL-205A Temperature probe adaptor with thermocouple (K type)

Approx. 1m



## GTL-207A Test Lead

Approx. 0.8m



## GTL-108A 4W Type Test Lead

Approx. 1.1m



## GTL-232 RS-232C Cable

Approx. 2m



## GSC-014 Soft Carrying Case for DMM Accessory



## GDM-TL1 Test Lead Set





# 5 1/2 Digit Dual Display Digital Multimeter



## GDM-8255A



### FEATURES

- \* 5 1/2 Digits (199,999 Counts Max.)
- \* VFD Two Colors Display
- \* 0.012% DCV Accuracy
- \* True RMS (AC, AC+DC)
- \* 9 Major Measuring Functions and 10 Advanced Measurement Functions
- \* 2W/4W Resistance Measurement
- \* High Voltage 1000V and 10A Current Range
- \* Standard Interface : RS-232C, USB Device, Digital I/O
- \* Free PC Software (DMM-VIEWER), LabVIEW Driver
- \* Optional 16+2 Channels Scanner Card

### GTL-205A Temperature probe adaptor with thermocouple (K type)

Approx. 1m



### GTL-247 USB Cable

A-A type cable, Approx. 1.8m



### GDM-01 Calibration key



### GDM-SC1A Scanner card

Multipoint Testing can be facilitated by simple insertion of scanner card.



GDM-8255A portable precision multimeters feature 199,999 counts, a dual display, a 0.012% DCV accuracy and 2w/4w measurement. The VFD display technology provides the excellent observation of contrast and brightness.

GDM-8255A carries an extensive list of standard measurement items with a dual-display allowing two measurement items to be displayed simultaneously. Advanced measurement functions, such as Max/Min, Hold, Relative value and Compare, are suitable for a multiplicity of applications such as production testing, research and field verification. The USB, RS-232C and 9-pin digital I/O interface are included as standard features for remote control and data capturing for ATE applications.

For convenient PC-based remote control and extensive data capture, GDM-8255A includes DMM-Viewer software at no additional cost. DMM-Viewer mimics the operation of the multimeters on the PC, allowing you to quickly use the software with little effort.

The optional scanner card (GDM-SC1A) creates a self-contained multipoint measurement solution with plug-in design. This approach eliminates the complexities of multipoint measurements and data processing. The scanner lets users effectively measure multiple channels connected to a single GDM-8255A. Each scanner card has 16 general purpose channels and 2 extra channels for current (ACI, DCI) measurements. All channels are fully isolated (Hi and Lo). Up to two scanner cards can be inserted into each multimeter for a maximum of 36 channels. These optional modules not only provide customers with a complete hands-free multiple measurement solution, but also provide a cost effective upgrade path compared with purchasing dedicated instruments.

### SPECIFICATIONS

FULL SCALE	
	5 1/2 Digits (199,999 Counts Max.)
SAMPLE RATE	
	Slow : 5 1/2 digits, 10 readings/second Medium : 4 1/2 digits, 30 readings/second Fast : 3 1/2 digits, 60 readings/second
DC VOLTAGE	
Range	100mV, 1V, 10V, 100V, 1000V 5 ranges
Accuracy	100mV : $\pm(0.012\% \text{ rdg} + 8 \text{ digits})$ 1V ~ 1000V : $\pm(0.012\% \text{ rdg} + 5 \text{ digits})$
Input Resistance	10M $\Omega$
AC VOLTAGE True RMS	
Range	100mV, 1V, 10V, 100V, 750V 5 ranges
Accuracy	100mV ranges : 20Hz ~ 45Hz : $\pm(1\% \text{ rdg} + 100 \text{ digits})$ 45Hz ~ 10kHz : $\pm(0.2\% \text{ rdg} + 100 \text{ digits})$ 10kHz ~ 30kHz : $\pm(1.5\% \text{ rdg} + 300 \text{ digits})$ 30kHz ~ 100kHz : $\pm(15\% \text{ rdg} + 300 \text{ digits})$ 1V, 10V, 100V, 750V ranges : 20Hz ~ 45Hz : $\pm(1\% \text{ rdg} + 100 \text{ digits})$ 45Hz ~ 10kHz : $\pm(0.2\% \text{ rdg} + 100 \text{ digits})$ 10kHz ~ 30kHz : $\pm(1\% \text{ rdg} + 100 \text{ digits})$ 30kHz ~ 100kHz : $\pm(3\% \text{ rdg} + 200 \text{ digits})$
Input Resistance	1.1M $\Omega$ in parallel with approx. 100pF
DC CURRENT	
Range	10mA, 100mA, 1A, 10A 4 ranges
Accuracy	10mA : $\pm(0.05\% \text{ rdg} + 15 \text{ digits})$ 100mA : $\pm(0.05\% \text{ rdg} + 5 \text{ digits})$ 1A, 10A range : $\pm(0.2\% \text{ rdg} + 5 \text{ digits})$
AC CURRENT TRUE RMS	
Range	10mA, 100mA, 1A, 10A 4 ranges
Accuracy	10mA, 100mA range : 20Hz ~ 50Hz : $\pm(1.5\% \text{ rdg} + 100 \text{ digits})$ 50Hz ~ 10kHz : $\pm(0.5\% \text{ rdg} + 100 \text{ digits})$ 10kHz ~ 20kHz : $\pm(2\% \text{ rdg} + 200 \text{ digits})$ 1A, 10A range : 50Hz ~ 10kHz : $\pm(1\% \text{ rdg} + 100 \text{ digits})$
RESISTANCE	
Range	100 $\Omega$ , 1k $\Omega$ , 10k $\Omega$ , 100k $\Omega$ , 1M $\Omega$ , 10M $\Omega$ , 100M $\Omega$ 7 ranges
2W Accuracy	100 $\Omega$ range : $\pm(0.1\% \text{ rdg} + 8 \text{ digits})$ (*) 1k $\Omega$ range : $\pm(0.08\% \text{ rdg} + 5 \text{ digits})$ (*) 10k $\Omega$ ranges : $\pm(0.06\% \text{ rdg} + 5 \text{ digits})$ (*) 100k $\Omega$ ~ 1M $\Omega$ ranges : $\pm(0.06\% \text{ rdg} + 5 \text{ digits})$ 10M $\Omega$ range : $\pm(0.3\% \text{ rdg} + 5 \text{ digits})$ 100M $\Omega$ range : $\pm(3\% \text{ rdg} + 8 \text{ digits})$
4W Accuracy	100 $\Omega$ range : $\pm(0.05\% \text{ rdg} + 8 \text{ digits})$ 1k $\Omega$ ~ 1M $\Omega$ 4 ranges : $\pm(0.05\% \text{ rdg} + 5 \text{ digits})$ 10M $\Omega$ range : $\pm(0.3\% \text{ rdg} + 5 \text{ digits})$ 100M $\Omega$ range : $\pm(3\% \text{ rdg} + 8 \text{ digits})$



## GDM-8255A

### SPECIFICATIONS

#### DIODE TEST

Open Circuit Voltage 2.0V, Test Current 0.5mA : Accuracy $\pm$ (0.025%rdg + 5 digits)

#### FREQUENCY

10Hz~100kHz : Sensitivity 0.1V, Accuracy $\pm$ (0.05%rdg + 15 digits)

100Hz~600kHz : Sensitivity 1V, Accuracy $\pm$ (0.05%rdg + 3 digits)

600Hz~800kHz : Sensitivity 2.5V, Accuracy $\pm$ (0.05%rdg + 3 digits)

#### CONTINUITY BEEPER

1 ~ 1000 $\Omega$  Define by user : Accuracy $\pm$ (0.08%rdg + 5 digits)

#### TEMPERATURE

0  $^{\circ}$ C~ 300  $^{\circ}$ C : J, K, T Type

#### OTHER FUNCTIONS

Auto range / Manual, Math : MX + B/ % / 1/X Max, Min, dBm, dB, REL, Hold, Compare, Store, Recall

#### DISPLAY

VFD, Two Colors Display

#### INTERFACE

Digital I/O, USB, RS-232C

#### POWER SOURCE

AC 100V~240V  $\pm$  10%, 50/60Hz; Power Consumption : Max. 20VA

#### DIMENSIONS & WEIGHT

265(W) x 107(H) x 350(D) mm, Approx. 2.6 kg

Note : ( \* ) USE "REL" Mode

### ORDERING INFORMATION

**GDM-8255A** 5 ½ Digit Dual Display Digital Multimeter

#### ACCESSORIES :

Quick start user manual x 1, Power cord x 1, Test lead GTL-207A x 1, USB Cable GTL-247  
CD x 1 (including complete user manual, upgrade program and PC software DMM Viewer),  
Calibration key GDM-01 x 1

#### OPTION

Opt.01 GDM-SC1A Scanner Card ( V ch x 16, I ch x 2 )

#### OPTIONAL ACCESSORIES

**GTL-108A** 4W Type test lead

**GTL-232** RS-232C Cable, 9-pin female to 9-pin, null modem for computer, Approx 2000mm

**GTL-205A** Temperature probe adaptor with thermocouple (K type), Approx. 1000mm

**GRA-422** Rack Mount Kit

**GDM-TL1** Test Lead Set

**GSC-014** Soft Carrying Case for DMM Accessory

#### FREE DOWNLOAD

**PC Software** DMM-VIEWER

LabVIEW Driver

**Driver** USB Driver

### Rear Panel



### GDM-TL1 Test Lead Set



### GTL-108A 4W Type Test Lead

Approx. 1.1m



### GTL-232 RS-232C Cable

Approx. 2m



### GSC-014 Soft Carrying Case for DMM Accessory



### GTL-207A Test Lead

Approx. 0.8m





# 5 1/2 Digit Dual Measurement Multimeter



## GDM-8351



### FEATURES

- \* 5 1/2 Digit (120,000 Counts), VFD Display
- \* Dual Measurement/Dual Display
- \* The Basic Precision of DC Voltage : 0.012%
- \* Selectable Measurement Speeds, the Maximum : 320 Readings/s
- \* True RMS (AC, AC+DC) Measurements
- \* Auto/Manual Selection
- \* 12 Different Measurement Functions : AC/DC Voltage, AC/DC Current, AC+DC Voltage/Current, 2W/4W Resistance, Continuity Beeper, Diode Test, Capacitance, Frequency, Temperature
- \* Many Auxiliary Functions : Max./Min., REL/REL#, Compare, Hold, dB, dBm, Math(MX+B, %, 1/X)
- \* Digital I/O Provides Dual Mode(Standard Compare and User Definition Modes)
- \* Standard RS-232C and USB Device Interface (Support USB CDC and USB TMC Modes)

### GTL-207A Test Lead

Approx. 0.8m



GW Instek presents the brand new 5 1/2 Digit Dual Measurement Multimeter-GDM-8351 to replace GDM-8251A of the same category. GDM-8351 features VFD dual-display, maximum 120,000 counts, 0.012% basic DC voltage accuracy and USB/RS232C connectors to provide users with measurement precision, lucid data observation, and the convenient connection with the personal computer. In addition to the fundamental measurement items such as AC/DC voltage, AC/DC current, AC+DC voltage/current, 2W/4W resistance, frequency, temperature measurement, continuity beeper and diode test, GDM-8351 also equips with the capacitance measurement function. Furthermore, the GDM-8351 also provides many auxiliary functions, including maximum/minimum values, dB, dBm, compare, reading hold, algorithms (MX+B, 1/X, %) etc. to meet the measurement requirements for manufacturing process tests, educational experiments and testing facilities. For the external control, the pin of digital I/O interface not only provides the signal output frequently used by the compare function, but also allows users to define signal output for each pin. Under the self-definition mode, users can apply the I/O as a simple digital hardware. The external control requirement can be achieved by signals from each pin so as to help users reduce trouble of making hardware. With respect to remote control and retrieving data, GDM-8351, taking consideration of users' habitual practice and universal system interface, provides standard RS-232C and USB interface to edit control programs and read measurement results. It is worth noting that for utilizing the USB interface, users have options of selecting either USBCDC or USBTMC mode. While USBTMC is selected, users are able to control instrument with the USB interface exactly the same as controlling instrument with the GPIB interface; therefore, the relatively expensive GPIB connection cable is no longer required.

### SPECIFICATIONS (\*1)

Range(*2)	Resolution	Test Current or Etc.	Accuracy(*3) 1 Year(23°C±5°C)
<b>DC VOLTAGE</b>			
100.000mV	1μV	10MΩ or >10GΩ	0.012 + 8
1.00000V	10μV	10MΩ or >10GΩ	0.012 + 5
10.0000V	100μV	11.1MΩ	0.012 + 5
100.000V	1mV	10.1MΩ	0.012 + 5
1000.00V	10mV	10MΩ	0.012 + 5
<b>RESISTANCE</b>			
100.000Ω	1mΩ	1mA	0.05 + 8
1.00000kΩ	10mΩ	1mA	0.05 + 5
10.0000kΩ	100mΩ	100μA	0.05 + 5
100.000kΩ	1Ω	10μA	0.05 + 5
1.00000MΩ	10Ω	1μA	0.05 + 5
10.0000MΩ	100Ω	0.5μA	0.30 + 5
100.000MΩ	1kΩ	0.5μA//10MΩ	3.00 + 8
<b>DC CURRENT</b>			
10.0000mA	100nA	1.1Ω	0.05 + 15
100.000mA	1μA	1.1Ω	0.05 + 5
1.00000A	10μA	0.1Ω	0.20 + 5
10.0000A	100μA	0.01Ω	0.20 + 5
<b>CONTINUITY</b>			
1000.00Ω	10mΩ	1mA	0.05 + 5
<b>DIODE TEST</b>			
6.0000V	100μV	1mA@6V	0.05 + 15
<b>CAPACITANCE</b>			
10.00nF	0.01nF	10μA	2.0 + 10
100.0nF	0.1nF	10μA	2.0 + 4
1.000μF	0.001μF	100μA	2.0 + 4
10.00μF	0.01μF	1mA	2.0 + 4
100.0μF	0.1μF	1mA	2.0 + 4

### General

Display	VFD, Two Colors Display
Interface	RS-232C, USB device (USBCDC & USBTMC)
Power Source	AC 100 V / 120 V / 220 V / 240 V ±10%, 50-60Hz ; Power Consumption Max. 15VA
Dimensions & Weight	265(W) x 107(H) x 302(D) mm, approx. 2.9kg

#### Note:

1. All specifications are applicable to the main (1st) display only and warmed up for at least 30 minutes and operated in the slow rate.
2. 20% overrange on all ranges, except 750V/10A range
3. Accuracy: ± (% of Reading + Digits)



**GDM-8351**

**Rear Panel**



SPECIFICATIONS (*1)			
Range(*3)	Resolution	Frequency or Etc.	Accuracy 1 Year (23°C±5°C)
<b>True RMS AC (or AC+DC – AC Coupled) Voltage</b>			
100.000mV	1μV	20Hz ~ 45Hz 45Hz ~ 10kHz 10kHz ~ 30kHz 30kHz ~ 100kHz	1.0 + 100 0.3 + 100 1.5 + 300 5.0 + 300
1.00000V	10μV	20Hz ~ 45Hz 45Hz ~ 10kHz 10kHz ~ 30kHz 30kHz ~ 100kHz	1.0 + 100 0.2 + 100 1.0 + 100 3.0 + 200
10.0000V	100μV	20Hz ~ 45Hz 45Hz ~ 10kHz 10kHz ~ 30kHz 30kHz ~ 100kHz	1.0 + 100 0.2 + 100 1.0 + 100 3.0 + 200
100.000V	1mV	20Hz ~ 45Hz 45Hz ~ 10kHz 10kHz ~ 30kHz 30kHz ~ 100kHz	1.0 + 100 0.2 + 100 1.0 + 100 3.0 + 200
750.00V	10mV	20Hz ~ 45Hz 45Hz ~ 10kHz 10kHz ~ 30kHz 30kHz ~ 100kHz	1.0 + 100 0.2 + 100 1.0 + 100 3.0 + 200
<b>True RMS AC (or AC+DC – AC Coupled) Current</b>			
10.0000mA	100nA	20Hz ~ 45Hz 45Hz ~ 2kHz 2kHz ~ 10kHz	1.5 + 100 0.5 + 100 2.0 + 200
100.000mA	1μA	20Hz ~ 45Hz 45Hz ~ 2kHz 2kHz ~ 10kHz	1.5 + 100 0.5 + 100 2.0 + 200
1.00000A	10μA	20Hz ~ 45Hz 45Hz ~ 2kHz 2kHz ~ 10kHz	1.5 + 100 0.5 + 100 2.0 + 200
10.0000A	100μA	20Hz ~ 45Hz 45Hz ~ 2kHz 2kHz ~ 10kHz	1.5 + 100 1.0 + 100 -----
<b>FREQUENCY</b>			
(Voltage)10Hz ~ 1MHz	-----	-----	0.01 + 3
(Current)20Hz ~ 10kHz	-----	-----	0.01 + 3
<b>TEMPERATURE (Thermocouple)</b>			
-200 °C ~ 0 °C	0.01 °C	J / T / K	0.4 °C(typical)
0 °C ~ +300 °C	0.01 °C	J / T / K	0.2 °C(typical)

## ORDERING INFORMATION

**GDM-8351** 5 ½ Digit Dual Measurement Multimeter

### ACCESSORIES :

Safety Instruction Sheet x 1, Power cord x 1, Test lead GTL-207A x 1, CD x 1 (including complete user manual, driver and software)

### OPTIONAL ACCESSORIES

<b>GTL-108A</b>	4Wire Test Lead (Kelvin Clip), Approx. 1100mm
<b>GTL-205A</b>	Temperature probe adaptor with thermocouple (K-type), Approx. 1000mm
<b>GTL-232</b>	RS-232C Cable, 9-pin female to 9-pin, null modem for computer, Approx. 2000mm
<b>GTL-246</b>	USB Cable, A-B type, Approx. 1200mm
<b>GRA-422</b>	Rack Mount Kit
<b>GDM-TL1</b>	Test Lead Set
<b>GSC-014</b>	Soft Carrying Case for DMM Accessory

**GSC-014** Soft Carrying Case for DMM Accessory



**GDM-TL1** Test Lead Set



**GTL-205A** Temperature probe adaptor with thermocouple (K type)

Approx. 1m





# 50000 Counts Dual Measurement Multimeter

Patent No. ZL201320125978.1



## GDM-8341 GDM-8342



### FEATURES

- \* 50000 Counts Vacuum Fluorescent Display with Two Colors
- \* Dual Measurement
- \* Fast Measurement Rate Up to 40 readings/s for DCV
- \* 0.02% DCV Basic Accuracy
- \* Auto/Manual Ranging
- \* True RMS (AC, AC+DC)
- \* 11 Measurement Functions
- \* Max./Min., REL, MX+B, 1/X, Ref %, Compare, Hold, dB, dBm
- \* Standard USB Device for Communicating to PC
- \* Temperature Measurement (GDM-8342 only)
- \* USB Storage for Data Collection (GDM-8342 only)
- \* Optional GPIB (factory install for GDM-8342 only)

GW Instek rolls out the new generation Dual Measurement Multimeter -- the GDM-8300 Series, which has two models - GDM-8341 and GDM-8342. Its exceptional features include 50,000 counts, VFD dual-display, 0.02% basic DC voltage accuracy and a USB protocol connector to provide users with measurement precision, lucid data observation, and the convenience to connect with the personal computer.

The GDM-8300 Series not only supports the fundamental measurement items provided by general multimeters, but also equips with capacitance and temperature measurement functions. Furthermore, the GDM-8300 Series also provides many auxiliary functions to meet the measurement requirements for manufacturing process tests, educational experiments and testing facilities.

With respect to storing and retrieving data, the GDM-8300 Series has two methods to offer: first, the USB flash drive storage function--- operating alone without connecting with a computer; second, USB interface (virtual COM port) and optional GPIB interface (must be installed in factory) for automatic measurement system users to conveniently save and retrieve data.

### SPECIFICATIONS (\*1\*2)

FUNCTION			
Range(*3)	Resolution	Test Current or etc.	Accuracy 1 Year (23°C±5°C)
<b>DC VOLTAGE</b>			
500.00mV	10μV	10MΩ or >10GΩ	0.02 + 4
5.0000V	100μV	10MΩ or >10GΩ	0.02 + 4
50.000V	1mV	11.1MΩ	0.02 + 4
500.00V	10mV	10.1MΩ	0.02 + 4
1000.0V	100mV	10MΩ	0.02 + 4
<b>RESISTANCE</b>			
500.00Ω	10mΩ	0.83mA	0.10 + 5 (*4)
5.0000kΩ	100mΩ	0.83mA	0.10 + 3 (*4)
50.000kΩ	1Ω	83μA	0.10 + 3
500.00kΩ	10Ω	8.3μA	0.10 + 3
5.0000MΩ	100Ω	830nA	0.10 + 3
50.000MΩ	1kΩ	560nA//10 MΩ	0.30 + 3
<b>DC CURRENT</b>			
500.00μA	10nA	0.06Vmax.	0.05 + 5
5.0000mA	100nA	0.6Vmax.	0.05 + 4
50.000mA	1μA	0.14Vmax.	0.05 + 4
500.00mA	10μA	1.4Vmax.	0.10 + 4
5.0000A	100μA	0.5Vmax.	0.25 + 5
10.000A	1mA	0.8Vmax.	0.25 + 5
<b>CONTINUITY</b>			
5000.0Ω	100mΩ	0.83mA	0.10 + 5
<b>DIODE TEST</b>			
5.0000V	100μV	0.83mA	0.05 + 5
<b>CAPACITANCE</b>			
5.000nF : 0.5~1nF	0.001nF	8.3μA	2.00 + 20
5.000nF : 1~5nF	0.001nF	8.3μA	2.00 + 10
50.00nF : 5~10nF	0.01nF	8.3μA	2.00 + 30
50.00nF : 10~50nF	0.01nF	8.3μA	2.00 + 10
500.0nF	0.1nF	83μA	2.00 + 4
5.000μF	1nF	0.56mA	2.00 + 4
50.00μF	10nF	0.83mA	2.00 + 4

### SPECIFICATIONS (\*1\*2)

FUNCTION			
Range(*3)	Resolution	Test Current or etc.	Accuracy 1 Year (23°C±5°C)
<b>True RMS AC (or AC+DC - AC Couple) Voltage (*5*6)</b>			
500.00mV	10μV	30Hz ~ 50Hz 50Hz ~ 10kHz 10kHz ~ 30kHz 30kHz ~ 100kHz	1.00 + 40 0.50 + 40 2.00 + 60 3.00 + 120
5.0000V	100μV	30Hz ~ 50Hz 50Hz ~ 10kHz 10kHz ~ 30kHz 30kHz ~ 100kHz	1.00 + 20 0.35 + 15 1.00 + 20 3.00 + 50
50.000V	1mV	30Hz ~ 50Hz 50Hz ~ 10kHz 10kHz ~ 30kHz 30kHz ~ 100kHz	1.00 + 20 0.35 + 15 1.00 + 20 3.00 + 50
500.00V	10mV	30Hz ~ 50Hz 50Hz ~ 10kHz 10kHz ~ 30kHz 30kHz ~ 100kHz	0.50 + 15 0.50 + 15 1.00 + 20 3.00 + 50
750.0V	100mV	30Hz ~ 50Hz 50Hz ~ 10kHz 10kHz ~ 30kHz 30kHz ~ 100kHz	0.50 + 15 0.50 + 15 0.50 + 15 0.50 + 15

### GTL-207A Test Lead

Approx. 0.8m





## GDM-8300 Series

### SPECIFICATIONS (\*1\*2)

#### True RMS AC (or AC+DC – AC Couple) Current (\*5\*6)

500.00μA	10nA	30Hz ~ 50Hz 50Hz ~ 2kHz 2kHz ~ 5kHz 5kHz ~ 20kHz	1.50 + 50 0.50 + 40 1.50 + 50 3.00 + 75
5.0000mA	100nA	30Hz ~ 50Hz 50Hz ~ 2kHz 2kHz ~ 5kHz 5kHz ~ 20kHz	1.50 + 40 0.50 + 20 1.50 + 40 3.00 + 60
50.000mA	1μA	30Hz ~ 50Hz 50Hz ~ 2kHz 2kHz ~ 5kHz 5kHz ~ 20kHz	1.50 + 40 0.50 + 20 1.50 + 40 3.00 + 60
500.00mA	10μA	30Hz ~ 50Hz 50Hz ~ 2kHz 2kHz ~ 5kHz 5kHz ~ 20kHz	1.50 + 40 0.50 + 20 1.50 + 40 3.00 + 60
5.0000 A	100μA	30Hz ~ 50Hz 50Hz ~ 2kHz	2.00 + 40 0.50 + 30
10.000A	1mA	30Hz ~ 50Hz 50Hz ~ 2kHz	2.00 + 40 0.50 + 30

#### FREQUENCY / PERIOD

10Hz ~ 500Hz	—	—	0.01 + 5
500Hz ~ 500kHz	—	—	0.01 + 3
500kHz ~ 1MHz	—	—	0.01 + 5

#### TEMPERATURE (THERMOCOUPLE)

-200 °C ~ +300 °C	0.1 °C	J / T / K type	2 °C (*7)
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#### DISPLAY

VFD, Two Colors Display

#### INTERFACE

USB device, USB Host (GDM-8342 only)

#### POWER SOURCE

AC 100V/120V/220V/240V ±10%, 50 ~ 60Hz ; Power Consumption : Max. 15VA

#### DIMENSIONS & WEIGHT

265(W) x 107(H) x 302(D) mm, Approx. 2.9kg

Note: The specifications apply when the DMM is warmed up for at least 30 minutes and operates in slow rate.

### ORDERING INFORMATION

**GDM-8342** with GPIB 50000 counts Dual Measurement Multimeter with USB Host/Device and opt.01 GPIB

**GDM-8342** 50000 counts Dual Measurement Multimeter with USB Host/Device

**GDM-8341** 50000 counts Dual Measurement Multimeter with USB Device

#### ACCESSORIES :

Safety Instruction Sheet x 1, Power cord x 1, Test lead GTL-207A x 1, CD x 1  
(including complete user manual, USB driver and PC software)

#### OPTION \*

Opt.01 GPIB Interface \* Factory installed for GDM-8342 only.

#### OPTIONAL ACCESSORIES

<b>GTL-205A</b>	Temperature probe adaptor with thermocouple (K-type), Approx. 1000mm
<b>GTL-246</b>	USB Cable, USB 2.0, A-B Type, 1200mm
<b>GTL-248</b>	GPIB Cable, Double Shielded, 2000mm
<b>GRA-422</b>	Rack Mount Kit
<b>GDM-TL1</b>	Test Lead Set
<b>GSC-014</b>	Soft Carrying Case for DMM Accessory

### Rear Panel



1. All specifications are ensured only under main (1st) display.
2. Accuracy : ± (% of reading + digits)
3. 2% overrange on all ranges, except 10A is 20% overrange.
4. REL function is on.
5. The accuracy of AC+DC is equal to AC with 10 more digits added.
6. AC Characteristics are for sinewave input > 5% of range.
7. Specifications do not include probe accuracy.

### GSC-014 Soft Carrying Case for DMM Accessory



### GDM-TL1 Test Lead Set



### GTL-205A Temperature probe adaptor with thermocouple (K type)

Approx. 1m





# 50000 Counts Dual Display Digital Multimeter



## GDM-8245 (50000 Counts)



### FEATURES

- \* 50000 Counts Display
- \* Multi-Function ACV, DCV, ACA, DCA, R, C, Hz, Continuity Beeper, Diode Test, Max/Min, REL, Hold, dBm
- \* Dual Display Indicate ACV and Hz, DCV(ACV) and dBm
- \* Manual or Auto Ranging
- \* 0.03% DCV Accuracy
- \* ACV Measuring Frequency Up to 50kHz
- \* AC True RMS or AC + DC True RMS

### Rear Panel



### GTL-117 Test Lead

Approx. 1.1m



GDM-8245 is an economical bench-top DMM equipped with a rich set of features.

GDM-8245 has large 7 segment LED dual display features up to 50,000 counts and the ability to show two measurements at extensive list of measurement items - DC Voltage/Current, AC Voltage/Current with true RMS, Resistance, Capacitance, Frequency, Continuity (with beeper), Diode Test, and dBm. Additional measurement functions, such as Max/Min, Hold and Relative value. With great range, good accuracy and ability to accept up to 20A of current, GDM-8245 is the perfect general purpose DMM.

### SPECIFICATIONS

#### DC VOLTAGE

Range	500mV, 5V, 50V, 500V, 1000V 5 ranges
Accuracy	$\pm (0.03\% \text{ rdg} + 4 \text{ digits})$
Input Impedance	10M $\Omega$

#### AC VOLTAGE TRUE RMS (AC OR AC + DC TRUE RMS)

Range	500mV, 5V, 50V, 500V, 1000V 5 ranges
Accuracy	500mV ~ 50V 3 ranges : 20Hz ~ 45Hz : $\pm (1\% \text{ rdg} + 15 \text{ digits})$ 45Hz ~ 2kHz $\pm (0.5\% \text{ rdg} + 15 \text{ digits})$ 2kHz ~ 10kHz $\pm (1\% \text{ rdg} + 15 \text{ digits})$ 10kHz ~ 20kHz $\pm (2\% \text{ rdg} + 30 \text{ digits})$ 20kHz ~ 50kHz $\pm (5\% \text{ rdg} + 30 \text{ digits})$ 500V, 1000V range : 45Hz ~ 1kHz $\pm (0.5\% \text{ rdg} + 15 \text{ digits})$
Input Impedance	10M $\Omega$

#### DC CURRENT

Range	500 $\mu$ A, 5mA, 50mA, 500mA, 2A, 20A 6 ranges
Accuracy	500 $\mu$ A ~ 500mA 4 ranges: $\pm (0.2\% \text{ rdg} + 2 \text{ digits})$ ; 2A ~ 20A 2 ranges: $\pm (0.3\% \text{ rdg} + 2 \text{ digits})$

#### AC CURRENT TRUE RMS (AC OR AC + DC TRUE RMS)

Range	500 $\mu$ A, 5mA, 50mA, 500mA, 2A, 20A 6 ranges
Accuracy	500 $\mu$ A ~ 20A 6 ranges 20Hz ~ 45Hz : $\pm (1\% \text{ rdg} + 15 \text{ digits})$ ; 45Hz ~ 2kHz : $\pm (0.5\% \text{ rdg} + 15 \text{ digits})$ 500 $\mu$ A ~ 50mA 3 ranges 2kHz ~ 10kHz : $\pm (1\% \text{ rdg} + 15 \text{ digits})$ ; 10kHz ~ 20kHz : $\pm (2\% \text{ rdg} + 15 \text{ digits})$

#### RESISTANCE

Range	500 $\Omega$ , 5k $\Omega$ , 50k $\Omega$ , 500k $\Omega$ , 5M $\Omega$ , 20M $\Omega$ 6 ranges
Accuracy	500 $\Omega$ : $\pm (0.1\% \text{ rdg} + 4 \text{ digits})$ ; 5k $\Omega$ ~ 500k $\Omega$ 3 ranges : $\pm (0.1\% \text{ rdg} + 2 \text{ digits})$ 5M $\Omega$ : $\pm (0.2\% \text{ rdg} + 2 \text{ digits})$ ; 20M $\Omega$ : $\pm (0.3\% \text{ rdg} + 2 \text{ digits})$

#### DIODE TEST

	The one range can check the forward voltage of diode. Maximum forward voltage 1.5V open voltage 2.8V
--	--

#### CAPACITANCE

Range	5nF, 50nF, 500nF, 5 $\mu$ F, 50 $\mu$ F 5 ranges
Accuracy	$\pm (2\% \text{ rdg} + 4 \text{ digits})$

#### FREQUENCY

Input Level (Sine Wave)	mV range : 10Hz ~ 50kHz : $>120\text{mV}$ ; 50k ~ 150kHz : $>200\text{mV}$ 5V ~ 50V range : 10Hz ~ 200kHz $>1.2\text{V}$ ; 500V range : 20Hz ~ 1kHz $>12\text{V}$
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#### FUNCTIONS

	Auto Manual/Range, Max, Min, dBm, REL, Hold
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#### CONTINUITY BEEPER

	Built in buzzer sounds when conductance is less than 5 $\Omega$
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#### DISPLAY

	Dual Display 0.4" and 0.5", 7 segment LED display
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#### POWER SOURCE

	AC 100V/120V/230V $\pm 10\%$ , 50/60Hz ; Power Consumption : Max. 8VA
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#### DIMENSIONS & WEIGHT

	251(W) x 91(H) x 291(D) mm, Approx. 2.6kg
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### ORDERING INFORMATION

**GDM-8245** 50,000 Counts Dual Display Digital Multimeter

#### ACCESSORIES :

User manual x 1, Power cord x 1, Test lead GTL-117 x 1

#### OPTIONAL ACCESSORIES

GDM-TL1	Test Lead Set	GSC-014	Soft Carrying Case for DMM Accessory
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## HAND-HELD DIGITAL MULTIMETER

MODEL	GDM-461	GDM-452	GDM-397	GDM-360	GDM-398	GDM-357	GDM-350B
Max. Display	22000	19999	4000	6000	4000	1999	1999
Auto Ranging	✓		✓	✓	✓		
Analogue Bar	✓		✓	✓	✓		
True RMS	✓			✓			
Display Backlight			✓	✓	✓		
Fused 10A Range	✓	✓	✓	✓	✓		✓
Auto Power off		✓	✓	✓	✓	✓	
DC Voltage	1000V	600V	1000V	1000V	1000V	600V	250V
AC Voltage	750V	600V	750V	750V	750V	600V	250V
DC Current	10A	10A	10A	10A	10A	10A	10A
AC Current	10A	10A	10A	10A	10A	10A	
Resistance	220MΩ	20MΩ	40MΩ	60MΩ	40MΩ	20MΩ	20MΩ
Capacitance	220mF	20 μF	4000 μF	4000 μF	4000 μF	200 μF	
Frequency	220MHz	20kHz	10MHz	10MHz	10MHz		
Diode	✓	✓	✓	✓	✓	✓	✓
Continuity	✓	✓	✓	✓	✓	✓	✓
Temperature			✓			✓	✓
Duty Cycle (%)	✓		✓	✓	✓		
Transistor (hFE)					✓		✓
EF					✓		
REL	✓		✓	✓	✓		
Data Hold	✓	✓	✓	✓	✓	✓	✓
Peak Hold	✓						
MAX MIN			✓	✓	✓		
RS-232C	✓		✓	✓			
Page	E17-18	E17-18	E17-18	E17-18	E17-18	E17-18	E17-18

## DIGITAL CLAMP METER

MODEL	Description (Main Function)	Page
GCM-403	Digital Clamp Meter ACA, ACV, DCA, DCV, Ohm, Diode, Buzzer	E19
GCM-407	Digital Clamp Meter ACA, ACV, DCV, Ohm, Diode, Buzzer and True RMS	E20



# Hand-Held Digital Multimeter



GDM-452



GDM-357



GDM-350B



## GDM-452 FEATURES

- \* 4 ½ Digits Manual Ranging
- \* AC Current True RMS
- \* Capacitance, Frequency Measurement
- \* Data Hold
- \* Auto Power Off

## GDM-357 FEATURES

- \* 3 ½ Digits Manual Ranging
- \* Temperature Measurement
- \* Capacitance, Frequency Measurement
- \* Data Hold
- \* Auto Power Off

## GDM-350B FEATURES

- \* 3 ½ Digits Manual Ranging
- \* Temperature Measurement
- \* Continuity Beeper/Diode Test
- \* hFE Test
- \* Data Hold

The GDM-300/400 Series Hand Held DMM are a compact, high precision, battery operated multimeter series designed to meet of service engineers. The GDM-300/400 Series design is driven by mobile-oriented features: automatic power off to preserve battery life, a large backlight display for crisp viewing, a rotary selector and push buttons to ease operation, and temperature measurement for outdoor use. The basic functions match the depth of bench-top multimeters: fuse-protected current input, true RMS for accurate AC measurements, Auto ranging, Duty cycle, and Relative mode. These compact, reliable, and economical devices are ideal for any engineer.

## SPECIFICATIONS

### DC VOLTAGE

Range	220mV, 2.2V, 22V, 220V, 1000V(GDM-461); 200mV, 2V, 20V, 200V, 600V(GDM-452); 40mV, 400mV, 4V, 40V, 400V, 1000V(GDM-397); 60mV, 600mV, 6V, 60V, 600V, 1000V(GDM-360); 400mV, 4V, 40V, 400V, 1000V(GDM-398); 200mV, 2V, 20V, 200V, 600V(GDM-357); 200mV, 2000mV, 20V, 200V, 250V(GDM-350B)
Best Accuracy	±(0.1%rdg + 2 digits) for GDM-461; ±(0.05%rdg + 3 digits) for GDM-452; ±(0.5%rdg + 1 digit) for GDM-397/360/398/357; ±(0.5%rdg + 2 digits) for GDM-350B
Input Impedance	10MΩ (3000MΩ for mV range of GDM-461/397/360/398)

### AC VOLTAGE

Range	220mV, 2.2V, 22V, 220V, 750V(GDM-461); 200mV, 2V, 20V, 200V, 600V(GDM-452) 40mV, 400mV, 4V, 40V, 400V, 750V(GDM-397); 400mV, 4V, 40V, 400V, 750V(GDM-398) 60mV, 600mV, 6V, 60V, 600V, 750V(GDM-360); 2V, 20V, 200V, 600V(GDM-357) 200V, 250V(GDM-350B)
Best Accuracy	±(0.8%rdg + 10 digits) for GDM-461; ±(0.5%rdg + 10 digits) for GDM-452 ±(1.0%rdg + 3 digits) for GDM-397/360/398; ±(0.8%rdg + 3 digits) for GDM-357 ±(1.2%rdg + 3 digits) for GDM-350B
Input Impedance	10MΩ(3000MΩ for mV range of GDM-461/397/360/398; 4.5MΩ for GDM-350B)

### DC CURRENT

Range	220μA, 2200μA, 22mA, 220mA, 10A(GDM-461); 2mA, 20mA, 200mA, 10A(GDM-452) 400μA, 4000μA, 40mA, 400mA, 4A, 10A(GDM-397/398) 600μA, 6000μA, 60mA, 600mA, 6A, 10A(GDM-360) 2mA, 20mA, 200mA, 10A(GDM-357); 2000μA, 20mA, 200mA, 10A(GDM-350B)
Best Accuracy	±(0.5%rdg + 10 digits) for GDM-461; ±(0.5%rdg + 5 digits) for GDM-452 ±(1.0%rdg + 2 digits) for GDM-397/398/350B; ±(1.0%rdg + 3 digits) for GDM-360 ±(0.8%rdg + 1 digit) for GDM-357

### AC CURRENT

Range	220μA, 2200μA, 22mA, 220mA, 10A(GDM-461); 2mA, 20mA, 200mA, 10A(GDM-452) 400μA, 4000μA, 40mA, 400mA, 4A, 10A(GDM-397/398) 600μA, 6000μA, 60mA, 600mA, 6A, 10A(GDM-360); 20mA, 200mA, 10A(GDM-357)
Best Accuracy	±(0.8%rdg + 10 digits) for GDM-461/452; ±(1.0%+3) for GDM-357; ±(1.2%rdg + 5 digits) for GDM-397/360/398

### RESISTANCE

Range	220Ω ~ 220MΩ 7 ranges(GDM-461); 200Ω ~ 20MΩ 6 ranges(GDM-452/357/350B) 400Ω ~ 40MΩ 6 ranges(GDM-397/398); 600Ω ~ 60MΩ 6 ranges(GDM-360)
Best Accuracy	±(0.5%rdg + 10 digits) for GDM-461; ±(0.3%rdg + 1 digit) for GDM-452; ±(1.0%rdg + 2 digits) for GDM-397/360/398/357; ±(0.8%rdg + 5 digits) for GDM-350B

### CAPACITANCE

Range	22nF, 220nF, 2.2μF, 22μF, 220μF, 2.2mF, 22mF, 220mF(GDM-461) 20nF, 200nF, 2μF, 20μF(GDM-452); 2nF, 20nF, 200nF, 2μF, 200μF(GDM-357) 40nF, 400nF, 4μF, 40μF, 400μF, 4000μF (GDM-397/360/398)
Best Accuracy	±(3.0%rdg + 5 digits) for GDM-461; ±(4.0%rdg + 20 digits) for GDM-452 ±(3.0%rdg + 5 digits) for GDM-397/360/398; ±(4.0%+3) for GDM-357

### FREQUENCY

Range	10Hz ~ 220MHz(GDM-461); 1Hz ~ 20kHz(GDM-452) 10Hz ~ 10MHz(GDM-397/360/398)
Best Accuracy	±(0.01%rdg + 5 digits) for GDM-461; ±(1.5%rdg + 5 digits) for GDM-452 ±(0.1%rdg + 4 digits) for GDM-397/360/398

### DIODE TEST

Open Circuit Voltage	GDM-461/452/397/360/398/357 : 2.8V (Approx.) GDM-350B : 2.3V (Approx.)
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### CONTINUITY BEEPER

Buzzer sounds if conductance less than 10Ω for GDM-461/397/357/360/398/350B Buzzer sounds if conductance less than 30Ω for GDM-452
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### TEMPERATURE

Range	-40℃~1000℃
Best Accuracy	±(1.2%rdg + 4 digits) for GDM-397; ±(1.0%rdg + 7 digits) for GDM-357 ±(1.0%rdg + 3 digits) for GDM-350B

### SPECIAL FUNCTION

Auto Ranging (GDM-461/397/360); True RMS (GDM-461/360); RS-232C (GDM-461/397/360) hFE Test (GDM-398/350B); Display Backlight (GDM-397/360/398); EF Function (GDM-398) Analog Bar (GDM-461/397/360/398); Auto Power Off (GDM-452/397/357/360/398)
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### LCD DISPLAY

22000 counts (GDM-461), 4 1/2 digits (GDM-452), 6000 counts (GDM-360) 3 3/4 digits (GDM-397/398), 3 1/2 digits (GDM-357/350B)
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### POWER SOURCE

Single 9V Battery (6F22)
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**GDM-461****GDM-397****GDM-360****GDM-398****SPECIFICATIONS****DIMENSIONS & WEIGHT**

87(W) x 180(H) x 47(D) mm, Approx. 370g (GDM-461/397/360/398)

91(W) x 186(H) x 39(D) mm, Approx. 300g (GDM-452/357)

72(W) x 137(H) x 35(D) mm, Approx. 200g (GDM-350B)

**ORDERING INFORMATION****GDM-461** 22000 Counts Hand-Held DMM with True RMS Measurement and RS-232C Interface**GDM-452** 4 1/4 Digits hand-Held DMM**GDM-397** 3 3/4 Counts Hand-Held DMM with RS-232C Interface**GDM-360** 6000 counts Hand-Held DMM with True RMS Measurement and RS-232C Interface**GDM-398** 3 3/4 counts Hand-Held DMM**GDM-357** 3 1/2 Digits Hand-Held DMM**GDM-350B** 3 1/2 Digits Hand-Held DMM**ACCESSORIES:**

User manual x1, Test leads, Battery

**FREE DOWNLOAD****GDM-461 PC Software** PC Software; Remote software (RS-232C)**GDM-397 PC Software** PC Software; Remote software (RS-232C)**GDM-360 PC Software** PC Software; Remote software (RS-232C)**GDM-461 FEATURES**

- \* 22000 Counts Auto/Manual Ranging
- \* 46 segments Analogue Bar
- \* Data/Peak Hold and Relative Mode
- \* True RMS/RS232C

**GDM-397 FEATURES**

- \* 4000 Counts Auto/Manual Ranging
- \* 41 segments Analogue Bar
- \* MAX/MIN, Data Hold and Relative Mode
- \* RS232C
- \* Auto Power Off

**GDM-360 FEATURES**

- \* 6000 Counts Auto/Manual Ranging
- \* Continuity Beeper/Diode Test
- \* Capacitance, Frequency Measurement
- \* Data Hold and Relative Mode
- \* True RMS/RS232C

**GDM-398 FEATURES**

- \* 4000 Counts Auto/Manual Ranging
- \* Capacitance, Frequency Measurement
- \* hFE Test / EF Function
- \* Data Hold and Relative Mode
- \* Auto Power Off

**SELECTION GUIDE**

MODEL	GDM-461	GDM-452	GDM-397	GDM-360	GDM-398	GDM-357	GDM-350B
Max. Display	22000	19999	4000	6000	4000	1999	1999
Auto Ranging	✓		✓	✓	✓		
Analogue Bar	✓		✓	✓	✓		
True RMS	✓			✓			
Display Backlight			✓	✓	✓		
Fused 10A Range	✓	✓	✓	✓	✓		✓
Auto Power off		✓	✓	✓	✓	✓	
DC Voltage	1000V	600V	1000V	1000V	1000V	600V	250V
AC Voltage	750V	600V	750V	750V	750V	600V	250V
DC Current	10A	10A	10A	10A	10A	10A	10A
AC Current	10A	10A	10A	10A	10A	10A	
Resistance	220MΩ	20MΩ	40MΩ	60MΩ	40MΩ	20MΩ	20MΩ
Capacitance	220mF	20 μF	4000 μF	4000 μF	4000 μF	200 μF	
Frequency	220MHz	20kHz	10MHz	10MHz	10MHz		
Diode	✓	✓	✓	✓	✓	✓	✓
Continuity	✓	✓	✓	✓	✓	✓	✓
Temperature			✓			✓	✓
Duty Cycle (%)	✓		✓	✓	✓		
Transistor (hFE)					✓		✓
EF					✓		
REL	✓		✓	✓	✓		
Data Hold	✓	✓	✓	✓	✓	✓	✓
Peak Hold	✓						
MAX MIN			✓	✓	✓		
RS-232C	✓		✓	✓			



# Digital Clamp Meter



## GCM-403



### FEATURES

- \* AC/DC 600A/600V Max Input
- \* Auto Range Except Current Measurement
- \* Auto Power Off
- \* Capacitance Measurement
- \* Frequency Measurement
- \* Temperature Measurement
- \* Max. Clamp Size :  $\varnothing$  28mm

The GCM-403 is a digital clamp meter, which can measure AC/DC voltage, AC/DC current, resistance, diodes, continuity, capacitance, frequency and temperature. Tapered jaws, auto range, data hold, REL function and auto power off make it a superb tool for electricians.

### SPECIFICATIONS

ACV	
Range	4V, 40V, 400V, 600V
Resolution	0.001V, 0.01V, 0.1V, 1V
Accuracy	$\pm(1.0 + 5) \sim \pm(1.2 + 5)$
Input Impedance	$\geq 10M \Omega // 100pF$ at least
Frequency Response	40~400Hz
ACA	
Range	40A, 600A
Resolution	0.01A, 1A
Accuracy	$\pm(2.5 + 5) \sim \pm(2.5 + 8)$
Frequency Response	50~60Hz
DCV	
Range	400mV, 4V, 40V, 400V, 600V
Resolution	0.1mV, 0.001V, 0.01V, 0.1V, 1V
Accuracy	$\pm(0.8 + 1) \sim \pm(1.0 + 3)$
Input Impedance	$\geq 10M \Omega$
DCA	
Range	40A, 600A
Resolution	0.01A, 1A
Accuracy	$\pm(2.0 + 5)$
OHM	
Range	400 $\Omega$ , 4k $\Omega$ , 40k $\Omega$ , 400k $\Omega$ , 4M $\Omega$ , 40M $\Omega$
Resolution	0.1 $\Omega$ , 0.001k $\Omega$ , 0.01k $\Omega$ , 0.1k $\Omega$ , 0.001M $\Omega$ , 0.01M $\Omega$
Accuracy	$\pm(1.0 + 2) \sim \pm(1.5 + 2)$
DIODE	
Range	4V
Resolution	0.001V
Open-circuit Voltage	Approx. 1.48V
CONTINUITY	
Range	400 $\Omega$
Resolution	0.1 $\Omega$
Accuracy	The buzzer turns on for resistance lower than 10 $\Omega$
Open-circuit Voltage	Approx. 0.45V
CAPACITANCE	
Range	40nF, 400nF, 4 $\mu$ F, 40 $\mu$ F, 100 $\mu$ F
Resolution	0.01nF, 0.1nF, 0.001 $\mu$ F, 0.01 $\mu$ F, 0.1 $\mu$ F
Accuracy	$\pm(4.0 + 3) \sim \pm(5.0 + 10)$
FREQUENCY	
Range	10Hz, 100Hz, 1kHz, 10kHz, 100kHz, 1MHz, 10MHz
Resolution	0.001Hz, 0.01Hz, 0.1Hz, 1Hz, 10Hz, 100Hz, 1kHz
Accuracy	$\pm(4.0 + 3) \sim \pm(5.0 + 10)$
TEMPERATURE (°C only)	
Range	-40°C ~ 1000°C
Accuracy	$\pm(2.5 + 3) \sim \pm(8.0 + 5)$
OTHER FUNCTION	
Data Hold, REL	
LCD DISPLAY	
Liquid crystal display : Displays 4000 counts maximum.	
CLAMP OPENING DIAMETER	
$\varnothing$ 28mm Maximum	
POWER SOURCE	
9V battery (16F22)	
DIMENSIONS & WEIGHT	
210 (L) x 76 (W) x 30 (H) mm; Approx. 260g	

### ORDERING INFORMATION

**GCM-403** Digital Clamp Meter

ACCESSORIES :

User manual x 1, Test leads, Temperature probe, Carrying case

# Digital Clamp Meter



## GCM-407



### FEATURES

- \* True RMS Measurement
- \* AC 600A/750V, DC 1000V Max Input
- \* Auto Range Except Current Measurement
- \* Auto Power Off
- \* Capacitance Measurement
- \* Non-Contact Voltage sensing function
- \* Max. Clamp Size :  $\varnothing 30\text{mm}$

The GCM-407 is a digital clamp meter with true RMS measurement. Tapered jaws, a wide range (AC 600A/750V, DC 1000V max input), capacitance measurement as well as non-contact voltage sensing function and the ability to keep MAX/MIN or hold data and automatically power down make the GCM-407 suitable for almost any cable measurement task.

SPECIFICATIONS	
<b>ACV</b>	
Range	6V, 60V, 600V, 750V
Resolution	0.001V, 0.01V, 0.1V, 1V
Accuracy	$\pm(1.2 + 5) \sim \pm(1.5 + 5)$
Input Impedance	$\geq 10\text{M}\Omega$
Frequency Response	40~400Hz
<b>ACA</b>	
Range	6A, 60A, 600A
Resolution	0.001A, 0.01A, 0.1A
Accuracy	$\pm(2.5 + 5) \sim \pm(2.5 + 30)$
Frequency Response	50~60Hz
<b>DCV</b>	
Range	600mV, 6V, 60V, 600V, 1000V
Resolution	0.1mV, 0.001V, 0.01V, 0.1V, 1V
Accuracy	$\pm(0.8 + 1) \sim \pm(1.0 + 8)$
Input Impedance	$\geq 10\text{M}\Omega$
<b>OHM</b>	
Range	600 $\Omega$ , 6k $\Omega$ , 60k $\Omega$ , 600k $\Omega$ , 6M $\Omega$ , 60M $\Omega$
Resolution	0.1 $\Omega$ , 0.001k $\Omega$ , 0.01k $\Omega$ , 0.1k $\Omega$ , 0.001M $\Omega$ , 0.01M $\Omega$
Accuracy	$\pm(1.0 + 2) \sim \pm(1.5 + 5)$
<b>DIODE</b>	
Range	6V
Resolution	0.001V
Open-circuit Voltage	Approx. 3.3V
<b>CONTINUITY</b>	
Range	600 $\Omega$
Resolution	0.1 $\Omega$
Open-circuit Voltage	The buzzer turns on for resistance lower than 30 $\Omega$ Approx. 1.2V
<b>CAPACITANCE</b>	
Range	99nF, 999nF, 9 $\mu\text{F}$ , 99 $\mu\text{F}$ , 999 $\mu\text{F}$ , 9mF, 59mF
Resolution	0.01nF, 0.1nF, 0.001 $\mu\text{F}$ , 0.01 $\mu\text{F}$ , 0.1 $\mu\text{F}$ , 0.001mF, 0.01mF
Accuracy	$\pm(4.0 + 5) \sim \pm 10$
<b>NCV (Non-Contact Voltage)</b>	
Range	< 10mm
Accuracy	AC Voltage only
<b>OTHER FUNCTION</b>	
Data Hold, MAX/MIN, REL, Backlight, Flashlight	
<b>LCD DISPLAY</b>	
Liquid crystal display : Displays 6000 counts maximum.	
<b>CLAMP OPENING DIAMETER</b>	
$\varnothing 30\text{mm}$ Maximum	
<b>POWER SOURCE</b>	
3 AAA 1.5V zinc manganese batteries	
<b>DIMENSIONS &amp; WEIGHT</b>	
228 (L) x 77 (W) x 41 (H) mm; Approx. 265g (inclusive of the battery)	

### ORDERING INFORMATION

**GCM-407** Digital Clamp Meter with True RMS Measurement

ACCESSORIES :  
User manual x 1, Test leads, Carrying case





## LCR METERS

GW Instek offers high-precision bench-top LCR meters: the LCR-8200/LCR-8000G/LCR-6000 series which are designed for a variety of applications such as production testing, QC inspection, and design verification, etc. Reliable operability, accurate results, user-friendly interfaces, and automatic testing functions make the LCR-8200/LCR-8000G/LCR-6000 series one of the best choices for passive component tests.

Other than the bench-top LCR meters, GW instek also provides the LCR-900 series hand-held LCR meters to make quick and basic LCR measurements at an affordable price.

### PRODUCTS

- Benchtop LCR Meter
- Handheld LCR Meter

## LCR METERS OVERVIEW

### Test Frequency

Based on testing requirement, a test frequency can be set either as specificity frequency like component's datasheet specification or as the working frequency like component's real condition in circuit. Electrical components need to be tested at the frequency in which the final product/application is used.

### Test Voltage

Most LCR meters can select the signal level applied to DUTs. Generally, the signal level is measured under an open circuit condition.

### Accuracy and Speed

The testing speed of a LCR meter is actually a trade-off between testing accuracy. The more time it takes, the more accurate the measurement becomes. Conversely, the faster the measurement speed, the less accurate it becomes.

### Measurement Parameters

Primary parameters L, C, R as well as Z, Y and DCR; Secondary parameters Q, D,  $\theta$  ( $\theta_r$  or  $\theta_d$ ) as well as X and G.

### Range

In order to measure a wide range of impedance value, a measurement instrument must have several ranges. Selecting a range is usually done automatically according to the impedance of DUTs.

### Averaging

Averaging is related to a LCR meter integration time. If the integration time is longer than cycles of the test signal, the measurement time will become longer, but the accuracy will be enhanced.

### Bias Voltage and Bias Current

A LCR meter might include bias voltage or bias current function applicable to DUT which providing an extra source level to DUT when a LCR meter is taking measurement. Bias voltage uses with capacitance measurement commonly and bias current uses with inductance measurement.

## BENCHTOP LCR METER

MODEL	Description (Main Function)	Page
LCR-8230	30MHz High Frequency LCR Meter	E23-26
LCR-8220	20MHz High Frequency LCR Meter	E23-26
LCR-8210	10MHz High Frequency LCR Meter	E23-26
LCR-8205	5MHz High Frequency LCR Meter	E23-26
LCR-8110G	10MHz High Precision LCR Meter	E27-28
LCR-8105G	5MHz High Precision LCR Meter	E27-28
LCR-8101G	1MHz High Precision LCR Meter	E27-28
LCR-6300	10Hz ~ 300kHz Precision LCR Meter	E29-30
LCR-6200	10Hz ~ 200kHz Precision LCR Meter	E29-30
LCR-6100	10Hz ~ 100kHz Precision LCR Meter	E29-30
LCR-6020	10Hz ~ 20kHz Precision LCR Meter	E29-30
LCR-6002	10Hz ~ 2kHz Precision LCR Meter	E29-30

## HANDHELD LCR METER

MODEL	Description (Main Function)	Page
LCR-916	100Hz/120Hz/1k/10k/100kHz Hand Held LCR Meter	E31-32
LCR-915	100Hz/120Hz/1k/10kHz Hand Held LCR Meter	E31-32
LCR-914	100Hz/120Hz/1kHz Hand Held LCR Meter	E31-32



# High Frequency LCR Meter



## LCR-8200 Series

NEW



### FEATURES

- \* Wide Test Frequency 10Hz~30/20/10/5MHz
- \* 7" LCD color Display
- \* 0.08% Basic Accuracy
- \* Displaying Four Measurement Results Simultaneously From 17 Selectable Measurement Parameters Freely
- \* 15 Steps List Measurement
- \* Two Curves Sweep Mode
- \* Internal DC Bias Voltage  $\pm 12V$
- \* USB Storage Available
- \* ALC Function Available
- \* Standard Interfaces : RS-232C, USB Host/Device, LAN, GPIB and Handler
- \* Universal Power Input

GW Instek launches a new series of high-frequency LCR tester – LCR-8200, which has four models and the maximum test frequency is up to 30MHz. The entire series adopts 7-inch color display and features a high measurement accuracy (0.08%). The measurement results can be presented numerically or graphically according to the selected measurement mode, allowing users to optimally interpret the characteristics of the DUT. At the same time, a full range of standard interfaces such as USB device / RS-232C / Handler and GPIB allow users to control the instrument by the most familiar interface without worrying about additional hardware investment costs. Furthermore, the series also provides USB storage function when operating in the graphics mode. The measured characteristic curves and values of the DUT are saved for subsequent analysis. The wide variety of features of the LCR-8200 can help users easily respond to the test requirements of passive components in R&D, engineering, and production.

Under the numerical measurement mode, it is divided into MEAS measurement and LIST measurement. Under the MEAS measurement mode, users can select up to 4 (at least 1) desired measurement items from the 17 measurement parameters. Each selected measurement item can be set to compare (PASS/FAIL judgement) or to the BIN function to conduct judgement and sorting, so that users can easily learn the results of the measurement by color and sound. Under the LIST mode, users is allowed to set 15 test points and each test point can set parameters independently, including frequency/voltage/bias, and it even can set independent comparison function and numerical display mode (value, difference value, difference percentage). On top of that, under the LIST mode, the automatic trigger mode is also provided. After each LIST measurement is completed, the instrument will be in the mechanism of standby trigger. Users only need to place the next DUT, and the LIST test can be automatically performed that saves time of repeatedly pressing the trigger button.

Under the graphical measurement mode, the SWEEP measurement provides the ability to sweep two parameters simultaneously (TRACE A / TRACE B). The relative parameters of the sweep, including the sweep source (frequency, voltage or current), horizontal / vertical axis scale (LINEAR / LOG), speed...etc., even adding a bias, can be set and tested according to the actual needs of users. After the sweep is completed, the scale can be automatically adjusted according to the selected TRACE, so that the whole observation is clearer and easier to read. Other than that, the swept graphics (bmp) and values (csv) can be saved to the flash drive for subsequent analysis and applications.

Whether it is for measurement data collection during the test process or the collocation for the system integration, the LCR-8200 series offers the most comprehensive communications interfaces, including USB device, RS-232C, LAN for PC connection and even GPIB, which are all standard communications interfaces. Users can choose according to the habits of use and the convenience of the system architecture without any additional cost. In addition, the LCR-8200 series also provides a Handler interface for system integration of PLCs or sorters.

### SPECIFICATIONS

	LCR-8230	LCR-8220	LCR-8210	LCR-8205
TEST FREQUENCY				
	DC,10Hz~30MHz; 6 Digits,±0.0007%	DC,10Hz~20MHz; 6 Digits,±0.0007%	DC,10Hz~10MHz; 6 Digits,±0.0007%	DC,10Hz~5 MHz; 6 Digits,±0.0007%
OUTPUT IMPEDANCE				
	25Ω / 100Ω SELECTABLE			
BASIC ACCURACY				
	±0.08%			
TEST SPEED				
	MAX: 25ms(>10kHz), FAST: 50ms(>20Hz), MEDIUM: 100ms SLOW: 300ms, SLOW2: 600ms			
TEST SIGNAL LEVEL				
AC Voltage	10mV ~ 2Vrms (FREQ. ≤1MHz), 10mV ~ 1Vrms (FREQ. > 1MHz or FREQ. ≤1MHz and RO=25Ω)			
AC Current	100 μA ~ 20mArms (RO=100Ω), 400 μA ~ 40mArms (RO=25Ω)			
DCR Voltage	1Vdc (40mA max.)			
MEASUREMENT PARAMETERS				
	Maximum four parameters can be measured and displayed at the same time Impedance (Z), Inductance (Ls/Lp), Capacitance (Cs/Cp), AC Resistance (Rs/Rp), Quality Factor (Q), Dissipation Factor (D), Admittance (Y), Conductance (G), Reactance (X), Phase Angle (θ d/ θ r), Susceptance (B), DC Resistance (Rdc)			
LIST MEASUREMENT				
Listed Steps	15			
Listed Parameters	Freq/Vac/lac/DC Bias/Comp/BIN			
Trigger	AUTO, REPEAT, SINGLE			
SWEEP MEASUREMENT				
Swept Graphical	Two of measurement parameters			
Swept Parameters	Freq/Vac/lac, Keep Trace			
OTHER FUNCTIONS				
Auto Level Control (ALC)	Standard			
DC Bias	0 ~ ±12V			
Handler	PASS, FAIL and OK, NG or BIN 1-9			

### DC Bias Voltage Box (Optional)

Description :  
External DC Bias Voltage Box  
Frequency : DC to 2MHz  
Max. Voltage :  $\pm 200V$





## LCR-8200 Series

SPECIFICATIONS				
	LCR-8230	LCR-8220	LCR-8210	LCR-8205
OTHER FEATURES				
Correction	Open/Short/HF Load/Load			
V/I Monitor	Vac, Iac, Vdc, Idc			
Comparator	Value, Δ, Δ%			
Buzzer	OFF, Pass, Fail			
Average	1 to 64			
DISPLAY				
7" LCD color display (800 x 480)				
INTERFACE				
USB/GPIB/LAN/RS-232/Handler/USB Host/TRIGGER Input				
POWER SOURCE				
AC 100V~240V, 50/60Hz; Consumption: 65VA (max.)				
DIMENSIONS & WEIGHT				
346 (W) x 145 (H) x 335 (D) mm; Approx. 3.3kg				

ORDERING INFORMATION	
LCR-8230	DC, 10Hz~30MHz High Frequency LCR Meter
LCR-8220	DC, 10Hz~20MHz High Frequency LCR Meter
LCR-8210	DC, 10Hz~10MHz High Frequency LCR Meter
LCR-8205	DC, 10Hz~5MHz High Frequency LCR Meter
ACCESSORIES :	
User Manual (CD) x 1, AC Power Cord x 1, Test Fixture LCR-06B x 1, Safety Sheet x 1	
OPTION	
DC Bias Voltage Box	External DC Bias Voltage Box
FREE DOWNLOAD	
PC Software	LCR Meter

### OPTIONAL ACCESSORIES SELECTION GUIDE

ACCESSORY MODEL	BRIEF DESCRIPTION	LCR-8230	LCR-8220	LCR-8210	LCR-8205
LCR-05	Test Fixture for axial & radial lead components	Δ	Δ	Δ	Δ
LCR-05A	Test Fixture for axial & radial lead components (up to 30MHz)	✓	✓	✓	✓
LCR-06B	Test Lead with Kelvin clip (4 wire type)	Δ	Δ	Δ	Δ
LCR-07	Test Lead with Alligator clip (2 wire type)	Δ	Δ	Δ	Δ
LCR-08	Test Fixture (Tweezers) for SMD / Chip components	Δ	Δ	Δ	Δ
LCR-10A	Test Fixture for bottom electrode components (up to 30MHz)	✓	✓	✓	✓
LCR-12	Test Lead with Kelvin clip (4 wire type)	Δ	Δ	✓	✓
LCR-15	Test Fixture for SMD / Chip components	Δ	Δ	✓	✓
LCR-15A	Test Fixture for SMD / Chip components (up to 30MHz)	✓	✓	✓	✓
GTL-234	RS-232C cable	✓	✓	✓	✓
GTL-248	GPIB Cable	✓	✓	✓	✓
GTL-246	USB Cable	✓	✓	✓	✓

Note : "Δ" means the accessories work with a frequency limitation (under 1MHz)

### Rear Panel



### LCR-05



Description:  
Test fixture for measuring axial and radial lead components  
Frequency: DC to 1MHz  
Max. Voltage: +/- 35V

### LCR-05A



Description:  
Test Fixture for axial & radial leaded components  
Frequency: DC to 30MHz  
Max. Voltage: +/- 45V (Including SHORT Bar and STD LOAD)

### LCR-06B



Description:  
Kelvin clip test lead  
Frequency: DC to 1MHz  
Max. Voltage: +/- 45V

### LCR-07



Description:  
Test leads for conventional component measurement.  
Frequency: DC to 1MHz  
Max. Voltage: +/- 35V

### LCR-08



Description:  
SMD / chip tweezers  
Frequency: DC to 1MHz  
Max. Voltage: +/- 35V

### LCR-10A



Description:  
Test Fixture for bottom electrode components  
Frequency: DC to 30MHz  
Max. Voltage: +/- 45V  
Application size: 0402 to 2512 (Including SHORT Bar and STD LOAD)

### LCR-12



Description :  
Kelvin clip test lead  
Frequency : DC to 10MHz  
Max. Voltage: +/- 35V  
Approx. 0.6m

### LCR-15



Description:  
SMD/chip test fixture  
Frequency: DC to 10MHz  
Max. Voltage: +/- 45V  
Application size: 0201 to 1812

### LCR-15A



Description:  
Test Fixture for SMD/Chip components  
Frequency: DC ~ 30MHz  
Max. Voltage: +/- 45V  
Application size: 0201 to 1812 (Including STD LOAD)



# High Frequency LCR Meter

## A. THE PRESENTATION OF FLEXIBLE MEASUREMENT COMBINATIONS



LCR-8200 allows users to select and arrange measurement parameters. Users can select at least one parameter to maximum four parameters from the 17 measurement parameters according

to the measurement requirements and the presentation order can also be arranged in a desired manner. The set parameters can be stored in internal/external memory groups for subsequent recalls.

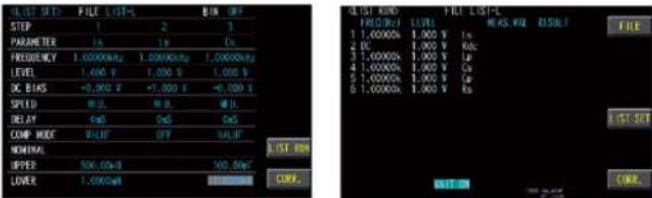
## B. INDEPENDENT SETTING JUDGMENT



Each selected test parameter can independently set judgement and comparison such as value, difference value or difference percentage. Additionally, the display method can also be based on value, difference value or difference percentage to self-define the presentation of test results, and the observation is more in line

with the actual needs. In addition to using the warning sound, all the parameters set for comparison judgment will be displayed in different colors. "Red" means that the limit value is exceeded, and "Green" means that it is within the limit value, so that the judgment can be conducted smoothly under noisy environment.

## C. LIST MEASUREMENT



The 15-point LIST measurement mode provides measurement values at a specific frequency or voltage of the DUT, and each set point can set independent comparison and judgement. When the trigger mode is set to "AUTO", the display "WAIT ON" will appear

on the measurement screen and LCR-8200 will detect the contact status of the fixture. When the DUT is connected, the test will start automatically.

## D. HYPERBOLIC SWEEP



Up to 2 characteristic parameters of the DUT can be swept at the same time. Sweep type (frequency/Vac/Iac), axis form (LOG/LINEAR), sweep speed, even adding bias (internal), etc can be set according to the actual demands. After the sweep is completed, automatic adjustment can be used to obtain the best

observation display. The movable cursor can be used to obtain the measurement result of the specific position. Swept displays and point values can be saved to the flash drive via the USB host on the panel for subsequent analysis.

## E. BIN FUNCTION



BIN settings for one specific parameter of the selected measurement parameters provide up to 9 BIN positions. Set the judgment basis for individual classifications according to the desired BIN methods (EQUAL/SEQUENTIAL/TOLERANCE/

RANDOM) and limit value mode (VALUE/delta/delta%). The result of this sorting can be obtained through the Handler interface. If directly connected to an external device such as a sorter, an immediate sorting can be performed.

## F. COMPLETE STANDARD INTERFACES



Provides a variety of standard PC connection interfaces such as RS-232C, USB device, LAN, and GPIB industrial control interface to remotely control settings or read measurement results and other related information so as to substantially increase work

efficiency without having to pay for additional interface procurement costs. In addition, LCR-8200 also provides Handler interface for PLC external control or for the collocation of measurement integration of sorters.



# 10/5/1MHz Precision LCR Meter



## LCR-8000G Series



### FEATURES

- \* Wide Test Frequency 20Hz ~ 10/5/1MHz
- \* 0.1% Basic Accuracy & 6 Digits Measurement Resolution
- \* Large LCD Display with Intuitive User Interface
- \* Full Measuring Functions with DUT V/I Monitor
- \* PASS/FAIL Function ( abs , % ,  $\Delta$  ) with Judgment Alarm
- \* Average 1 ~ 256 Times
- \* DC Resistance Measurement
- \* Multi Step Mode
- \* Graph Mode
- \* Standard RS-232C/GPIB Interface
- \* Optional DC Bias box (frequency up to 2MHz max.)

### DC Bias Voltage Box (Optional)

Description :  
External DC Bias Voltage Box  
Frequency : DC to 2MHz  
Max. Voltage : +/- 200V



The LCR-8000G Series LCR meter, with test frequency up to 10MHz, provides accuracy, versatility and high resolution for a wide range of component measurements, even including DC resistance measurement and Voltage/Current monitoring. The Multi-Step function allows on-screen programming of customized measurement sequence with Pass/Fail indication. Each program includes 30 test steps and each test step can be set with selected parameters and test limits. Under Multi-Step operation, a tedious work routine can be done step by step automatically just at a press of a button. With Graph Mode, LCR-8110G, LCR-8105G and LCR-8101G display the component impedance response either over a wide range of test frequency sweep or over a wide range of test voltage sweep in a graph chart. This gives an analysis result of either impedance vs. frequency or impedance vs. applied voltage all at a glance. GPIB and RS-232C interfaces are available as standard for instrument control and test result display on the PC. The rich features of LCR-8000G Series easily make your measurement tasks done at a very competitive price.

### SPECIFICATIONS

MODEL	LCR-8110G	LCR-8105G	LCR-8101G
TEST FREQUENCY			
	20Hz ~ 10MHz, 5 Digits, ±0.005%	20Hz ~ 5MHz, 5 Digits, ±0.005%	20Hz ~ 1MHz, 5 Digits, ±0.005%
OUTPUT IMPEDANCE			
	100Ω		
BASIC ACCURACY			
	±0.1% (R, Z, X, G, Y, B, L, C)		
TEST SPEED			
	AC (>2kHz) - MAX: 75mS, FAST: 150mS, MEDIUM: 450mS, SLOW: 600mS DC - MAX: 30mS, FAST: 60mS, MEDIUM: 120mS, SLOW: 900mS		
TEST SIGNAL LEVELS			
Test Frequency	Test Signal Level (rms)	Step	Accuracy
≤ 3MHz	10mV ~ 2V	1mV/10mV	2%± 5mV
> 3MHz	10mV ~ 1V	1mV/10mV	2%± 5mV
SHORT CIRCUIT CURRENT			
Max. 20mA			
MEASUREMENT RANGES			
Mode	Measure Range		
R, Z, X	0.1mΩ ~ 100MΩ		
Rdc	0.01mΩ ~ 100MΩ		
G, Y, B	10nS ~ 1000S		
L	0.0001μH ~ 100kH		
C	0.01pF ~ 1F		
D	0.00001 ~ 9.9999		
Q	0.1 ~ 9999.9		
θ	-180° ~ +180°		
MEASUREMENT PARAMETERS			
Impedance (Z), Phase Angle (θ), Inductance (L), Capacitance (C), AC Resistance (Rac), Quality Factor (Q), Dissipation Factor (D), Admittance (Y), Conductance (G), Reactance (X), Susceptance (B), DC Resistance (Rdc)			
SERIES OR PARALLEL EQUIVALENT CIRCUIT			
C + R, C + D, C + Q, L + R, L + Q, L + D			
SERIES EQUIVALENT CIRCUIT ONLY			
X + R, X + D, X + Q			
PARALLEL EQUIVALENT CIRCUIT ONLY			
C + G, B + G, B + D, B + Q, B + R, L + G			
POLAR FORM			
Z + Phase Angle, Y + Phase Angle			
AVERAGE			
1 ~ 256 times			
LCD DISPLAY			
320 x 240 DOT-MATRIX			
INTERFACE			
RS-232C, GPIB			
POWER SOURCE			
AC 115V (+10%/-25%), AC 230V (+15% / -14%)(Selectable), 50/60Hz; 12W (max.)			
DIMENSIONS & WEIGHT			
330(W) x 170(H) x 340(D)mm, Approx. 5kg			

\* Basic accuracy varies with the temperature, frequency, AC signal level and impedance of the device under test.



## LCR-8110G

### ORDERING INFORMATION

**LCR-8110G** 10 MHz Precision LCR Meter

**LCR-8105G** 5 MHz Precision LCR Meter

**LCR-8101G** 1 MHz Precision LCR Meter

#### ACCESSORIES:

User manual x 1, Power cord x 1, Test lead LCR-12 x 1

#### OPTION

Opt. 02 DC Bias Voltage Box External DC Bias Voltage Box

#### FREE DOWNLOAD

PC Software LCR\_Exc.

### OPTIONAL ACCESSORIES SELECTION GUIDE

ACCESSORY MODEL	BRIEF DESCRIPTION	LCR-8110G	LCR-8105G	LCR-8101G
<b>LCR-05</b>	Test Fixture for axial & radial lead components	△	△	✓
<b>LCR-06B</b>	Test Lead with Kelvin clip (4 wire type)	△	△	✓
<b>LCR-07</b>	Test Lead with Alligator clip (2 wire type)	△	△	✓
<b>LCR-08</b>	Test Fixture (Tweezers) for SMD / Chip components	△	△	✓
<b>LCR-12</b>	Test Lead with Kelvin clip (4 wire type)	✓	✓	✓
<b>LCR-15</b>	Test Fixture for SMD / Chip components	✓	✓	✓
<b>GTL-234</b>	RS-232C cable	✓	✓	✓
<b>GTL-248</b>	GPIB Cable	✓	✓	✓
<b>GRA-404</b>	Rack Adapter Panel (19", 4U)	✓	✓	✓

Note: "△" means the accessories work with a frequency limitation (under 1MHz)

### Rear Panel



### LCR-05



Description:  
Test fixture for measuring axial and radial lead components  
Frequency: DC to 1 MHz  
Max. Voltage: +/- 35V

### LCR-06B



Description:  
Kelvin clip test lead  
Frequency: DC to 1 MHz  
Max. Voltage: +/- 45V

### LCR-07



Description:  
Test leads for conventional component measurement.  
Frequency: DC to 1 MHz  
Max. Voltage: +/- 35V

### LCR-08



Description:  
SMD / chip tweezers  
Frequency: DC to 1 MHz  
Max. Voltage: +/- 35V

### LCR-12



Description:  
Kelvin clip test lead  
Frequency: DC to 10 MHz  
Max. Voltage: +/- 35V  
Approx. 0.6m

### LCR-15



Description:  
SMD/chip test fixture  
Frequency: DC to 10 MHz  
Max. Voltage: +/- 45V  
Application size:  
0201 to 1812

### GTL-234 RS-232C Cable





# Precision LCR Meter



## LCR-6000 Series



### FEATURES

- \* 3.5" Color LCD
- \* 5 Models (10Hz ~ 2kHz/20kHz/100kHz/200kHz/300kHz)
- \* Consecutive Test Frequency
- \* Basic Accuracy : 0.05%
- \* Measuring Speed up to 25ms (Max.)
- \* Full Frequency Range or Spot OPEN/SHORT
- \* 16 Major/Secondary Parameter Measurement Combinations and Two Additional Monitoring Parameters (Maximum Four Different Parameters Can be Show Simultaneously)
- \* DCR Measurement and Internal D.C. Bias Voltage ( $\pm 2.5V$ )
- \* PASS/FAIL Judgment
- \* Auto Level Control (ALC) Function
- \* BIN Function Provides 9BIN and 1AUX, Totally 10BIN
- \* 10 Steps Listed Tests to Select Different Frequency, Voltage and Current Criteria
- \* Standard Interface : RS-232C, Handler and USB Host/Device
- \* Compact Size, Ideal for Automatic Integration (2U, 1/2 Rack)

GW Instek introduces the brand new high precision LCR meter - LCR-6000 series, which, with five models, has a test frequency range extending from 2kHz/20kHz/100kHz/200kHz/300kHz (maximum) and with 0.05% basic accuracy. The compact size design, 2U height and 1/2 rack, is one of the practical features of the series which is the optimum space saver suitable for either bench top or system rack. The compacted LCR-6000 series with abundant features is absolutely the excellent tool for R&D, production test, IQC, etc. on implementing each test stages for passive components.

The LCR-6000 series provides rich functionalities with the compact size. First of all, the entire series adopts 3.5-inch color LCD and features opulent display parameters. In addition to simultaneously displaying setting criteria and measurement results, the series increases two additional monitoring parameters. In other words, there are four parameters, primary/secondary and two monitoring, simultaneously shown on the screen that tremendously enhances the measurement efficiency. The enlarge display mode not only emphasizes the measurement results, but also provides PASS/FAIL judgment to facilitate a rapid and convenient test result.

Convenience is one of the unique features. The LCR-6000 series comes equipped with two zero methods, which are full frequency range and spot. Users, without turning off the power and changing test fixture, can freely change frequency within the provided frequency range to conduct measurements. By so doing, tremendous time can be saved from repeatedly executing zero operation. Additionally, frequency range of the series is consecutive that allows users to input precise frequency value to conduct the most genuine test on components.

The LCR-6000 series also features diverse ancillary measurements to meet the measurement requirements of different materials. For instance, the series provides the automatic level control (ALC) function to satisfy the test voltage requirement of MLCC. For inductive component measurements, the series provides the adjustable test current function and the D.C. resistance measurement function. The optional external bias current adapter ( $\pm 2.5A$ ) is to satisfy the measurement requirements. With respect to the D.C. bias voltage test for capacitive components requirements, the series allows users to conduct verification measurement on materials by its internal  $\pm 2.5V$  adjustable voltage or via an optional external bias voltage adapter ( $\pm 45V$ ). Furthermore, 10 steps of listed test functionalities allow users to set testing parameters (either by frequency, or voltage, or current) for each step based on users' requirements in order to observe the trend of DUT characteristics.

The LCR-6000 series has 10 memory sets defined by panel setting criteria to facilitate users in selecting test criteria and saving time in repeated settings. 10,000 measurement result storage capability can easily record measurement results instantaneously. The USB host allows easy access to recorded results without connecting the series to the PC. The USB host also allows USB to retrieve and save screen so as to assist users in compiling setting guidelines.

For the external control, the LCR-6000 series provides handler interface and collocates with its measurement sorting function (9BIN, AUX: 1BIN) to facilitate the connection with sorting machine so as to sort out the materials. For remote control and measurement result retrieval requirements, the LCR-6000 series provides RS-232C to assist setting control or measurement result retrieval via the PC commands. Additionally, the free PC software gives users an instant tool to store measurement results that saves time in developing programs.

The brand new compacted LCR-6000 series can effectively improve the limitation of space. Diverse measurement functionalities and display methods are making the series the high CP ratio choice in meeting the requirements of R&D, component assessment for engineering departments, category sorting requirements for component production, and IQC for verification on component specifications.

### SPECIFICATIONS

#### TEST FREQUENCY

LCR-6300 : 10Hz ~ 300kHz ( $\pm 0.01\%$ ) (4 digits resolution)  
LCR-6200 : 10Hz ~ 200kHz ( $\pm 0.01\%$ ) (4 digits resolution)  
LCR-6100 : 10Hz ~ 100kHz ( $\pm 0.01\%$ ) (4 digits resolution)  
LCR-6020 : 10Hz ~ 20kHz ( $\pm 0.01\%$ ) (4 digits resolution)  
LCR-6002 : 10Hz ~ 2kHz ( $\pm 0.01\%$ ) (4 digits resolution)

#### OUTPUT IMPEDANCE

30  $\Omega$  / 50  $\Omega$  / 100  $\Omega$  selectable

#### BASIC ACCURACY

Slow / Med 0.05%  
Fast 0.1%

#### TEST SPEED

FAST : 25ms / MED : 100ms / SLOW : 333ms

#### TEST SIGNAL LEVELS

AC Voltage 10.00mV- 2.00V ( $\pm 10\%$ ) CV : 10.00mV- 2.00V ( $\pm 6\%$ )  
Current 100.0 $\mu$ A- 20.00mA ( $\pm 10\%$ ) CC : 100.0 $\mu$ A- 20.00mA ( $\pm 6\%$ ) (@2VMax)  
DCR  $\pm 2V$ , 0.066A (Max), Output impedance fixed 30  $\Omega$

#### DC BIAS

Internal  $\pm 2.5V$  (0.5% + 0.005V)

#### DISPLAY RANGE

R, X, |Z| 0.00001 $\Omega$  ~ 99.9999M $\Omega$   
G, B, |Y| 0.01nS ~ 999.999S  
L 0.00001 $\mu$ H ~ 9999.99H  
C 0.00001pF ~ 9999.99mF  
D 0.00001 ~ 9.99999  
Q 0.00001 ~ 99999.9  
 $\theta$  d -179.999° ~ 179.999°  
 $\theta$  r -3.14159 ~ 3.14159  
DCR 0.00001 $\Omega$  ~ 99.9999M $\Omega$   
 $\Delta$  % -99999% ~ 99999%

#### TEST MODE

Combinations Cs-Rs, Cs-D, Cp-Rp, Cp-D, Lp-Rp, Lp-Q, Ls-Rs, Ls-Q,  
Rs-Q, Rp-Q, R-X, DCR, Z- $\theta$  r, Z- $\theta$  d, Z-D, Z-Q, Auto LCZ  
Monitor Parameter (2 Selectable) Z, D, Q, Vac, Iac,  $\Delta$ ,  $\Delta$  %,  $\theta$  r,  $\theta$  d, R, X, G, B, Y



## LCR-6000 Series

### SPECIFICATIONS

#### LISTED MODE

	10 steps
--	----------

#### BIN FUNCTION

	Comparator (9BIN,AUX:1BIN)
--	----------------------------

#### MEMORY

INT – Panel Setting	10 file name
INT – Measured Data	10000 Data(.csv)
USB Storage	10 file name for setting, 9999 file name for data, 999 Log file for LCD screen

#### OTHER FUNCTION

Auto Level Control (ALC)	ON/OFF
Average	1~256 times
Trigger	INT / MAN / EXT / BUS
Delay	0ms~60s
Judgment	PASS / FAIL
Screen Capture	Saving into USB (Bmp form)

#### DISPLAY

3.5" LCD, RGB color (320x240)
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#### INTERFACE

RS-232(SCPI), Handler, USB Host/USB Device
--

#### POWER SOURCE

AC 100V ~ 240V, 50 ~ 60Hz, Max. 30W
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#### DIMENSIONS & WEIGHT

265(W) x 107(H) x 312(D) mm ; Approx. 3kg
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### ORDERING INFORMATION

LCR-6300	10Hz ~ 300kHz Precision LCR Meter
LCR-6200	10Hz ~ 200kHz Precision LCR Meter
LCR-6100	10Hz ~ 100kHz Precision LCR Meter
LCR-6020	10Hz ~ 20kHz Precision LCR Meter
LCR-6002	10Hz ~ 2kHz Precision LCR Meter

#### ACCESSORIES :

Safety Sheet x 1, Power Cord x 1, Test Fixture LCR-06B x 1, CD x 1 (User manual/PC software)

#### OPTION

LCR-16	±45V DC Bias Voltage Box
LCR-17	±2.5A DC Bias Current Box

#### OPTIONAL ASSESSORIES

LCR-05	Test Fixture for Axial & Radial Lead Components
LCR-06B	Kelvin Clip Test Lead
LCR-07	Test Fixture, Two-Wire with Alligator Clips
LCR-08	Test Fixture (Tweezers) for SMD/Chip Components
LCR-15	Test Fixture for SMD/Chip Components (0201 to 1812)
GTL-232	RS-232C Cable, 9-pin Female to 9-pin, null Modem for Computer, Approx. 2m
GTL-246	USB Cable, USB 2.0 A-B TYPE CABLE, 4P
GRA-422	Rack Mount Kit

#### FREE DOWNLOAD

PC Software	LCR-6000
Driver	LabVIEW Driver

### Rear Panel



#### LCR-05

Patent:185538



Description:  
Test fixture for measuring axial and radial lead components  
Frequency: DC to 1MHz  
Max. Voltage: +/- 35V

#### LCR-06B



Description:  
Kelvin clip test lead  
Frequency: DC to 1MHz  
Max. Voltage: +/- 45V

#### LCR-07



Description:  
Test leads for conventional component measurement.  
Frequency: DC to 1MHz  
Max. Voltage: +/- 35V

#### LCR-08

Patent:188540



Description:  
SMD / chip tweezers  
Frequency: DC to 1MHz  
Max. Voltage: +/- 35V

#### LCR-15



Description:  
SMD/chip test fixture  
Frequency: DC to 10MHz  
Max. Voltage: +/- 45V  
Application size: 0201 to 1812

#### LCR-16



Description:  
External DC Bias voltage box  
Frequency: 40Hz to 1MHz  
Max. Voltage: +/- 45V

#### LCR-17



Description:  
External DC Bias Current Box  
Frequency: 40Hz to 1MHz  
Max. Current: +/- 2.5A



# Hand Held LCR Meter



## LCR-916/915/914 (100kHz/10kHz/1kHz)



### FEATURES

- \* 20,000/2,000 Counts Dual Display
- \* Test Frequency : 100Hz/120Hz/1kHz/10kHz/100kHz Depend on Model
- \* Auto LCR Mode for DUT Measuring
- \* 0.2% Basic Accuracy
- \* Measurement Parameters : L, C, R(AC/DC), D, Q, ESR,  $\theta$
- \* Parallel/Series Testing Mode
- \* Sorting Mode for Quality Control
- \* 2Wire or 5Wire Measurement Available
- \* Data Hold and Zero Mode Supported
- \* Max and Min (LCR-916 Only)
- \* Auto Range, Auto Backlit
- \* Low Battery Indication
- \* Auto Power Off
- \* Data Collection or DC Power Operation (Optional for LCR-915)

The LCR-916/915/914 is a smart, convenient and fully-functional dual display handheld LCR meter. The test frequency extends as high as 100 kHz/10/1kHz, providing greater flexibility to test a wider range of components. The LCR-916/915/914 uses a dual 20,000/2000 count display. The 20000 count display is used for displaying primary parameters such as capacitance, inductance, reactance and resistance and a 2000 count display is for secondary parameters such as Q, D, ESR and RP measurements. Secondary measurements can also be combined with the primary measurement while the primary measurement is still being taken. The LCR-916/915/914 provides two measurement methods, 2 wire and 5 wire measurement, The LCR-916/915/914 also comes with a host of various standard or optional accessories to assist in testing a number of different component types. The meters also include handy functions such as data hold, tolerance sorting, zero mode and Min/Max (LCR-916 only).

The meters' USB interface can be used to log data to a PC using the LCR-900 software and provide the DC 5V needed to power the meter.

With the LCR-916/915/914, you can perform quick and basic LCR measurements with precision at an affordable price.

SPECIFICATIONS			
	LCR-916	LCR-915	LCR-914
TEST FREQUENCY			
	100Hz/120Hz/1kHz/10kHz/ 100kHz Selectable	100Hz/120Hz/1kHz/10kHz Selectable	100Hz/120Hz/1kHz Selectable
FULL SCALE			
	Main Display : 20,000/2,000 count Selectable; Sub Display : 2,000 count		
INDUCTANCE			
Range	20uH ~ 20kH depends on the selected test frequency		
Best Accuracy	± (0.2% rdg + 2 digits)		
Resolution	0.001uH ~ 0.001kH depends on the selected range		
CAPACITANCE			
Range	20pF ~ 20mF depends on the selected test frequency		
Best Accuracy	± (0.2% rdg + 2 digits)		
Resolution	0.001pF ~ 0.001mF depends on the selected range		
RESISTANCE			
Range	20Ω ~ 200MΩ depends on the selected test frequency		
Best Accuracy	± (0.2% rdg + 2 digits)		
Resolution	0.001Ω ~ 0.01MΩ depends on the selected range		
DC RESISTANCE			
Range	200Ω ~ 200MΩ		
Best Accuracy	± (0.2% rdg + 2 digits)		
Resolution	0.01Ω ~ 0.01MΩ depends on the selected range		
QUALITY FACTOR (Q)			
Range	0.000 ~ 999		
Accuracy	2 x (main parameter accuracy)		
Best Resolution	0.001		
DISSIPATION FACTOR (D)			
Range	0.000 ~ 999		
Accuracy	2 x (main parameter accuracy)		
Best Resolution	0.001		
PHASE ANGLE (θ)			
Range	-90.0° ~ 90.0°		
Accuracy	± (0.2% rdg + 5 digits)		
Resolution	0.1°		
MEASUREMENT CIRCUIT			
Parallel or Series Selectable			
AUTO LCR MODE			
Automatically identifies and measures the DUT when the meter is switched on			
SORTING MODE			
±0.1%, ±0.2%, ±0.25%, ±0.5%, ±1.0%, ±2.0%, ±5.0%, ±10.0%, ±20.0% and +80%/-20% Selectable			
OTHER FUNCTIONS			
Auto range, Auto back-light, Max, Min, Data Hold, Zero, 46 segments Analogue bar, Auto power off			
DISPLAY			
LCD mono display			
INTERFACE			
USB			
POWER SOURCE			
AA Battery 1.5V x 4, DC 5V (through AC adapter or USB cable - optional for LCR-915/914)			
DIMENSIONS & WEIGHT			
95(W) x 207(H) x 52(D) mm. Approx. 630 g			

Note : Specifications are performed by test cable length = 0m

AUTO LCR MODE



5Wire & 2Wire Measurement Terminal



Full Accessories



ORDERING INFORMATION

LCR-916	100kHz Hand-held LCR Meter
LCR-915	10kHz Hand-held LCR Meter
LCR-914	1kHz Hand-held LCR Meter

ACCESSORIES :  
User manual x 1, Battery

OPTIONAL ACCESSORIES

Opt.01	4Wire DIP test lead
Opt.02	Accessory Pack for LCR-915
Opt.03	Accessory Pack for LCR-914
Opt.04	Magnetic Hang kit for LCR-914

Note : 1. The accessory pack for LCR-915 includes SMD test probe, AC adapter, USB cable and CD.

ACCESSORIES GUIDE

MODEL		LCR-916	LCR-915	LCR-914
①	Shorting Cube	Standard	Standard	Standard
②	Alligator Clip	Standard	Standard	Standard
③	Magnetic Hang Kit	Standard	Standard	Opt. 04
④	4 Wire SMD Probe	Standard	Opt. 02	Opt. 03
⑤	AC Power Adapter	Standard	Opt. 02	Opt. 03
⑥	USB Cable	Standard	Opt. 02	Opt. 03
⑦	PC Software (CD)	Standard	Opt. 02	N/A
⑧	4 Wire DIP Clip	Opt. 01	Opt. 01	Opt. 01





## SAFETY TESTERS

Safety testers are designed to ensure safe operation of DUTs under various operating conditions and environment. GW Instek's, GPT-Series provides safe and quick measurement tools for AC/DC withstanding voltage tests, insulation resistance tests, and AC ground bond tests as well as ground continuity tests. Those tests are required by many international safety regulations such as CE, UL, VDE, and etc.

A dedicated option, multiplex scanner box, for specific safety tester series. This multiplex scanner box, GSB-01/02, has a function that distributes the test voltage or current provided by the GPT-9900A/9900/9800 Series to multiple test points.

We also have leakage current tester, GLC-9000, which supports all the major leakage current test standards for general electronic equipment.

## PRODUCTS

- AC/DC/IR/GB Electrical Safety Analyzer
- AC/DC Withstanding Voltage/Insulation Resistance/Ground Bond Tester
- AC Ground Bond Tester
- Multiplex Scanner Box
- Leakage Current Tester

## SAFETY TESTERS OVERVIEW

A safety tester is designed to ensure safe operation of DUT's under a number of operating conditions and environments. Thus, many of the international safety regulation, such as UL in USA, VDE in Germany, CE in EU, BS in the Great Britain and CSA in Canada, are constituted to standardize safety testing. GW Instek offers a series of Safety Testers for manufacturers to meet the mentioned regulations. The Safety Testers offered by GW Instek, GPT-12000/9900/9800/9600 Series are general multifunction safety testers and cover a variety of different usages based models: AC Hi-Pot, DC Hi-Pot, Insulation Resistance and Ground Bond as well as Continuity tests.

## TEST ITEMS EXPLANATION

<b>HI-Pot (Withstanding)</b>	<p><b>Purpose:</b> Make sure users do not receive electrical shocks that might be caused by a breakdown of the electrical insulation when using product.</p> <p><b>Method:</b> While operating the product under high voltage mode, measure the current leakage between AC primary circuits and low voltage secondary circuits, or between AC primary circuits and its ground, or between low voltage secondary circuits and its ground.</p>
<b>ARC Detection</b>	<p><b>Purpose:</b> Check potential problems such as loose screws, bad material insulation, etc.</p> <p><b>Method:</b> Measure the duration of a current spike caused by a dramatic change in voltage. Normally, an ARC Detection is performed during a Hi-Pot test.</p>
<b>Insulation Resistance</b>	<p><b>Purpose:</b> Check the quality of insulation.</p> <p><b>Method:</b> Measure the resistance between AC primary circuits and low voltage secondary circuits, or between AC primary circuits and its ground, or between low voltage secondary circuits and its ground.</p>
<b>Ground Bond</b>	<p><b>Purpose:</b> Verify if exposed conductive parts of product and its power system ground are well connected and be able to sustain high current, until the fuse or circuit breaker shuts off the power.</p> <p><b>Method:</b> Measure the resistance of a ground circuit and verify the adequacy of the connection. A Ground Bond test is for measuring the ground path with low voltage and high current.</p>
<b>Continuity</b>	<p><b>Purpose:</b> Verifies that an electrical connection exists between the mains power ground and any conductive surface of the product.</p> <p><b>Method:</b> A ground bond test is for measuring the ground path with low voltage and low current.</p>



## GPT-9000 FAMILY (GPT-9900 Series, GPT-9800 Series and GPT-9600 Series)

The GPT-9000 family is a fully automatic electrical tester with 500VA, 200VA and 100VA test capacity which combines AC/DC Hi-pot, Insulation Resistance and high current ground bond (up to 32Aac) tests. The GPT-9000 family complies with electrical equipment and appliance testing standards such as UL, CSA and. The safety compliance, reliable test results, user-friendly and fully automatic interface make the GPT-9000 Series family an advanced safety tester series that can perform up to four essential electrical safety tests and deliver fast and reliable test results from a single test connection.

### No Load Set Up of Trip Current and Output Voltage

With the GPT-9900/9800 Series, the trip current and output voltage can be set without high voltage, or using a load resistor.

### Safety Fault Interrupt

With the built-in Safety Fault Intercept technology, the GPT-9900/9800/9600 Series are able to set the high limit current as a watchdog to detect whether the current is abnormal to shut-off the output power when tripped.

### Flashing High voltage indicator

A flashing red LED indicator outputs a warning when a high voltage is present at the output

### Highly Efficiency Voltage Output

The high-efficiency PWM power amplifier of the GPT-9900/9800/9600 Series provides a very stable HV output and avoids load affecting the DUT.

### Zero Crossing Turn-On

The Zero Crossing Turn-On feature ensures that the output voltage will start from the zero crossing point of a sine wave. This function prevents unexpected occurrences of spikes or arcs, and ensures accurate cut-off current.

### True RMS Current Read-Back

The GPT-9900/9800/9600 Series are equipped with a true RMS circuit to make sure that the read-back of the test is a real value instead of average value, especially under capacitance and inductance loads. This function will prevent wrong cut-off current measurements.

### Selectable Arc Detection

An Arc is a short duration ( $>10\mu\text{s}$ ) current spike occurring due to a dramatic change in voltage or current. The GPT-9900/9800/9600 Series offer selectable Arc detection setting value depending on the cutoff range to identify the potential problems in product quality such as loose screws, bad insulation material etc.

### Controllable Ramp Up Time

During a AC/DC Hi-pot and IR test, an unfavorable condition such as spike in current might occur. The GPT-9900/9800 Series can control the ramp up time to prevent spikes, which might cause erroneous measurement results.

### Memories of 100 AUTO, Each AUTO 16 Manu Steps of Test Set-Up

The GPT-9900/9800 Series provide 16 steps for test set-ups, each Manu step containing one electrical safety test. All 16 steps can be executed just by pressing a button. The GPT-9900/9800 Series offer 100 AUTO of memories to facilitate testing of up to 100 different products in a production line.

## SAFETY TESTING INSTRUMENTS

MODEL	Description (Main Function)	Page
GPT-12004	AC/DC/IR/GB Electrical Safety Analyzer	E37-40
GPT-12003	AC/DC/IR Electrical Safety Analyzer	E37-40
GPT-12002	AC/DC Electrical Safety Analyzer	E37-40
GPT-12001	AC Electrical Safety Analyzer	E37-40
GPT-9904	AC 500VA AC/DC Withstanding Voltage/Insulation Resistance/Ground Bond Tester	E41-42
GPT-9903A	AC 500VA AC/DC Withstanding Voltage/Insulation Resistance Tester	E41-42
GPT-9902A	AC 500VA AC/DC Withstanding Voltage Tester	E41-42
GPT-9901A	AC 500VA AC Withstanding Voltage Tester	E41-42
GPT-9804	AC 200VA AC/DC Withstanding Voltage/Insulation Resistance/Ground Bond Tester	E41-42
GPT-9803	AC 200VA AC/DC Withstanding Voltage/Insulation Resistance Tester	E41-42
GPT-9802	AC 200VA AC/DC Withstanding Voltage Tester	E41-42
GPT-9801	AC 200VA AC Withstanding Voltage Tester	E41-42
GSB-01	Multiplex Scanner Box – 8CH H.V.	E43-44
GSB-02	Multiplex Scanner Box – 6CH H.V./2CH G.B.	E43-44
GCT-9040	AC Ground Bond Tester	E45-46
GPT-9603	AC 100VA AC/DC Withstanding Voltage/Insulation Resistance Tester	E47-48
GPT-9612	AC 100VA AC Withstanding Voltage/Insulation Resistance Tester	E47-48
GPT-9602	AC 100VA AC/DC Withstanding Voltage Tester	E47-48
GPT-9601	AC 100VA AC Withstanding Voltage Tester	E47-48
GLC-9000	Leakage Current Tester	E49-50

## GPT-SERIES QUICK SELECTION GUIDE

MODEL	Output Capacity	Functions					Features					
		ACW	DCW	IR	GB	GC	SWEEP	ARC Detect	RAMP Up	RAMP Down	Rear Output	Barcode
GPT-12004	200VA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GPT-12003	200VA	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
GPT-12002	200VA	✓	✓			✓	✓	✓	✓	✓	✓	✓
GPT-12001	200VA	✓				✓	✓	✓	✓	✓	✓	✓
GPT-9904	500VA	✓*	✓	✓	✓		✓	✓	✓		✓	
GPT-9903A	500VA	✓*	✓	✓			✓	✓	✓		✓	
GPT-9902A	500VA	✓*	✓				✓	✓	✓		✓	
GPT-9901A	500VA	✓*					✓	✓	✓		✓	
GPT-9804	200VA	✓	✓	✓	✓			✓	✓			
GPT-9803	200VA	✓	✓	✓				✓	✓			
GPT-9802	200VA	✓	✓					✓	✓			
GPT-9801	200VA	✓						✓	✓			
GPT-9603	100VA	✓	✓	✓				✓				
GPT-9612	100VA	✓		✓				✓				
GPT-9602	100VA	✓	✓					✓				
GPT-9601	100VA	✓						✓				

\* Short Current > 200mA



# AC/DC/IR/GB Electrical Safety Analyzer



GPT-12004

NEW



GPT-12003/12002/12001

NEW



## FEATURES

- \* 200VA AC Test Capacity
- \* Comply with IEC 61010-2-034
- \* 7" TFT LCD
- \* Manual / Auto Mode
- \* True RMS Current Measurement
- \* Zero Crossing Turn-on Operation
- \* Controllable Ramp-up
- \* Ramp-down Time
- \* Capacitive Load Testing Capability up to 47μF(DCW 400V max.)
- \* Statistics Function
- \* Sweep Function for DUT Characteristic Analysis
- \* USB Storage Available
- \* Rear Panel Output Available
- \* Interface : RS-232C, USB Host/Device, Signal I/O and GPIB(Optional)
- \* Universal Power Input

GHT-115 High Voltage/Contiunity Test Lead



GW Instek introduces the flagship model (200VA output capacity) safety analyzer-the GPT-12000 series, which is the first safety analyzer in the world to comply with IEC 61010-2-034 (Safety requirement for electrical requirement for measurement, control and laboratory use – particular requirements for measurement equipment for insulation resistance and test equipment for electric strength), which stipulates that the requirements of the software and hardware interfaces must be followed while designing high voltage and insulation resistance test and measurement instruments so as to ensure that users are provided with necessary protection and warning while using the instruments.

The GPT-12000 series safety analyzer has four models: GPT-12004 features AC/DC withstanding voltage test, insulation resistance test, AC ground bond test and continuity test; GPT-12003 conducts AC/DC withstanding voltage test, insulation resistance test, and continuity test; GPT-12002 carries out AC/DC withstanding voltage test and continuity test; GPT-12001 executes AC withstanding voltage test and continuity test. The entire series provides an output capacity of 200VA and utilizes a high-efficient PWM amplifier to effectively exclude the influence from the fluctuating input voltage or distorted waveforms so as to guarantee a stable high-voltage output while conducting AC withstanding voltage test on the DUT to meet the safety regulations such as IEC、EN、UL、CSA、GB、JIS that demand the test requirements for various electronic/electrical products or parts.

To comply with IEC 61010-2-034 requirements, the series takes into account of safety by adopting the double insulation design for input power supply and output voltage to enhance user safety. Additionally, the retracted on-off switch design (START key) and various (optional) mechanisms for test activation (for instance, press and hold for 1 second to activate, activation by pressing double keys, etc.) are incorporated into the series to avoid accidentally touching that results in high voltage/large current output causing damage and danger to products or users. High illumination LED lights (flashing or permanently lit) and a high volume audial indicator are included in designing the series to provide warnings of the status of the on-going tests or judgement results from the safety analyzer. On top of that, the DUT will be automatically discharged to the safe voltage (approximately 30V) after each test to prevent large residual test voltage from causing harm to users.

The series utilizes 7-inch color TFT LCD and inherits the consistent simplicity key design style of the product family to allow users to experience easy operations and a clear observation of the test results. The major test functions include AC withstanding voltage test (AC 5kV/40mA), DC withstanding voltage test (DC 6kV/10mA), insulation resistance test (DC 50V~1200V/50GΩ max.), ground bond test (AC 32A/650mΩ max.), and grounding continuity test (DC 100mA fixed/70Ω max.). The series also collocates with superb output adjustment resolution, measurement resolution (AC withstanding voltage: 1μA; DC withstanding voltage: 0.1μA; insulation resistance: 0.1MΩ; ground bond: 0.1MΩ; continuity test: 0.01Ω), controllable voltage ramp up and ramp down time settings, and upper/lower limit judgement settings, and large capacitance test capability (up to 47μF) for DUT with large capacitance such as surge absorber and large capacitance on the input terminal of EMC/EMI prevention. For Insulation resistance, provides 10mA pre-charged current (fixed) to first rapidly fully charge the DUT's capacitive load and then to conduct test and measurement so as to avoid misjudgment from fluctuating inrush current. All the above features of the series facilitate a more flexible execution of the required tests so that users can obtain accurate test and measurement results.

The statistic function is the highlight of the series. Test items, number of tests, judgement results are recorded after testing and the test results can be shown by bar graph on the display. Users can immediately learn the status of product tests and judgement distribution during the manufacturing process without using a PC. The other strong feature is the sweep function, which can be used for the analysis on product's crash point. Users can use the sweep mode to see the curve diagram of the test results after finishing the functional tests. Users can also select any time point during the process to analyze the relation between voltage and current (when ACW or DCW is selected). The test result of the certain period of time can be swept by setting start and stop time points to analyze the relation between voltage and current under that time frame. Furthermore, the tabular continuity test function can combine 10 manual memory sets to carry out automatic tests or 9 manual memory sets with one connection device to connect next automatic test so as to increase the test items of the continuity test. Users can obtain various test values and judgement results without switching to a different display screen.

Other functions and features of the GPT-12000 series include 100 sets of manual test memory for the storage of different test conditions; rear output terminal for system integration; front panel remote control terminal mount/rear panel Signal I/O for users to conveniently control the analyzer's output/stop based upon the requirements. The USB storage function allows test results to be stored in the USB flash drive to save the trouble of using a PC, and the function is conducive to the follow-up data analysis. For users with the requirements of PC control and test results recording, the series also provides RS-232C, USB and GPIB (optional)

## SPECIFICATIONS

### AC WITHSTANDING

Output-Voltage Range	0.050kV~5.000kV
Output-Voltage Resolution	1V
Output-Voltage Accuracy	±(1% of setting + 5V) [no load]
Maximum Rated Load	200 VA (5kV/40mA)
Maximum Rated Current	40mA (0.5kV< V ≤ 5kV); 10mA (0.05kV ≤ V ≤ 0.5kV)
Output-Voltage Waveform	Sine wave
Output-Voltage Frequency	50 Hz / 60 Hz selectable
Voltage Regulation	±(1% + 5V) [maximum rated load -- no load]
Voltmeter Accuracy	±(1% of reading + 5V)
Current Measurement Range	1μA~40.00mA
Current Best Resolution	1μA / 10μA
Current Measurement Accuracy	±(1.5% of reading + 30μA)
Window Comparator Method	Yes
ARC Detect	Yes
RAMP UP (Rise Time)	0.1s~999.9s
RAMP DOWN (Fall Time)	0.0s~999.9s
TIMER (Test Time)*	OFF, 0.3s~999.9s
WAIT TIME	0.0s~999.9s
GND	ON/OFF

### DC WITHSTANDING

Output-Voltage Range	0.050kV~6.000kV
Output-Voltage Resolution	1V
Output-Voltage Accuracy	±(1% of setting + 5V) [no load]
Maximum Rated Load	50W (5kV/10mA)
Maximum Rated Current	10mA (0.5kV< V ≤ 6kV); 2mA (0.05kV ≤ V ≤ 0.5kV)
Voltage Regulation	±(1% + 5V) [maximum rated load -- no load]
Voltmeter Accuracy	±(1% of reading + 5V)



SPECIFICATIONS	
Current Measurement Range	1μA~10.00mA
Current Best Resolution	0.1μA /1μA /10μA
Current Measurement Accuracy	±(1.5% of reading + 3μA) when I Reading < 1mA ±(1.5% of reading + 30μA) when I Reading ≥ 1mA
Window Comparator Method	Yes
ARC Detect	Yes
RAMP UP (Rise Time)	0.1s~999.9s
RAMP DOWN (Fall Time)	0.0s~999.9s
TIMER (Test Time)*	OFF, 0.3s~999.9s
WAIT TIME	0.0s~999.9s
GND	ON/OFF
INSULATION RESISTANCE	
Output Voltage	50V~1200V dc
Output-Voltage Resolution	50V
Output-Voltage Accuracy	±(1% of setting + 5V) [no load]
Resistance Measurement	
Test Voltage	Display Range
50V ≤ V ≤ 100V	0.1MΩ~10.00GΩ
150V ≤ V ≤ 450V	0.1MΩ~20.00GΩ
500V ≤ V ≤ 1200V	0.1MΩ~50.00GΩ
	Measurement Range / Accuracy
	0.1MΩ~1MΩ:±(5% of reading+3count); 1MΩ~50MΩ:±(5% of reading+1count); 51MΩ~2GΩ:±(10% of reading+1count)
	0.1MΩ~1MΩ:±(5% of reading+3count); 1MΩ~500MΩ:±(5% of reading+1count); 501MΩ~9.999GΩ:±(10% of reading+1count); 10GΩ~50GΩ:±(20% of reading+1count)
Voltage Regulation	±(1% + 5V) [maximum rated load -- no load]
Voltmeter Accuracy	±(1% of reading + 5V)
Short-Circuit Current	10mA max.
Output Impedance	2kΩ
Window Comparator Method	Yes
RAMP UP (Rise Time)	0.1s~999.9s
RAMP DOWN (Fall Time)	0.0s~999.9s
TIMER (Test Time)*	0.3s~999.9s
WAIT TIME	0.0s~999.9s
GND	ON/OFF
GROUND BOND	
Output-Current	03.00A~32.00A ac
Output-Current Resolution	0.01A
Output-Current Accuracy	3A ≤ I ≤ 8A:±(1% of reading + 0.2A); 8A < I ≤ 32A:±(1% of reading+0.05A)
Test-Voltage	8Vac max (open circuit)
Test-Voltage Frequency	50Hz/60Hz selectable
Ohmmeter Measurement Range	1mΩ~ 650mΩ
Ohmmeter Measurement Resolution	0.1mΩ
Ohmmeter Measurement Accuracy	±(1% of reading + 2 mΩ)
Window Comparator Method	Yes
TIMER (Test Time)*	0.3s~999.9s
Test Method	Four Terminal
GND	ON/OFF
CONTINUITY TEST	
Output-Current	100mA dc (fixed)
Ohmmeter Measurement Range	0.10Ω~ 70.00Ω
Ohmmeter Measurement Resolution	0.01Ω
Ohmmeter Measurement Accuracy	±(10% of reading + 2 Ω)
Window Comparator Method	Yes
TIMER (Test Time)*	0.3s~999.9s
MEMORY	
Single Step Memory	MANU : 100 blocks
Automatic Testing Memory	AUTO : 100 blocks, Manu per auto : 10
INTERFACE	
Standard (Front)	REMOTE, USB host
Standard (Rear)	Rear Output, RS-232C, USB device, Signal I/O,
Option	GPIB
DISPLAY	
	7" color LCD
POWER SOURCE	
	AC 100V~240V ± 10%, 50Hz/60Hz; Power consumption : Max. 400VA
DIMENSIONS & WEIGHT	
GPT-12004	380(W) x 148(H) x 454(D) mm; Approx. 15kg
GPT-12001/12002/12003	380(W) x 148(H) x 436(D) mm; Approx. 11kg (Max.)

Note : \* TIMER Accuracy: +/- (100ppm+20ms)

## ORDERING INFORMATION

GPT-12004 AC/DC/IR/GB Electrical Safety Analyzer

GPT-12003 AC/DC/IR Electrical Safety Analyzer

GPT-12002 AC/DC Electrical Safety Analyzer

GPT-12001 AC Electrical Safety Analyzer

ACCESSORIES :

Quick Start Guide x 1, Power cord x 1, CDx1 (complete user manual), Interlock Key x 1, Remote Terminal Cable GHT-119 x 1, Test lead GHT-115 x 1 for GPT-12001/12002/12003, Test lead GHT-115 x 1, GTL-215 x 1 for GPT-12004

OPTION

Opt.1 GPIB card

OPTIONAL ASSESSORIES

GHT-113 High Voltage Test Pistol

GHT-117 High Voltage Adapter Box

GHT-118 High Voltage / Ground Bond Adapter Box

GHT-205 High Voltage Test Probe

GTL-232 RS232C Cable, 9-pin Female to 9-pin, null Modem for Computer

GTL-246 USB Cable, A-B type, approx. 1.2m

GTL-248 GPIB Cable, approx. 2m

GRA-440 Rack Adapter Panel (19", 4U)

## Interlock Key



## GHT-119 Remote Cable

Approx. 500mm



## GHT-205 High Voltage Test Probe



## GTL-215 Test Lead



## GHT-117 HV Adapter/HV Adapter(EU)



## GHT-118 HV/GB Adapter HV/GB Adapter(EU)





# AC/DC/IR/GB Electrical Safety Analyzer



**GPT-12004**

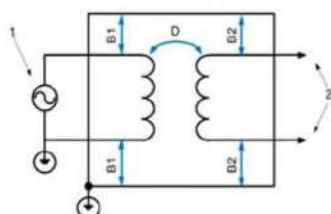
**GPT-12004 Rear Panel**



**GPT-12003/12002/12001 Rear Panel**



## A. MEETS IEC 61010-2-034 DESIGN REQUIREMENTS



Providing the markets with safe electronic products is the responsibility of every manufacturer! Similarly, safety analyzer that tests whether electronic products meet safety regulations must attach the importance to the safety it provides! GPT-12000 is the world's first safety analyzer to comply with IEC 61010-2-034 (Safety requirement for electrical requirement for measurement, control and laboratory use – particular requirements for measurement equipment for insulation resistance and test equipment for electric strength). Apart from this, the safety considerations also include double insulation for input and output voltages, safe output/warning mechanism, post-test discharge mechanism, etc. to ensure user safety during the operation.

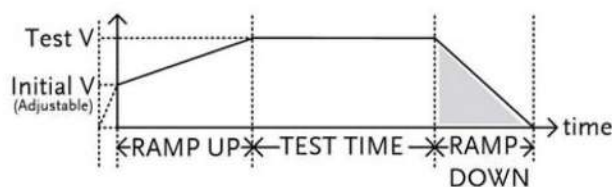
## B. HIGH ACCURACY AND HIGH RESOLUTION TESTING PERFORMANCE



### High Adjustment & Measurement Resolution

For production tests and characteristic verification, the GPT-12000 series provides a withstand voltage test voltage (AC 5kV/DC 6kV) that can be adjusted in 1V steps with current measurement resolutions up to 1 $\mu$ A (ACW) or 0.1 $\mu$ A (DCW) to realize the small leakage current measurement for products or components. In addition, the insulation resistance test voltage can be adjusted in 50V steps from a DC output range of 50V to 1200V, and the resistance measurement resolution can reach 0.1M $\Omega$ . Since most safety regulations require AC power supply for ground bond test, the GPT-12000 series provides 8Vac (open) and 3A to 32Aac current for ground bond test with a resistance measurement resolution of 0.1m $\Omega$ . The entire series provides the continuity grounding test function with a 100mAdc (fixed) test source and a measurement resolution of 0.01 $\Omega$  to detect if the tested equipment is correctly grounded. With these functions, users can perform various safety tests and verifications with high accuracy and reliability.

## C. FLEXIBLE SUPPLEMENTARY TESTING MECHANISM

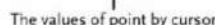


**Testing Period Timing**

To make tests compliant with the test requirements of relevant safety regulations, the GPT-12000 series provides a more flexible output sequence setting starting from the start point of the test. Taking the AC/DC withstand voltage test as an example, the initial voltage can be set. Users determine the initial voltage ratio (i.e., the ratio of the rated test voltage), and then the voltage ramp up can also be set to reduce the risk of insulation breakdown or damage to the DUT caused by transient high voltages. After the rated test voltage is reached, the upper/lower limit judgement window, delay judgment and test timer mechanism can be set to assist users to conduct tests smoothly and correctly. The new voltage ramp down time setting allows users to test with a

ramp down voltage to avoid the impact of excessively high rated test voltage to instantaneous discharge on the DUT. With respect to the insulation resistance test, other than the newly added grounding mode to perform test in accordance with the actual grounding state of the DUT, the setting mechanism of the supplementary upper/lower limit judgement is also added to shorten the test time. The user-definable mode mechanisms include: STOP ON FAIL: The test is terminated as soon as the FAIL setting is met; STOP ON PASS: The test is terminated as long as the PASS setting is met, or TIMER: judgement is conducted when the timer time is reached.

## D.



### Sweep Function

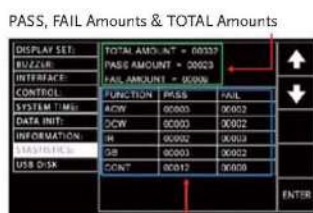


### Automatic Test

The GPT-12000 series features a unique sweep function, which displays a curve diagram of the test results of the DUT. Test readings are recorded point by point based on the applied test voltage or current and relevant settings (such as initial voltage, ramp up time, test time, or ramp down time). After the test is completed, users can learn the amount of applied energy (voltage or current) at a specific time point and the results of measurement parameters by moving the cursor position so as to help users understand the changes of the measurement parameters (current or resistance) during the test. The function can also be used to determine the critical break down of the DUT.

With respect to the automatic test function, each automatic test has up to 10 manual test items and all related settings and result judgement are presented in a table, so that users can easily obtain the results of all test items at a time. Other than that, if there are multiple automatic test connection requirements, users only need to select CON in the last item of the table to automatically connect the automatic measurement of the next position (such as AUTO-012~AUTO-013)

## F.



### PASS & FAIL Amounts Distributions in Each Test Function

Statistic

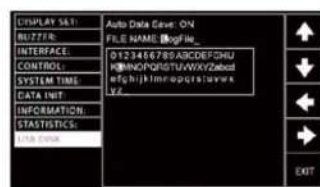


## Analysis

The GPT-12000 series provides the statistic function, which can record the test functions and judgment results in the temporary storage area (60,000 lots max.). Users can immediately learn the test of each function during the test without using a PC. The distribution of the good products can be analyzed to understand the quality of the batch based on the data. If most of them fall at

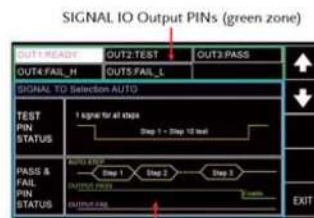
the critical point that is close to be categorized as defect product, the results can be found in the test process in time so as to improve the manufacturing process and stop the defect products from entering the markets to ensure the reliability of products after leaving the factory.

## F.



### Usb Storage Function

In order to facilitate users to analyze the results of the safety test, GPT-12000 provides the USB storage function in addition to its own statistic and analysis functions. When a USB is inserted and the storage function is activated, each time the test button (START) is pressed, the test results of all tests (every manual or automatic test item) are automatically saved to the USB in the form of a text file (txt) for follow-up analysis.



SIGNAL IO Selection for AUTO Test (blue zone)

Signal I/O Self-defined Signal I/O

For interface connections, the GPT-12000 series offers external control or a variety of remotely connected ports such as a signal I/O port that can be used to connect an external controller or PLC. The signal I/O's output signal pins can be self-defined so as to collocate with various PLC control requirements. Besides, the entire series is equipped with RS-232C and USB device (GPIB is optional) for easy retrieval of test data and results by connecting a PC.



# AC/DC Withstanding Voltage/Insulation Resistance/Ground Bond Tester



**GPT-9904**



**GPT-9903A/9902A/9901A**



**GPT-9804**



**GPT-9803/9802/9801**



## FEATURES

- \* 500VA and 200VA AC Test Capacity
- \* 240 x 64 Ice Blue Dot Matrix LCD
- \* Manual/Auto Mode
- \* Function Key for Quick Selecting
- \* High Intensity Flash for Caution & Status Indication
- \* Safety Interlock Function
- \* Zero Crossing Turn-on Operation
- \* Controllable Ramp-up Time
- \* True RMS Current Measurement
- \* High Resolution : 1μA for Measuring Current, 2V for Setting Voltage
- \* PWM Switching Amplifier to Enhance the Power Efficiency and Reliable Testing
- \* Max. 100 Memory Block for Test Condition (Step) Setting. And Each Step can be Named Individually
- \* Remote Terminal on the Front Panel for "Start" and "Stop" Control by External
- \* Interface : RS-232C, USB Device, Signal I/O and GPIB (Optional)

The GPT-9900 series is built upon a platform of AC 500VA, and the GPT-9800 series is built upon a platform of AC 200VA maximum power output. Each series with 4 models, The GPT-9904 and GPT-9804 are a 4-in-1 model capable of performing AC withstanding, DC withstanding, insulation resistance and ground bond tests. The GPT-9903A and GPT-9803 are a 3-in-1 model capable of performing AC withstanding, DC withstanding and insulation resistance tests. The GPT-9902A and GPT-9802 are capable of performing both AC and DC withstanding tests, whereas the GPT-9901A and GPT-9801 are able to perform AC withstanding test. The high-efficiency PWM amplifier is the core of both series platform design to impede the influence from the voltage fluctuation of input AC source. Each series supports the major test items among all the needed for the compliance of the safety standards such as IEC, EN, UL, CSA, GB, JIS and other safety regulations.

Following a tidy and easy-to-use design concept, the both series are equipped with a simple & clear panel layout, a high resolution dot matrix LCD display, and color LED indicators, allowing operators to interpret measurement results easily and quickly. All major test functions, including AC withstanding (AC 5kV), DC withstanding (DC 6kV), insulation resistance (DC 50V ~ 1000V) and ground bond (AC 32A max.) tests, are performed under a high-stability voltage or current output with high-resolution measurement results. Further more, the test duration, ramp up time and upper/lower limits of the tripping current/resistance are fully-adjustable to accommodate a wide variety of safety tests with accurate measurement results.

The unique "Sweep" function of the GPT-9900 series is able to display the test results point by point all through the testing period to form a trace graph. This graphic display performs the characteristic verification of a DUT through observing the parameter response to the changes of the applied voltage or current or testing time.

Other significant functions and features are also incorporated with both series such as the output voltage is automatically cut off (within 150μs) upon the detection of an abnormal output voltage or a trip of current limits during test to protect the operator from hazardous injury and automatically discharges a DUT after test to eliminate excessive voltage on a DUT, the open-circuit detection to ensure proper connections of apparatus for ground bond test, 100 sets of memory to save and recall the panel settings for individual or sequential tests, a remote output on-off terminal on the front panel and a signal I/O port in the rear panel provided as the means for remote start/stop control of the safety tester, and RS-232C, USB and GPIB (optional) interfaces available for PC remote control and test result logging.

SPECIFICATIONS		
	GPT-9800 Series	GPT-9900 Series
<b>AC WITHSTANDING</b>		
Output-Voltage Range	0.050kV~ 5.000kV ac	0.050kV~ 5.000kV ac
Output-Voltage Resolution	2V/step	2V/step
Output-Voltage Accuracy	±(1% of setting + 5V) [no load]	±(1% of setting + 5V) [no load]
Maximum Rated Load	200 VA (5kV/40mA)	500 VA (5kV/100mA)
Maximum Rated Current	40mA (0.5kV<V≤5kV) 10mA (0.05kV≤V≤0.5kV)	100mA (0.5kV<V≤5kV) 10mA (0.05kV≤V≤0.5kV)
Output-Voltage Waveform	Sine wave	Sine wave
Output-Voltage Frequency	50Hz/60Hz selectable	50Hz/60Hz selectable
Voltage Regulation	±(1% of rdg + 5V) [full load → no load]	±(1% of rdg + 5V) [full load → no load]
Voltmeter Accuracy	±(1% of rdg + 5V)	±(1% of rdg + 5V)
Current Measurement Range	0.001mA~40.0mA	0.001mA~100.0mA
Current Best Resolution	0.001mA/0.01mA/0.1mA	0.001mA/0.01mA/0.1mA
AC Current Measurement Accuracy	±(1.5% of rdg+30counts)when HI SET <1.11mA ±(1.5% of rdg+3counts)when HI SET ≥1.11mA	±(1.5% of rdg+30counts)when HI SET <1.11mA ±(1.5% of rdg+3counts)when HI SET ≥1.11mA
Window Comparator Method	Yes	Yes
ARC Detect	Yes	Yes
RAMP (Ramp-Up Time)	0.1s~999.9s	0.1s~999.9s
TIMER (Test Time)*	OFF, 0.5s~999.9s	OFF, 0.5s~999.9s
Sweep Function*	NOT Support	Yes
GND	ON/OFF	ON/OFF
<b>DC WITHSTANDING</b>		
Output-Voltage Range	0.050kV~6.000kV dc	0.050kV~6.000kV dc
Output-Voltage Resolution	2V/step	2V/step
Output-Voltage Accuracy	±(1% of setting + 5V) [no load]	±(1% of setting + 5V) [no load]
Maximum Rated Load	50W (5kV/10mA)	100W (5kV/20mA)
Maximum Rated Current	10mA (0.5kV<V≤6kV) 2mA (0.05kV≤V≤0.5kV)	20mA (0.5kV<V≤6kV) 2mA (0.05kV≤V≤0.5kV)
Voltage Regulation	±(1% of rdg + 5V) [full load→no load]	±(1% of rdg + 5V) [full load→no load]
Voltmeter Accuracy	±(1% of rdg + 5V)	±(1% of rdg + 5V)
Current Measurement Range	0.001mA~10.0mA	0.001mA~20.0mA
Current Best Resolution	0.001mA/0.01mA/0.1mA	0.001mA/0.01mA/0.1mA
DC Current Measurement Accuracy	±(1.5% of rdg+30counts)when HI SET <1.11mA ±(1.5% of rdg+3counts)when HI SET ≥1.11mA	±(1.5% of rdg+30counts)when HI SET <1.11mA ±(1.5% of rdg+3counts)when HI SET ≥1.11mA
Window Comparator Method	Yes	Yes
ARC Detect	Yes	Yes
RAMP (Ramp-Up Time)	0.1s~999.9s	0.1s~999.9s
TIMER (Test Time)*	OFF, 0.5s~999.9s	OFF, 0.5s~999.9s
Sweep Function*	NOT Support	Yes
GND	ON/OFF	ON/OFF



SPECIFICATIONS				
		GPT-9800 Series		GPT-9900 Series
INSULATION RESISTANCE				
Output Voltage	50V~1000V dc		50V~1000V dc	
Output-Voltage Resolution	50V/step		50V/step	
Output-Voltage Accuracy	±(1% of setting +5V)[no load]		±(1% of setting +5V)[no load]	
Resistance Measurement Range	1M Ω~ 9500M Ω		0.001G Ω~ 50.00G Ω	
Test Voltage	Measurable Range	Accuracy	Measurable Range	Accuracy
50V≤V≤450V	1 ~ 50M Ω	±(5% of rdg+1count)	0.001~0.050G Ω	±(5% of rdg+1count)
	51 ~ 2000M Ω	±(10% of rdg+1count)	0.051~2.000G Ω	±(10% of rdg+1count)
500V≤V≤1000V	1 ~ 500M Ω	±(5% of rdg+1count)	0.001~0.500G Ω	±(5% of rdg+1count)
	501 ~ 9500M Ω	±(10% of rdg+1count)	0.501~9.999G Ω	±(10% of rdg+1count)
			10.00~50.00G Ω	±(20% of rdg+1count)
Window Comparator Method	Yes		Yes	
Output Impedance	600k Ω		600k Ω	
RAMP (Ramp-Up Time)	0.1s~999.9s		0.1s~999.9s	
TIMER (Test Time)	0.5s~999.9s		0.5s~999.9s	
GND	OFF (fix)		OFF (fix)	
Sweep Function*	NOT Support		Yes	
GROUND BOND				
Output-Current	03.00A~30.00A ac		03.00A~32.00A ac	
Output-Current Resolution	0.01A		0.01A	
Output-Current Accuracy	3A≤I≤8A : ±(1% of setting+0.2A), 8A< I≤30A : ±(1% of setting+0.05A)		3A≤I≤8A : ±(1% of setting+0.2A), 8A< I≤32A : ±(1% of setting+0.05A)	
Test-Voltage	6Vac max (open circuit)		6Vac max (open circuit)	
Test-Voltage Frequency	50Hz/60Hz selectable		50Hz/60Hz selectable	
Resistance Measurement Range	10m Ω~ 650.0m Ω		10m Ω~650.0m Ω	
Resistance Measurement Resolution	0.1m Ω		0.1m Ω	
Resistance Measurement Accuracy	±(1% of rdg + 2m Ω)		±(1% of rdg + 2m Ω)	
Window Comparator Method	Yes		Yes	
TIMER (Test Time)	0.5s~999.9s		0.5s~999.9s	
Sweep Function*	NOT Support		Yes	
Test Method	Four Terminal		Four Terminal	
MEMORY				
Single Step Memory	MANU : 100 blocks		MANU : 100 blocks	
Automatic Testing Memory	AUTO : 100 blocks, menu per auto:16		AUTO : 100 blocks, menu per auto:16	
INTERFACE				
Rear Output	NOT Support		Standard	
RS-232C	Standard		Standard	
USB	Standard		Standard	
GPIO	Option		Option	
Remote Terminal (Front)	Standard		Standard	
Signal I/O	Standard		Standard	
DISPLAY	240 x 64 Ice Blue Dot matrix LCD		240 x 64 Ice Blue Dot matrix LCD	
POWER SOURCE				
	AC100V/120V/220V/230V±10%, 50/60Hz; Power Consumption : Max. 500VA		AC100V/120V/220V/230V±10%, 50/60Hz; Power Consumption : Max. 1000VA	
DIMENSIONS & WEIGHT				
	330(W) x 148(H) x 452(D) mm Approx. 19kg max.		330(W)x148(H)x482(D)mm(GPT-9902A/9901A/9903A); 330(W)x148(H)x587(D)mm(GPT-9904); Approx. 27kg max.	

\* The sweep function and timer off can only be performed when the tester is in the special MANU mode.

## ORDERING INFORMATION

GPT-9904	AC 500VA AC/DC Withstanding Voltage/Insulation Resistance/Ground Bond Tester
GPT-9903A	AC 500VA AC/DC Withstanding Voltage/Insulation Resistance Tester
GPT-9902A	AC 500VA AC/DC Withstanding Voltage Tester
GPT-9901A	AC 500VA AC Withstanding Voltage Tester
GPT-9804	AC 200VA AC/DC Withstanding Voltage/Insulation Resistance/Ground Bond Tester
GPT-9803	AC 200VA AC/DC Withstanding Voltage/Insulation Resistance Tester
GPT-9802	AC 200VA AC/DC Withstanding Voltage Tester
GPT-9801	AC 200VA AC Withstanding Voltage Tester

### ACCESSORIES :

Quick Start Guide x 1, Power cord x 1, CDx1 (complete user manual), Interlock Key x 1, Remote Cable GHT-119 x 1, Test lead GHT-114 x 1 for GPT-9903A/9902A/9901A/9803/9802/9801, Test lead GHT-114 x 1, GTL-115 x 1 for GPT-9904/9804

### OPTION

Opt.1	GPIO card	Opt.3	GSB-02(6CH H.V./2CH G.B.) Multiplex Scanner Box
Opt.2	GSB-01(8CH H.V.) Multiplex Scanner Box		

### OPTIONAL ASSESSORIES

GHT-113	High Voltage Test Pistol	GTL-247	USB Cable, A-A type, approx. 1.8m
GHT-117	HV Adapter/HV Adapter(EU)	GTL-232	RS-232C Cable, 9-pin Female to 9-pin null Modem for Computer
GHT-118	HV/GB Adapter, HV/GB Adapter(EU)		Rack Mount Kit
GHT-205	High Voltage Test Probe	GRA-417	Rack Mount Kit for GPT-9904 only
GTL-248	GPIO Cable, approx. 2m	GRA-433	

### FREE DOWNLOAD

PC Software GPT-9000

## Interlock Key



## GHT-119 Remote Cable

Approx. 500mm



## GHT-114 Clip High Voltage Probe

Approx. 1m

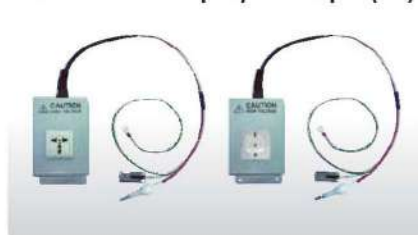


## GTL-115 Test Lead

Approx. 1m



## GHT-117 HV Adapter/HV Adapter(EU)



## GHT-118 HV/GB Adapter HV/GB Adapter(EU)





# Multiplex Scanner Box

ZL201420282101.8



## GSB-01/02



### FEATURES

- \* Model : GSB-01 (8CH High Voltage Scanner Box), GSB-02 (6CH High Voltage and 2CH Ground Bond Scanner Box)
- \* Multi-channel Outputs for Withstanding Voltage, Insulation Resistance, Ground Bond Tests
- \* High-intensity LED for Channel, Status & Judgment Indications
- \* Front & Rear Input Connector Design is Suitable for the GPT-9800/9900/9900A Series
- \* A Maximum of 4 Scanner Boxes (32 CH) can be Connected to One GPT-9800/9900/9900A Series

### GTL-235 Communication Cable

Approx. 700mm



### GHT-116R Test Lead

Approx. 1500mm



### GHT-116B Test Lead

Approx. 1500mm



The GSB-01/GSB-02, multiplex scanner box, is a dedicated option for GPT-9800/9900/9900A Series. The GSB-01 has connections for ACW, DCW and IR testing, while the GSB-02 also includes support for GB testing. It will provide reliable withstanding voltage, insulation resistance and ground bond testing for the electronic products and components.

This scanner box handles withstanding voltage 5kVac / 6kVdc and insulation resistance voltage 1kVdc as well as the ground bond current 40Aac supplied from safety tester proper. Each scanner box extends the output to 8 channels, a potential HI, LO or X can be set for each channel and AC/DC withstanding voltage, insulation resistance or ground bond test can be conducted depending on the model of scanner box.

A maximum 4 scanner boxes can be connected to one GPT-9800/9900/9900A series, it allows the output channel can be extended up to 32 channels. It is particularly well suited for multi-point safety testing as well for volume testing on factory floors.

SPECIFICATIONS		
	GSB-01	GSB-02
HIGH VOLTAGE RATING		
	5kVac/ 6kVdc	5kVac/ 6kVdc
HIGH CURRENT RATING		
	----	40Aac
NUMBER OF H.V. CHANNELS		
	8CH	6CH
NUMBER OF G.B CHANNELS		
	----	2CH
MAXIMUM NUMBER OF SCANNERS		
	4 Scanners (up to 32 channels)	
INTERFACE		
	RS-232C for connection between tester or scanner box	
POWER SOURCE		
	AC 100-240V $\pm$ 10%, 50/60Hz; Power Consumption : Max. 50VA	
DIMENSIONS & WEIGHT		
	GSB-01 : 330(W) x 101(H) x 399(D) mm	
	GSB-02 : 330(W) x 101(H) x 413(D) mm	
	Approx. 5.5kg	

### ORDERING INFORMATION

- GSB-01** Multiplex Scanner Box – 8CH H.V.  
**GSB-02** Multiplex Scanner Box – 6CH H.V./ 2CH G.B

#### ACCESSORIES:

Quick Start Guide x 1, Power Cord x 1, CD x 1 (Complete user manual),  
H.V. Wiring Lead GHT-108 x 1, G.B Wiring Lead GHT-109 x 1 (GSB-02 only),  
Communication Cable GTL-235 x 1  
Test Lead for GSB-01 : GHT-116R x 8, GHT-116B x 1  
Test Lead for GSB-02 : GHT-116R x 6, GHT-116B x 1, GTL-116R x 2, GTL-116B x 1

#### OPTIONAL ASSESSORIES

- GRA-438** Rack Mount Kit



**GSB-01**



**GSB-02**

**GSB-01 Rear Panel**

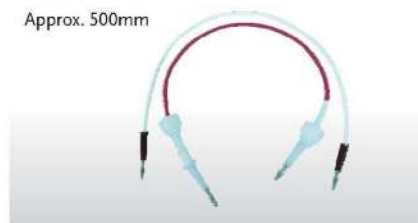


**GSB-02 Rear Panel**



**GHT-108 H.V. Wiring Lead**

Approx. 500mm



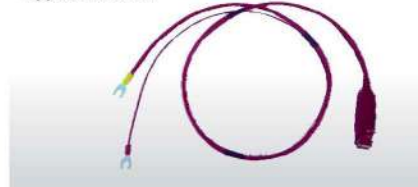
**GHT-109 G.B Wiring Lead**

Approx. 450mm



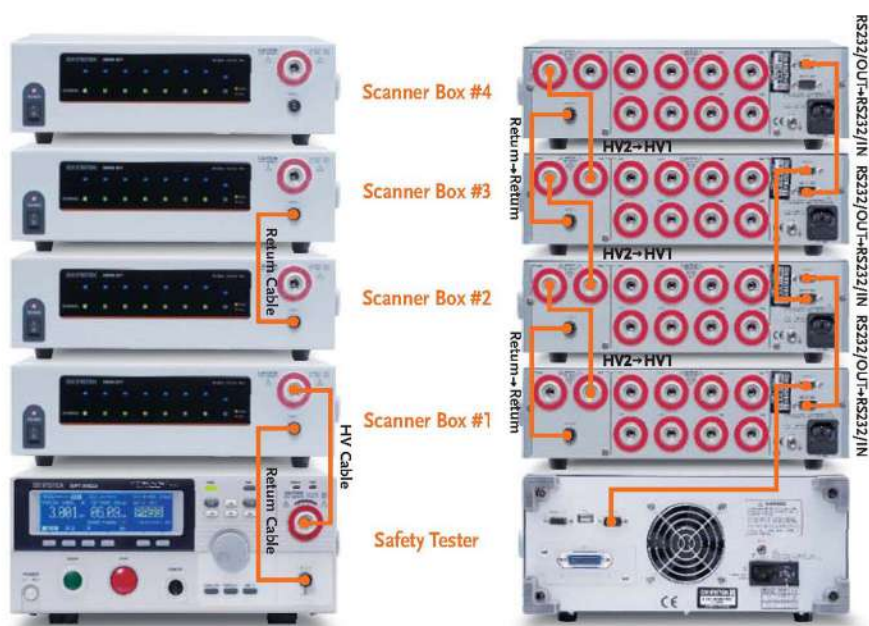
**GTL-116R Test Lead**

Approx. 1500mm



**GTL-116B Test Lead**

Approx. 1500mm





# AC Ground Bond Tester



## GCT-9040



### FEATURES

- \* AC 40A Ground Bond Tester
- \* Measuring Resistance from  $1\text{m}\Omega$ ~ $650\text{m}\Omega$
- \* Connect with the GPT-9800/9900 Series to Become a Sequential Test or Simultaneous Test System
- \* 240x64 Ice Blue Dot Matrix LCD
- \* Function Key for Quick Selecting
- \* High Intensity Flash for Caution & Status Indication
- \* PWM Switching Amplifier to Enhance the Power Efficiency and Reliable Testing
- \* Max. 100 Memory Block for Test Condition Setting
- \* Remote Terminal on the Front Panel for "Start" and "Stop" Remote Active
- \* Interface : USB Device, Signal I/O and GPIB (optional)

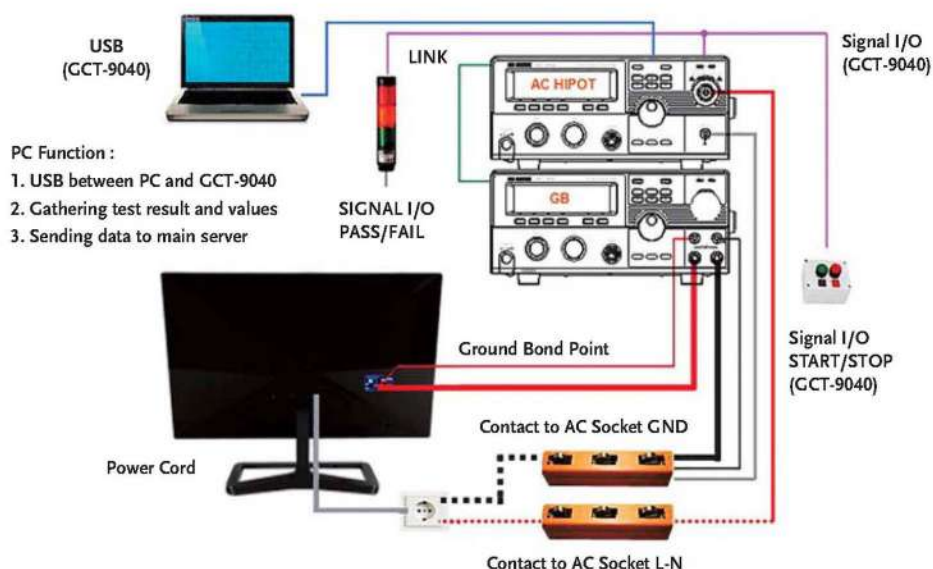
GW Instek rolls out 40A AC ground bond tester - GCT-9040 to augment the existing safety tester product line and to replace the legacy model GCT-630. GCT-9040 provides the maximum AC test current of 40A and adopts the PWM design the same as other models to ensure test efficiency and reliability. Furthermore, large LCD display, 100 memory blocks from setting criteria, and programmable communications interface together deliver users with higher readability and convenience.

In addition to the standalone ground bond test operation, GCT-9040, with 40A AC ground bond test capability, can also externally connect with GW Instek safety testers such as GPT-9800/9900/9900A series to augment users' product test requirements by the all-in-one test platform. For instance, GPT-9802 (AC/DC withstanding tester), via external connection, can be expanded to a safety tester system with three testing functionalities.

Additionally, after the safety tester system has been assembled, not only the sequential test function for the original all-in-one models can be executed, but also the simultaneous output test can be conducted. The simultaneous output test allows two testers to simultaneously test DUT so as to shorten the overall test time. Whether the safety tester system executes sequential test or simultaneous output test, GCT-9040 will automatically obtain control over two testers, including activation control, final status indication light, and pin signal output from Digital I/O etc. to avoid confusion caused by each tester's indication light.

Last but not least, GCT-9040, with respect to remote control and data retrieval, not only provides standard USB (optional GPIB) interface to control all functionalities but also controls connected safety testers (GPT-9800/9900/9900A series) via commands to read measurement results.

### SIMULTANEOUS TEST (SCHEMATIC DIAGRAM FOR CONNECTION)





**GCT-9040**

**Rear Panel**



#### SPECIFICATIONS

##### GROUND BOND

Output-Current	03.00A~ 40.00A ac
Output-Current Resolution	0.01A
Output-Current Accuracy	3A ≤ I ≤ 8A: ±(1% of setting + 0.2A) 8A < I ≤ 40A: ±1% of setting + 0.05A
Test-Voltage	8Vac max (open circuit)
Test-Voltage Frequency	50Hz/60Hz selectable
Resistance Measurement Range	1.0mΩ ~ 650.0mΩ
Resistance Measurement Resolution	0.1mΩ
Resistance Measurement Accuracy	±(1% of reading + 2mΩ)
Window Comparator Method	Yes
TIMER (Test Time)	0.5s~999.9s
GND	OFF (fix)
Test Method	Four Terminal

##### MEMORY

Single Step Memory	MANU : 100 blocks
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##### INTERFACE

LINK	For system connection
USB	Standard
GPIO	Option
Remote Terminal (Front)	Standard
Signal I/O	Standard
Display	240 x 64 Ice Blue Dot matrix LCD

##### POWER SOURCE & CONSUMPTION

Source	AC 100 V / 120 V / 220 V / 230 V ±10%, 50/60Hz
Consumption	Max. 700VA

##### DIMENSIONS & WEIGHT

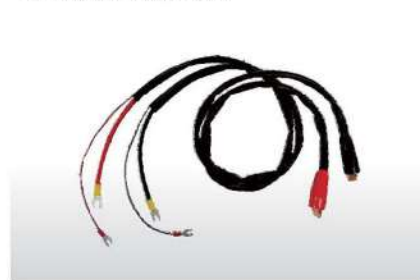
330(W) x 148(H) x 460(D) mm; Approx. 17kg max.

**GHT-119 Remote Cable**

Approx. 500mm



**GTL-215 Test Lead**



**GTL-132 LINK Cable**



#### ORDERING INFORMATION

**GCT-9040** 40A AC Ground Bond Tester

##### ACCESSORIES:

Quick Start Guide x 1, Power cord x 1, Test lead GTL-215 x 1, LINK cable GTL-132 x 1, USB cable GTL-247 x 1, Remote Cable GHT-119 x 1, Interlock key x 1, CD x1 (complete user manual)

##### OPTION

Opt.1 GPIO card

##### OPTIONAL ASSESSORIES

**GTL-248** GPIO Cable, approx. 2m

**GRA-417** Rack Mount Kit



# AC/DC Withstanding Voltage/Insulation Resistance Tester



## GPT-9600 Series



### FEATURES

- \* 100VA AC Test Capacity
- \* 240 x 48 Ice Blue Dot Matrix LCD
- \* True RMS Current Measurement
- \* ARC Detection
- \* Zero Crossing Turn-on Operation
- \* PWM Switching Amplifier to Enhance the Power Efficiency and Reliable Testing
- \* Automatically Switching Input Source for World-wide Input Voltage
- \* Light Design and Easy to Operation

GW Instek launches new economical safety testers, the GPT-9600 Series, which offers an affordable solution for supporting routine tests of major items of the safety standards such as IEC, EN, UL, CSA, GB, JIS and other safety regulations.

The GPT-9600 Series is built upon a platform of 100VA AC maximum power output. The GPT-9603 is a 3-in-1 model capable of performing AC withstanding, DC withstanding and insulation resistance tests. The GPT-9612 is capable of performing AC withstanding and insulation resistance tests. The GPT-9602 is capable of performing AC and DC withstanding tests, and GPT-9601 is able to perform AC withstanding test. The GPT-9600 Series is equipped with the high-efficiency PWM amplifier, which is the core of the platform design to impede the influence from the input AC voltage fluctuation and ensure a stable voltage output.

Following a tidy and easy-to-use design concept, the GPT-9600 Series renders users an intuitive operation environment by a simple and clear panel layout, a large LCD display and color LED indicators. The switching power supply, used as a universal input source, accommodates the power systems in most countries in the world. The GPT-9600 series, equipped with the same output voltage function as that of all GW Instek Safety Testers, indicates the expected output voltage before high voltage tests are applied. Furthermore, an AUTO mode, including test sequence selections of withstanding-then-insulation or insulation-then-withstanding, is designed for models carrying insulation Resistance test function to reduce the testing time of dual test items.

Other functions and features of GPT-9600 include: the zero crossing turn-on operation protects DUT from the impact of surge voltage output, the interlock function safeguards users from the hazardous shock of unintentional touch of the voltage output, a remote output on-off terminal in the front panel and a signal I/O port in the rear panel are provided as the means for remote start/stop control of the safety tester.

### SPECIFICATIONS

#### AC WITHSTANDING

Output-Voltage Range	0.10kV~ 5.00kV ac
Output-Voltage Resolution	10V
Output-Voltage Accuracy	± (1.5% of setting + 2 counts) with no load
Maximum Rated Load	100VA(5kV/20mA)
Maximum Rated Current	20mA (0.5kV<V≤5kV); 5mA (0.1kV≤V≤0.5kV)
Output-Voltage Waveform	Sine wave
Output-Voltage Frequency	50Hz/60Hz selectable
Voltage Regulation	±(1.5% + 2 counts) [full load → no load]
Voltmeter Accuracy	±(1.5% of rdg + 2 counts)
Current Measurement Range	0.01mA~20.0mA
Current Best Resolution	0.01mA/0.1mA
Current Measurement Accuracy	±(2.0% of rdg+5 counts)when HI SET<1.00mA ; ±(2.0% of rdg+3counts)when HI SET≥1.00mA
Current Judgment Accuracy	±(3.0% of setting+5 counts)when HI SET<1.00mA ; ±(3.0% of setting+3counts)when HI SET≥1.00mA
Window Comparator Method	Yes
ARC Detect	Yes
RAMP (Ramp-Up Time)	0.1s fixed
TIMER (Test Time)	OFF, 1s~180s
GND	ON

#### DC WITHSTANDING

Output-Voltage Range	0.10kV~6.00kV dc
Output-Voltage Resolution	10V
Output-Voltage Accuracy	± (1.5% of setting + 2 counts) with no load
Maximum Rated Load	25W(5kV/5mA)
Maximum Rated Current	6mA(0.5kV< V≤ 6kV); 2mA (0.1kV≤V≤0.5kV)
Voltage Regulation	±(1.5% + 2 counts)[full load → no load]
Voltmeter Accuracy	±(1.5% of rdg + 2 counts)
Current Measurement Range	0.01mA~6.00mA
Current Best Resolution	0.01mA
Current Measurement Accuracy	±(2.0% of rdg+5 counts)when HI SET<1.00mA ±(2.0% of rdg+3counts)when HI SET≥1.00mA
Current Judgment Accuracy	±(3.0% of setting+5 counts)when HI SET<1.00mA ±(3.0% of setting+3counts)when HI SET≥1.00mA
Window Comparator Method	Yes
ARC Detect	Yes
RAMP (Ramp-Up Time)	0.1s fixed
TIMER (Test Time)	OFF, 1s~180s
GND	ON

#### INSULATION RESISTANCE

INSULATION RESISTANCE		
Output Voltage	50V, 100V, 250V, 500V, 1000V dc	
Output-Voltage Accuracy	±(3.0% of setting +1 count)[no load]	
Resistance Measurement Range	1MΩ ~ 2000MΩ	
Test Voltage	Measurable Range	Accuracy
50V/100V/250V	1 ~ 50MΩ	±(5% of rdg + 2MΩ)
	51 ~ 2000MΩ	±(10% of rdg + 2MΩ)
500V/1000V	1 ~ 500MΩ	±(5% of rdg + 2MΩ)
	501 ~ 2000MΩ	±(10% of rdg + 2MΩ)



## GPT-9600 Series

### SPECIFICATIONS

Window Comparator Method	Yes
Output Impedance	600k $\Omega$
RAMP (Ramp-Up Time)	0.1s fixed
TIMER (Test Time)	OFF, 1s~180s
GND	OFF (fix)
<b>TEST MODE *</b>	
Single	ACW, DCW, IR
Auto	AC-IR, IR-AC, DC-IR, IR-DC
<b>INTERFACE</b>	
Remote Terminal (Front)	Standard
Signal I/O	Standard
<b>DISPLAY</b>	
	240 x 48 Ice Blue Dot matrix LCD
<b>POWER SOURCE</b>	
	AC100V~120V/220V~240V $\pm$ 10% , 50/60Hz
<b>POWER CONSUMPTION</b>	
	400VA Max.
<b>DIMENSIONS &amp; WEIGHT</b>	
	330(W)x148(H)x385(D)mm; Approx. 9kg max.

\* The available "Test Mode" depends on selected model

### ORDERING INFORMATION

GPT-9603 AC 100VA AC/DC Withstanding Voltage/Insulation Resistance Tester  
 GPT-9612 AC 100VA AC Withstanding Voltage/Insulation Resistance Tester  
 GPT-9602 AC 100VA AC/DC Withstanding Voltage Tester  
 GPT-9601 AC 100VA AC Withstanding Voltage Tester

#### ACCESSORIES :

Quick Start Guide x 1, Power cord x 1, CD x 1 (complete user manual), Interlock Key x 1,  
 Remote Cable GHT-119 x 1, Test lead GHT-114 x 1

#### OPTIONAL ASSESSORIES

GHT-113 High Voltage Test Pistol  
 GRA-417 Rack Mount Kit  
 GHT-205 High Voltage Test Probe  
 GHT-117 HV Adapter/HV Adapter(EU)

#### Rear Panel



#### Interlock Key



#### GHT-119 Remote Cable

Approx. 500mm



#### GHT-114 Clip High Voltage Probe

Approx. 1m



#### GHT-117 HV Adapter/HV Adapter(EU)





# Leakage Current Tester



## GLC-9000



### FEATURES

- \* Suitable for General Electrical of Leakage Current Measurement
- \* Touch Panel with Color LCD Display
- \* 9 Different Measurement Network to Simulate the Resistance of Human Body
- \* 50 Sets Preset Test Conditions Conform to the IEC 60990 ; 30 Sets Memories for Customer Defined
- \* 8 Different Types of Leakage Current
- \* Meter Function with SELV/CONV Function
- \* Upper & Lower Limitation for PASS/FAIL Judgment
- \* Various Leakage Current Measuring Mode : DC/AC/AC+DC/AC Peak
- \* Various Standard Interfaces : RS-232/ GPIB/USB Host & Device/EXT I/O

#### GTL-207A Test Lead

Approx. 0.8m



#### GLC-01 Alligator Clips



#### GLC-02 Foil Probe



The GLC-9000, leakage current tester, is used to perform leakage current (or called touch current) tests on general purpose electric (IEC 60990) equipment. This tester engages with nine measurement networks (or called Measuring Device) to provide the simulation of human body whilst the EUT (equipment under test) is taking a leakage current testing, in compliance with the specific standards or regulations such as IEC, UL, JIS...etc..

In order to provide a simple operation environment, the GLC-9000 equips a large TFT LCD touch panel to configure system as well as to present the measurement settings information and result simultaneously. Besides, there are 50 preset testing conditions, which conform to IEC60990 and other standards, for general electric equipment can be recalled to reduce the setting time. In addition, 30 sets of empty memory are available for user defined.

A Meter mode is also available for the GLC-9000. It uses the measurement terminal (T1/T2) to measure voltage as the same way of ordinary voltmeter. During the voltage measurement, the SELV function (safety extra low voltage) is applicable to detect the voltage value between measuring points whether exceeding the SELV setting.

### SPECIFICATIONS

	Ranges	Range	Resolution	Accuracy
<b>DC</b>				
	25.00mA	5.00mA ~ 25.00mA	10 $\mu$ A	$\pm(0.2\%rdg+3dgt)$
	5.000mA	0.500mA ~ 5.000mA	1 $\mu$ A	$\pm(0.2\%rdg+3dgt)$
	500.0 $\mu$ A	50.0 $\mu$ A ~ 500.0 $\mu$ A	0.1 $\mu$ A	$\pm 1.0\%fs$
	50.00 $\mu$ A	4.00 $\mu$ A ~ 50.00 $\mu$ A	0.01 $\mu$ A	$\pm 1.0\%fs$
<b>AC or AC+DC</b>				
	25.00mA	5.00mA ~ 25.00mA	10 $\mu$ A	10Hz<f $\leq$ 100kHz $\pm(2.0\%rdg+6dgt)$ 100kHz<f $\leq$ 1MHz $\pm(2.0\%rdg+10dgt)$
	5.000mA	0.500mA ~ 5.000mA	1 $\mu$ A	$\pm(2.0\%rdg+6dgt)$ $\pm(2.0\%rdg+10dgt)$
	500.0 $\mu$ A	50.0 $\mu$ A ~ 500.0 $\mu$ A	0.1 $\mu$ A	$\pm(2.0\%rdg+6dgt)$ $\pm(2.0\%rdg+10dgt)$
	50.00 $\mu$ A	4.00 $\mu$ A ~ 50.00 $\mu$ A	0.01 $\mu$ A	$\pm 2.0\%fs$ $\pm 2.0\%fs$
<b>AC PEAK</b>				
	75.0mA	10.0mA ~ 25.0mA	100 $\mu$ A	20Hz<f $\leq$ 1kHz $\pm(2.0\%rdg+2dgt)$ 1kHz<f $\leq$ 10kHz $\pm(5.0\%rdg+10dgt)$
	10.00mA	1.00mA ~ 10.00mA	10 $\mu$ A	$\pm(2.0\%rdg+2dgt)$ $\pm(5.0\%rdg+10dgt)$
	1.000mA	500 $\mu$ A ~ 1.000mA	1 $\mu$ A	$\pm 2.5\%fs$ $\pm 5.0\%fs$
	500.0 $\mu$ A	40.0 $\mu$ A ~ 500.0 $\mu$ A	0.1 $\mu$ A	$\pm 4.0\%fs$ $\pm 5.0\%fs$
<b>EUT (V/I CHECK)</b>				
Voltage	300V	85V ~ 300V	0.1V	$\pm(2\%rdg+10dgt)$
Current	10A	0.5A ~ 10A	0.1A	$\pm(2\%rdg+5dgt)$
<b>METER MODE</b>				
	AC/DC	10.0 ~ 300.0V	0.1V	$\pm(3\%rdg+2V)$
	AC+DC	10.0 ~ 300.0V	0.1V	$\pm(3\%rdg+2V)$
	AC Peak	15.0 ~ 430.0V	0.1V	$\pm(3\%rdg+2V)$
<b>INTERFACE</b>				
RS-232C, GPIB, USB Host & Device, EXT I/O				
<b>POWER SOURCE</b>				
For GLC-9000: AC 100V/120V/220V/230V $\pm$ 10%, 50/60Hz; Power Consumption: Max. 30VA For EUT: AC 85V ~ 250V, 50/60Hz				
<b>DIMENSIONS &amp; WEIGHT</b>				
330 (W) x 150 (H) x 350 (D) mm; Approx. 5kg				

### ORDERING INFORMATION

**GLC-9000** Leakage Current Tester

#### ACCESSORIES :

User manual x 1, Power cord x 2, Test lead(GTL-207) x 2, CD x1 (Complete user manual), Alligator clips(GLC-01) x 4(Red x 2/Black x 2), Foil probe(GLC-02) x 1,

#### OPTIONAL ACCESSORIES

**GTL-232** RS-232C Cable  
**GTL-240** USB Cable, USB 2.0, A-B Type (L Type), 1200mm  
**GTL-246** USB Cable, USB 2.0 A-B TYPE CABLE, 4P  
**GTL-248** GPIB Cable (2.0m)



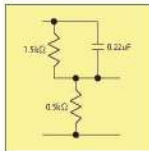
GLC-9000

Rear Panel

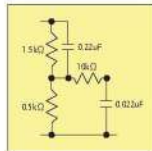


## MEASUREMENT NETWORK (MD)

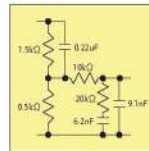
MD-A



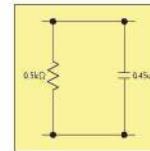
MD-B



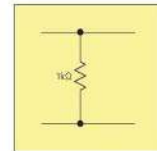
MD-C



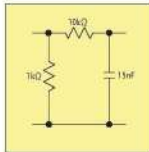
MD-D



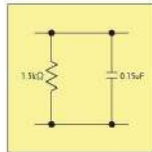
MD-E



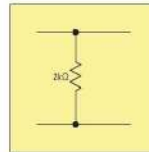
MD-F



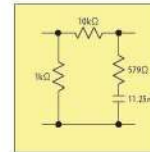
MD-G



MD-H



MD-I

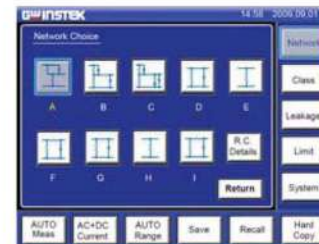


## A. SIMPLE AND INTUITIVE SYSTEM



The color TFT touch screen makes operation intuitive and simple, whilst making it easier to observe test result.

## B. VARIOUS MEASUREMENT NETWORK



Nine Measurement Network are available for measuring the leakage current of electrical and medical equipment.

## C. VARIOUS STANDARD INTERFACES



The various practical interfaces are equipped as standard making control convenient and flexible.





## OTHER METERS

In order to provide customers with a complete "one stop shopping" solution, GW Instek also offers many other special test and measurement instruments for different applications. For current measurement, PCS-1000I is a high-precision D.C. and A.C. Current Shunt Meter which carries built-in current shunts and high-accuracy current measurement circuits. For power related measurement, bench-top GPM-8213(A.C./D.C) power meter is suitable for middle to high-end applications. If you need to measure the impedance of material components, the GOM-800 Series D.C. milli-ohm meter is your ideal tool. As for audio signals related measurements, GW Instek provides GAD-201G automatic distortion meter and GVT-417B/GVT-427B A.C. millivolt meters. We also supply several models of the GFC-8000 Series frequency counters with ranges of 2.7GHz, 1.3GHz and 120MHz. Other special application instruments such as digital IC tester and logic probe (pulser included) are also available.

## PRODUCTS

- |                                 |                              |
|---------------------------------|------------------------------|
| • DC Milli-Ohm Meter            | • Logic Probe & Pulser       |
| • Digital Power Meter           | • Automatic Distortion Meter |
| • Digital IC Tester             | • AC Millivolt Meter         |
| • Precision Current Shunt Meter | • Frequency Counter          |
| • Battery Meter                 |                              |

## OTHER APPLICATION METERS

### COMPONENTS TESTING INSTRUMENT

MODEL	Description (Main Function)	Page
GOM-805	DC Milli-Ohm Meter 5mΩ ~ 5MΩ	E53-56
GOM-804	DC Milli-Ohm Meter 5mΩ ~ 5MΩ	E53-56
GUT-6000B	Digital IC Tester	E57
GUT-6600A	Handy Digital IC Tester	E57
GBM-3300	300V Battery Meter (including RS-232C/USB device/host and HANDLER interface)	E58-60
GBM-3080	80V Battery Meter (including RS-232C/USB device/host and HANDLER interface)	E58-60

### OTHER

MODEL	Description (Main Function)	Page
GLP-1A	Logic Probe & Pulser	E61

### POWER RELATED INSTRUMENT

MODEL	Description (Main Function)	Page
GPM-8213	A.C./D.C Power Meter Simultaneous Display of W, A, V (PF or Hz) True RMS V, A, W; Max./Min./Hold Function	E62-64

### AUDIO RELATED INSTRUMENT

MODEL	Description (Main Function)	Page
GAD-201G	20Hz ~ 20kHz Automatic Distortion Meter	E65
GVT-427B/417B	AC Millivolt Meter (2CH/1CH)	E66

### PRECISION CURRENT SHUNT METER

MODEL	Description (Main Function)	Page
PCS-1000I	Max. Voltage, AC 600V/DC 1000V, Max. Current, AC 300A/DC 300A	E67-70

### FREQUENCY COUNTER

MODEL	Description (Main Function)	Page
GFC-8010H	10Hz ~ 120MHz Digital Frequency Counter	E71
GFC-8270H	0.01Hz ~ 2.7GHz Intelligent Counter	E72
GFC-8131H	0.01Hz ~ 1.3GHz Intelligent Counter	E72



# D.C. Milli-Ohm Meter



## GOM-804/805



### FEATURES

- \* 50,000 Counts Display
- \* 3.5" (320 x 240) TFT LCD Display
- \* High Accuracy of 0.05% Precision
- \* 1Amp Test Current, 0.1 $\mu\Omega$  Resolution
- \* Fast Measurement of 60 Readings Per Second
- \* Four wire Resistance Measurement
- \* Temperature Compensation Measurement Function
- \* Delayed Measurement
- \* 20 sets of Panel Setting Memory
- \* Dry Circuit (GOM-805 Only)
- \* Drive Modes :  
GOM-805:DC+,DC-,Pulsed,PWM,Zero,Standby  
GOM-804:DC+, Standby
- \* Interface : USB Device, RS-232C, Handler/Scan/EXT I/O, and GPIB(Optional)

GOM-804/805 feature 3.5-inch TFT display, maximum 50,000 counts measurement display, the rapid sampling rate of 60 readings per second, optimum 0.05% measurement precision, four wire measurement method as well as the temperature measurement and temperature compensation measurement function to meet the requirement of low resistance measurement application. The GOM-805 also includes various drive modes and Dry circuit for contact resistance measurement applications. More features, including 20 sets of panel setting memory and many external control interface such as RS-232C, USB, Handler/Scan/EXT IO or GPIB (option), greatly elevate GOM-804/805 milliohm meter's convenience on practical applications.

GOM-804/805 adopt 3.5-inch color LCD to enhance the clarity of measurement results and to provide display for related setting criteria that tremendously brings up the completeness of test information. Additionally, GOM-804/805, with the optimum 0.05% precision, augment the measurement speed to 60 sampling rate per second and maintain the display digits of five instead of four despite of different speed selections. Furthermore, the independent functionality keys and direction keys together increase the operational convenience which allows users to complete their measurement tasks with intuitive convenience and speed.

GOM-805 provides Dry circuit and various drive modes (DC+, DC-, Pulsed, PWM) for measurement applications on different materials. The pulsed current output mode is suitable for interacting conductors of different materials and this output mode is to reduce the thermal EMF influence, which is caused by electric potential difference generated from different conductors acting on different temperatures while conducting low resistance measurements. The DC+ and DC- output modes are best for the measurement requirements of inductive components. The PWM output mode, ideal for changing temperature sensitive materials, can avoid resistance value variation which is due to over load happened on current measurement for a long period of time. During the DC+, DC- and Pulsed drive is supplied; the Dry circuit can work with them also. Dry circuit can limit the applied voltage under the open circuit voltage of 20mV to avoid over voltage occurred on the both ends of components. The over voltage will damage the oxide coating and the thin layer of contact surface, as a result, the validity of measurement will then be ruined. For instance, contact resistance of connector measurement is one of the applications.

With respect to connecting the external control, GOM-804/805 provide a D-sub 25-pin combined interface to execute, according to the functionalities, Handler, Scan or EXT IO for respectively connecting to a sorting machine; connecting to an external on-off switch, and directly conducting external trigger control. For remote control and measurement result retrieval requirements, GOM-804/805 also provide various interface selections such as RS-232C, USB, and GPIB (GOM-804(option)/GOM-805(standard) interface. Furthermore, the control commands are compatible to that of GOM-802 that saves time in adjusting programs while switching from the old model to the new model.

To sum up, GOM-804 evolves from GOM-802 platform with more advanced functionalities and specifications, including display digits, measurement speed and standard interface (RS-232C/USB). With all the capabilities of GOM-804, GOM-805 augments itself with new measurement abilities (Dry circuit and various drive modes) to meet the requirements of broader low resistance measurement applications.

### SPECIFICATIONS

SPECIFICATIONS		GOM-804	GOM-805
DISPLAY			
	50,000 counts		
SAMPLING RATE			
Slow		10 readings / s	
Fast		60 readings / s	
RESISTANCE MEASUREMENT			
Range	Resolution	Test Current	Accuracy
5mΩ	0.1μΩ	1A	±(0.1% reading + 0.2% of range)
50mΩ	1μΩ	1A	±(0.1% reading + 0.02% of range)
500mΩ	10μΩ	100mA	±(0.05% reading + 0.02% of range)
5Ω	100μΩ	100mA	±(0.05% reading + 0.02% of range)
50Ω	1mΩ	10mA	±(0.05% reading + 0.02% of range)
500Ω	10mΩ	1mA	±(0.05% reading + 0.008% of range)
5kΩ	100mΩ	100μA	±(0.05% reading + 0.008% of range)
50kΩ	1Ω	100μA	±(0.05% reading + 0.008% of range)
500kΩ	10Ω	10μA	±(0.05% reading + 0.008% of range)
5MΩ (GOM-804)	100Ω	1μA	±(0.2% reading + 0.008% of range)
5MΩ (GOM-805)	100Ω	1μA	±(0.5% reading + 0.008% of range)
TEMPERATURE			
Range	-50°C ~ 399.9°C		
Accuracy	-10°C ~ 40°C : 0.3% 0.5°C ; Other : 0.3% 1.0°C		
Resolution	0.1°C		
DRY CIRCUIT			
	—		Open circuit less than 20mV; For 500mΩ, 5Ω, 50Ω range only



**GOM-804/805**

SPECIFICATIONS		
	GOM-804	GOM-805
DRIVE MODE		
DC+ / DC-	DC + Only	Yes
Pulsed	—	Yes
PWM	—	Yes
Zero	—	Yes
Standby(*)	Yes	Yes
OTHER FUNCTIONS		
	Trigger - Internal, Manual, External; Math - ABS, REL, %, TC; Average : 2 –10 times; Measurement Delay; TC for Transformer; Compare; Diode; Continuity beeper; Binning (GOM-805 only)	
INTERFACE		
USB	Standard	Standard
RS-232C	Standard	Standard
HANDLER/SCAN/EXT I/O	Standard	Standard
GPIO	Option (factory installed)	Standard
DISPLAY		
	3.5" (320 x 240) TFT LCD	
MEMORY		
	20 sets for panel setting	
POWER SOURCE		
	AC 100 – 240 V, 50/60Hz	
CONSUMPTION		
	25VA (max.)	
DIMENSIONS & WEIGHT		
	223 (W) x 102 (H) x 283 (D) mm ; Approx. 3kg	

Note: (\*)The Standby function must be collocated with the new PCB hardware; it is not applicable to sold instruments.

#### ORDERING INFORMATION

<b>GOM-805</b>	D.C. Milliohm Meter(Handler/RS-232C/USB Device/GPIB)
<b>GOM-804 with GPIB</b>	D.C. Milliohm Meter(Handler/RS-232C/USB Device/Opt.01 GPIB)
<b>GOM-804</b>	D.C. Milliohm Meter(Handler/RS-232C/USB Device)

#### ACCESSORIES :

Quick Start Guide x 1, Power cord x 1, Test lead GTL-308 x 1, CD x 1 (complete user manual)

#### OPTION

Opt.01	GPIB Card (only for GOM-804 and must be installed at factory before shipment)
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#### OPTIONAL ACCESSORIES

<b>PT-100</b>	Platinum Temperature Probe
<b>GTL-232</b>	RS-232C cable 9-pin, F-F type, approx. 2000mm
<b>GTL-246</b>	USB cable, A-B type, approx. 1200mm
<b>GTL-248</b>	GPIB cable approx. 2000mm
<b>GTL-309</b>	Test lead, approx. 3m

#### FREE DOWNLOAD

Driver	LabView Driver
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#### Rear Panel



#### GTL-308 Test lead

Approx. 1.5m



#### GTL-309 Test lead

Approx. 3m



#### PT-100 Temperature Probe

Approx. 1.5m





# D.C. Milli-Ohm Meter

## A. TOTALLY REPLACING THE EXISTING MODELS



In terms of the basic functionalities and specifications, GOM-804/805 can absolutely replace the existing model\_GOM-802. All GOM-802 functionalities can be found from GOM-804/805, including resistance measurement range, 1A test current (maximum), four wire measurement method, temperature probe (option, accessory model : PT-100) for temperature measurement and temperature compensation measurement,

etc.The programming commands are also compatible to that of GOM-802. To simply put it, the brand new GOM-804/805 not only provide better display interface, fast measurement (60 readings per second), but also collocate with standard communications interface (RS-232C/USB device) to facilitate users in accomplishing measurement tasks rapidly. On top of that, model switching will not be a problem.

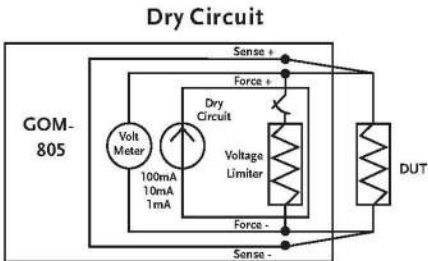
## B. FASTER MEASUREMENT WITHOUT SACRIFICING RESOLUTION



GOM-804/805 has two measurement speed selections, which are Fast reaching 60 readings per second, and Slow 10 readings per second. A major departure from the past, users, in the past, had to juggle between speed and display resolution. GOM-804/805 will not affect resolution

despite of any speed selections and will maintain the highest display digits. In other words, reading resolution will not be changed by changing speed and the display digits remain the same.

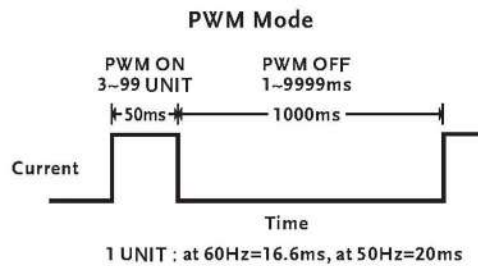
## C. DRY CIRCUIT TEST FOR GOM-805 ONLY



Dry circuit is to limit test voltage and current to certain levels which will not cause contact points to produce physically or electrically changed circuit and its most frequently used application is contact resistance of connector measurement. Based upon MIL-STD-1344 method 3002-1 low signal level contact resistance, tests must be applied under the maximum open circuit voltage of 20mV (or lower), and short circuit current of 100mA (or lower)

to avoid over voltage for the both ends of components. The over voltage will damage the oxide coating and the thin layer of contact surface, as a result, the validity of measurement will then be ruined. GOM-805 provides three levels (500mΩ:100mA/5Ω:10mA/50Ω:1mA) to limit open circuit voltage at 20mV to execute Dry circuit tests.

## D. VARIOUS DRIVE MODES FOR GOM-805 ONLY



GOM-805 provides various current output drive modes to satisfy diversified and accurate low resistance measurement applications. For instance, for interacting conductors of different materials, the pulsed current output mode can be applied to reduce the thermal EMF influence, which is caused by different conductors acting on different temperatures.

The PWM output mode, ideal for changing temperature sensitive materials, can avoid resistance value variation which is due to over load on large current measurement in a long period of time. The DC+ and DC- output modes are best for the measurement requirements of inductive components.

## E. STANDARD INTERFACE FOR CONTROL AND COMMUNICATIONS



With respect to connecting the external control, GOM-804/805 provide a D-sub 25-pin composite interface to execute, according to the functionalities, Handler, Scan or EXT IO for connecting to a sorting machine; connecting to an external on-off switch, and directly conducting external trigger control respectively. For remote control and measurement result retrieval requirements, GOM-804/805 also provide various interface

selections such as RS-232C, USB, and GPIB GOM-804(option)/GOM-805 (standard) interface. The commands of GOM-804/805 are compatible to that of GOM-802 that allows users to switch equipment with simple settings. There is no cost in adjusting existing programs and production delay will not be happening while switching from the old model to the new model.



## Handy Digital IC Tester



### GUT-6600A



#### FEATURES

- \* Easy-Operation Tester, Particularly Designed for the Digital IC
- \* Supported Device : 74/54/40/45, Drive 2xxx
- \* Small, Portable, Light and Power-Saving
- \* Can be Operated using either DC adaptor or Batteries
- \* Average Search Time : 0.6 Second
- \* Display : 16 Characters in 1 Line LCD
- \* Test Pins : 14 ~ 24 Pins

GUT-6600A is a portable digital IC tester with features matching those of its desktop cousin, GUT-6000B. Standard DC adaptor operation or battery provides a secure power supply anytime, anywhere. Geared towards ease of use, no programming or fixtures are required when operating GUT-6600A; users simply plug in the device and a search is completed within a mere 0.6 seconds on average. All these features and compact profile make GUT-6600A the ideal choice as an additional companion in a users' tool kit.

#### SPECIFICATIONS

TEST RANGE	
	TTL 74/54 ; CMOS 40/45 ; DRIVE 2xxx
TEST VOLTAGE	
	2.5/3.0/3.3/5V
TEST TIME	
	Average Search Time : 0.6Sec
DISPLAY	
	16 Characters in 1 line LCD
POWER SOURCE	
	DC 9V/500mA adaptor or 9V battery x 2(*)
DIMENSIONS & WEIGHT	
	110(W) x 45(H) x 160(D)mm, Approx. 0.4kg

(\*) Batteries not included

#### ORDERING INFORMATION

**GUT-6600A** Handy Digital IC Tester

ACCESSORIES :  
User manual x 1, DC 9V/500mA adaptor

## Digital IC Tester



### GUT-6000B



#### FEATURES

- \* Loop Test
- \* Auto-Search
- \* Self-Diagnosis
- \* Over-Load Protection
- \* Measures 1800 Types of Device
- \* 54/74 Series TTL
- \* 4000 and 4500 Series CMOS
- \* Test Socket : 28-Pin

GUT-6000B is a desktop digital IC tester. Oriented toward automating testing tasks, GUT-6000B contains high-end features such as auto-search and loop testing. Automated processes provide an intelligent and continuous process for detecting defective ICs. Self-diagnosis functions and over-load protection mechanisms make GUT-6000B close to maintenance-free, releasing users from unnecessary hassles. The wide device coverage includes the 1800 series as well as the ubiquitous TTL and CMOS, providing a one-size fits-all solution for an IC testing bench area.

#### SPECIFICATIONS

TEST RANGE	
	TTL 74/54 ; CMOS 40/45 ; DRIVE
TEST VOLTAGE	
	2.5/3.0/3.3/5V
TEST TIME	
	Average Search Time : 0.6Sec
DISPLAY	
	16Characters in 1 line LCD
POWER SOURCE	
	AC100V~240V±10%,50/60Hz
DIMENSIONS & WEIGHT	
	335(W) x105(H) x300(D)mm, Approx. 1.5kg

(\*) Batteries not included

#### ORDERING INFORMATION

**GUT-6000B** Digital IC Tester

ACCESSORIES :  
User manual x 1, Power cord x 1

# Battery Meter



## GBM-3300/3080



### FEATURES

- \* 3.5" TFT LCD (320x240)
- \* Measurement Items: DC Voltage and AC Resistance
  - Voltage Measurement: 300V (GBM-3300) or 80V (GBM-3080)
  - Resistance Measurement: 0mΩ ~ 3.2kΩ (max.)
- \* Basic Accuracy For Voltage Measurement: 0.01%
- \* Basic Accuracy For Resistance Measurement: 0.5%
- \* Measurement Resolution up to 0.1μΩ and 10μV, Suitable For Single-cell Measurement
- \* Independent Go/NoGo Determination Function For Voltage and Resistance Respectively
- \* The Judgment Mechanism of Test Lead (Probe) Disconnect/Contact Failure is to Ensure The Measurement Reliability
- \* Standard Interfaces: USB Host/Device, RS-232C and Handler

GW Instek launches a new series of desktop battery tester, the GBM-3000 Series, which uses AC 1kHz as the test signal and measures battery's voltage and internal resistance to 300V (GBM-3300) and 80V (GBM-3080). The series features 3.5" TFT LCD, 4-wire measurement method, high-resolution (6-digit voltage/5-digit resistance) measurement display capability, and independent GO/NOGO determination of voltage and resistance, various communications interfaces, etc. to meet various types of battery measurements, ranging from single cell, battery cell, to the end product (battery), etc. so as to facilitate users in achieving accurate measurements at all stages of production.

The GBM-3000 Series provides excellent features for various types of batteries in measuring open circuit voltage and resistance. For voltage measurement, the accuracy is as high as  $\pm (0.01\% \text{ reading} + 3 \text{ digits})$ , and measurement resolution is up to 10μV (at 8V). For resistance measurement, the accuracy reaches  $\pm (0.5\% \text{ reading} + 5 \text{ digits})$  and the resolution achieves 0.1μΩ (at 3mΩ) that is especially suitable for the sorting of single cell measurements, which is to achieve a better output balance for the follow-up series and parallel connections.

In the meantime, in order to facilitate users to quickly and clearly interpret the measurement results, the GBM-3000 Series features HI/LO determination respectively based on voltage and resistance, and can be switched to the simple (big numerical display) mode to meet the requirements of test accuracy, clear and easy-to-read, and elevated inspection efficiency and capabilities.

Other than the excellent measurement capabilities, the GBM-3000 Series also provides a number of functions to ensure effectiveness and convenience. For the effectiveness, the test lead (probe) contact status detection function is to effectively prompt users whether test lead (probe) and DUT are in good contact to ensure the validity of the measured value. In terms of convenience, the GBM-3000 Series provides two data storage methods (up to 10,000 lots of measurement values). "General storage" only stores the measured voltage and resistance values; "statistical storage" has the related parameters (Cp/Ckp/Mean/MAX/MIN...) for the statistical analysis. Users can store the data from the measurement process in the internal memory first and then transfer the data to the computer via flash drive for subsequent analysis without being limited to the connection with the computer.

In addition, for retrieving and storing measurement results via the transmission method, the GBM-3000 Series provides RS-232C/USB device (virtual COM) for writing programs and retrievals. The handler interface is provided for external trigger control via PLC. All interfaces are standard-equipped that not only save the cost of instruments, but also meet the requirement of using different automated measurement systems.

### SPECIFICATIONS

#### DISPLAY

Screen	3.5" (320 x 240) TFT LCD
Resistance	5 digits
Voltage	6 digits

#### TEST SPEED

Slow	3 time/second
Medium	14 time/second
Fast	25 time/second
Ex. Fast	65 time/second

#### RESISTANCE MEASUREMENT

Test Frequency	1kHz ( $\pm 0.5\text{Hz}$ ) Fixed
Input Impedance	3mΩ ~ 300mΩ: 99kΩ, 3Ω ~ 3kΩ: 2MΩ

#### Range

Range No.	Range	Max. scale	Resolution	Test Current	Open-circuit Voltage (V <sub>pp</sub> , Max)
0	3mΩ	3.1000mΩ	0.1 μΩ	100mA	8V
1	30mΩ	31.000mΩ	1 μΩ	100mA	8V
2	300mΩ	310.00mΩ	10 μΩ	10mA	7V
3	3Ω	3.1000Ω	100 μΩ	1mA	3V
4	30Ω	31.000Ω	1mΩ	100 μA	2V
5	300Ω	310.00Ω	10mΩ	10 μA	1.5V
6	3kΩ	3200.0Ω	100mΩ	10 μA	1.5V

#### Accuracy

Range No.	Speed	Accuracy	Temperature Coefficient
0	Slow Medium Fast EX. Fast	$\pm 0.5\% \text{rdg} \pm 10 \text{dgt}$ $\pm 0.5\% \text{rdg} \pm 15 \text{dgt}$ $\pm 0.5\% \text{rdg} \pm 20 \text{dgt}$ $\pm 0.5\% \text{rdg} \pm 40 \text{dgt}$	$(\pm 0.05\% \text{rdg} \pm 1 \text{dgt}) / ^\circ\text{C}$
1~6	Slow Medium Fast EX. Fast	$\pm 0.5\% \text{rdg} \pm 5 \text{dgt}$ $\pm 0.5\% \text{rdg} \pm 7 \text{dgt}$ $\pm 0.5\% \text{rdg} \pm 7 \text{dgt}$ $\pm 1.0\% \text{rdg} \pm 8 \text{dgt}$	$(\pm 0.05\% \text{rdg} \pm 0.5 \text{dgt}) / ^\circ\text{C}$



Battery Meter

Rear Panel



GBM-3030/3080

GBM-01 4 Wire(kelvin clip) test lead, 90V(max.)  
Approx. 1.1m



GBM-02 4 Wire(single pin) test probe, 80V(max.)  
Approx. 1.1m



GBM-03 4 Wire(twin pin) test probe, 300V(max.)  
Approx. 1.4m



GBM-S1 Short Bar



SPECIFICATIONS				
VOLTAGE MEASUREMENT				
Range	Range No.	Range	Max. scale	Resolution
	0	8V	±8.08000	10 μV
	1	80V	±80.8000	100 μV
	2	300V (For GBM-3300 only)	±303.000	1mV
Accuracy	Range No.	Speed	Accuracy	Temperature Coefficient
	0~2	Slow	±0.01%rdg ± 3dgt	(±0.001%rdg ± 0.3dgt)/°C
		Medium	±0.01%rdg ± 5dgt	
		Fast	±0.05%rdg ± 5dgt	
EX. Fast		±0.10%rdg ± 6dgt		
OTHER FUNCTIONS				
Range Selection	Auto range, Hold range, Nom range			
Comparator	ABS, PER or SEQ			
Contact Detection	OPEN & WIRE			
Buzzer	OFF, Pass, Fail			
Trigger	INT, EXT			
INTERFACE				
	USB Host/USB Device/RS-232C/Handler			
POWER SOURCE				
	AC 100~240V, 50-60Hz; Consumption: 10W			
DIMENSIONS & WEIGHT				
	264(W) x 107(H) x 309(D) mm, Approx. 2.8kg			

ORDERING INFORMATION	
GBM-3300	300V Battery Meter (including RS-232C/USB device/host and HANDLER interface)
GBM-3080	80V Battery Meter (including RS-232C/USB device/host and HANDLER interface)
ACCESSORIES :	
Safety sheet x 1, Power cord x 1, GBM-01 x 1 : 4 Wire(kelvin clip) test lead, 90V(max.), approx..1100mm, CD x 1 (including complete user manual and USB driver)	
OPTIONAL ACCESSORIES	
GBM-02	4 Wire (single pin) test probe, 80V (max.), approx. 1100mm
GBM-03	4 Wire (twin pin) test probe, 300V (max.), approx. 1400mm
GBM-S1	Short Bar (for GBM-02/GBM-03)
GTL-232	RS-232C cable, 9-pin Female to 9-pin, null modem for computer, Approx. 2000mm
GTL-246	USB cable, A-B type, approx.1200mm
GRA-422	Rack Mount kit

## A. TWO DISPLAY MODES



### Standard Mode

(Setting conditions and R+V measurement parameters)

The GBM-3000 series offers two display modes to facilitate users in maximizing the benefits of their measurements – Standard mode: The main measurement parameters (three combinations: R+V/R/V) and parameter settings for the related measurements can be displayed



### Simple Mode

(R+V measurement parameters)

simultaneously. This mode is applicable to R&D design and engineering certification. Simple mode: Big numerical display only shows the results of main measurement parameters to increase the visibility of observations. This mode is suitable for production measurements.

## B. INDEPENDENT GO/NOGO DETERMINATION



### Independent HI/LO Setting

The GBM-3000 series provides independent HI/LO determination settings for both voltage and resistance and can be set according to the required mode, such as SEQ, PER or ABS. In addition to displaying



### Separate & Totally Judgement

the results of the final determination, the results of individual measurement parameters are also provided for subsequent actions.

## C. EXCELLENT SUPPLEMENTARY MEASUREMENT CAPABILITY



### Disconnect/Contact Display

In addition to providing accurate measurements, the ability of the GBM-3000 Series to supplement the measurement of production lines is also a major feature of the series. For example, the ability to detect disconnect/contact. The display screen can clearly show bad contact of the test lead (probe). The series can store up to 10,000 lots of measurement data and has the statistical calculation function to allow



### Statistical Function

the status of the production process to be clearly observed and retained in real time without any manual calculation or connection to the computer. After the measurement is completed, the result can be transferred to the computer through flash drive for long-term storage and subsequent analysis.

## D. COMPREHENSIVE STANDARD INTERFACES



Finally, the GBM-3000 series provides a variety of practical and standard-equipped interfaces including RS-232C/USB device/Handler, which are for measurement result collection in the remote program control or collocating with system integration for external trigger measurement through PLC.



# Logic Probe & Pulser



## GLP-1A (Logic Probe & Pulser)



The GLP-1A logic pulser can be used to perform in-circuit testing of TTL, CMOS, and many other logic devices at a maximum of 50MHz. GLP-1A is enhanced with a logic probe function with a minimum detectable pulse width of 10 ns, providing enough sensitivity for most applications. A Short 10 sec pulse width assures that no damage will occur to circuits whilst testing. With a weight less than 50g, a non-slip grip and an external sync input all provide comfort and reliability for various troubleshooting tasks.

### FEATURES

- \* Combining a Logic Probe and Pulser Combined into One
- \* Probe for Troubleshooting Digital Circuits
- \* Operating Voltage : 4VDC~18VDC
- \* Maximum Input Signal Frequency: 50MHz
- \* TTL : Logic "1"  $>3.0V \pm 0.25V$ , Logic"0"  $<0.75V \pm 0.25V$
- \* CMOS : Logic "1"  $>60\%VCC \pm 5\%$ , Logic"0"  $<15\% VCC \pm 5\%$
- \* Minimum Detectable Pulse Width 10nsec
- \* Pulser : Sync Input Impedance 120k $\Omega$
- \* Pulse Rate : Switchable 0.5/400Hz
- \* Pulse width : 10 $\mu$ sec
- \* Dimensions & Weight : 18(W) x 210(H) x 18(D)mm, Approx. 50g

### ORDERING INFORMATION

GLP-1A	Logic Probe & Pulser
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# Digital Power Meter



## GPM-8213



USB  
Device

LAN

RS-232

GPIB

### FEATURES

- \* 4" TFT LCD
- \* Basic Accuracy :  $\pm(0.1\% \text{ of reading} + 0.1\% \text{ of range})$
- \* Two Data Display Modes
  - Standard Display : Displaying Two Major Measurement Items + Six Minor Measurement Items
  - Simple Display : Displaying Test Data of Four Different Measurement Items
- \* Met the Requirement of IEC 62301 Power Measurement
  - Voltage/Current Test Frequency Bandwidth : DC ~ 6kHz
  - Watt Resolution : 1mW
  - Current Resolution : 0.1mA
  - Current/Voltage Measurements Reach CF=3 for Distorted Wave and CF=6 for Half Range
  - W-h Power vs Time/A-h Current vs Time Integration Function
  - Total Harmonic Distortion Measurement
- \* Front Panel Test Terminal
- \* Standard Interfaces : RS-232C, USB Device, LAN
- \* Optional Test Fixture : GPM-001

GPM-8213 power meter is designed specifically for single-phase (1P/2W) AC power supply's power measurements. Powerful features, including 4" TFT LCD, five-digit measurement display, 19 power measurement parameters, integral measurement function, high-accuracy voltage/current/power measurement capabilities, front/rear panel input terminals, and various communications ports, are to facilitate users with clear, convenient, and accurate power measurements.

GPM-8213 provides as many as 19 power measurement parameters, including voltage ( $V_{rms}/V_{+pk}/V_{-pk}$ ), current ( $I_{rms}/I_{+pk}/I_{-pk}$ ), frequency (VHz/IHz), power ( $P/P_{+pk}/P_{-pk}$ ), crest factor (CFV/CFI), apparent power (VA), reactive power (VAR), power factor (PF), phase angle (DEG), total harmonic distortion (THDV/THDI), high-accuracy voltage/current/power measurement capabilities (reading:  $\pm 0.1\%$ ; level:  $\pm 0.1\%$ ). The advantages of TFT LCD have been efficiently deployed to simple mode and standard mode. Simple mode displays conventional power meter's four measurement parameters to meet the requirement of accuracy and clarity for the test on manufacturing process. Standard mode extends the display to the maximum of 8 measurement parameters (2 major measurements + 6 monitor measurements) to satisfy the various measurement application requirements of R&D, design, and quality verification.

For DUT requiring IEC 62301/EN 50564 standby power consumption test, GPM-8213 provides the optimal measurement supports, including test frequency bandwidth of DC~6kHz, the minimum current level of 5mA (resolution: 0.1uA), power measurement resolutions (1uW for minimum current and voltage levels; 1mW for maximum current and voltage levels), crest factor reaching 3 (half range reaching 6), and measurement of total harmonic distortion (at least 13th order power harmonic). For large voltage/large current measurement applications of general power measurement, GPM-8213 provides PT/CT rate function to collocate with external potential transformer or current transformer to meet the measurement requirements.

With respect to data retrieval and storage, the standard RS-232C/USB interfaces (virtual COM)/LAN can be utilized to edit and retrieve programs or the optional GPIB interface (installed by manufacturer) can be selected to meet users' automatic test system requirements.

### SPECIFICATIONS

#### INPUT

ITEM		
RATING VOLTAGE	Voltage Current Current	Range
RATING CURRENT		600 Vrms
IMPEDANCE(50/60Hz)		20 Arms
		2.4 MΩ
		5mA~200mA:500 mΩ
		0.5A~20A:5 mΩ
MAXIMUM VOLTAGE		700 Vrms
MAXIMUM CURRENT		25 Arms
MAXIMUM COMMON MODE VOLTAGE		300 V
LOW PASS FILTER	Cutoff frequency	500 Hz

#### PARAMETERS

ITEM MEASUREMENT	Voltage Current Power Crest Factor Power Factor Frequency Angle Total Harmonic Distortion Integration	Symbol Vdc, Vrms, V+pk, V-pk Idc, Irms, I+pk, I-pk P, P+pk, P-pk, VA, Var CFV, CFI PF VHz, IHz Deg THDV, THDI
DISPLAY DIGITS		Time, WP, WP+, WP-, q, q+, q-
FREQUENCY BANDWIDTH		5 digits
AVERAGE		DC, 45Hz~6kHz
PT RATE		1, 2, 4, 8, 16, 32, 64
CT RATE		1 ~ 9999.999
DISPLAY MODE	Standard Simple	1 ~ 9999.999 8 measurement item 4 measurement item

#### VOLTAGE

ITEM		
RANGE	CF=3 CF=6	Range
CREST FACTOR		15V, 30V, 60V, 150V, 300V, 600V
ACCURACY	Effective Range	7.5V, 15V, 30V, 75V, 150V, 300V
	DC	3 or 6 (selectable)
	45Hz ≤ f ≤ 66Hz	1% ~ 105% of range
	66Hz < f ≤ 1kHz	±(0.2% of reading+0.2% of range)
	1kHz < f ≤ 6kHz	±(0.1% of reading+0.1% of range)
TEMPERATURE EFFECT	Filter(ON)	±(0.1% of reading+0.2% of range)
RESIDUAL NOISE	5-18° C / 28-40° C	±3% of reading
		Add 0.3% of reading@45Hz ~ 66Hz
		Add ±0.03% of reading/° C
		0.5% of range



# Digital Power Meter

Rear Panel



GPM-8213

GPM-001 Test Fixture/Test Fixture(EU)



GTL-209 Test Lead



## SPECIFICATIONS

CURRENT		
ITEM MEASUREMENT	CF=3 CF=6	Range 5mA,10mA,20mA,50mA,100mA,200mA,0.5A,1A,2A,5A,10A,20A 2.5mA,5mA,10mA,25mA,50mA,100mA,250mA,0.5A,1A,2.5A,5A,10A
CREST FACTOR	Effective Range	1% ~ 105% of range
ACCURACY	DC 45Hz ≤ f ≤ 66Hz 66Hz < f ≤ 1kHz 1kHz < f ≤ 6kHz Filter(ON)	±(0.2% of reading+0.2% of range) ±(0.1% of reading+0.1% of range) ±(0.1% of reading+0.2% of range) ±3% of reading Add 0.3% of reading@45Hz ~ 66Hz
TEMPERATURE EFFECT	5-18° C/28-40° C	Add ±0.03% of reading/° C
RESIDUAL NOISE		0.5% of range
POWER		
ITEM MEASUREMENT	Effective Range	Range 1% ~ 110% of range
ACCURACY	DC 45Hz ≤ f ≤ 66Hz 66Hz < f ≤ 1kHz 1kHz < f ≤ 6kHz Filter(ON)	±(0.2% of reading+0.2% of range) ±(0.1% of reading+0.1% of range) ±(0.1% of reading+0.3% of range) ±3% of reading Add 3% of reading@45Hz~66Hz
TEMPERATURE EFFECT	5-18° C/28-40° C	Add ±0.03% of reading/° C
FREQUENCY		
ITEM MEASUREMENT	Filter(ON) Filter(OFF)	Range 30.000 Hz~499.99 Hz 30.000 Hz~9.9999 kHz
PARAMETER		Voltage, Current
EFFECTIVE RANGE		10%~105% of voltage input
ACCURACY		±0.06% of reading
INTEGRATION		
ITEM INTERGRATION TIME	Accuracy Range Accuracy	Range ±(voltage or current accuracy+0.1% of reading) 0 hour 00 min ~ 9999 hour 59 min ±0.01%±1second
DISPLAY		
4" TFT LCD		
POWER CONSUMPTION		
Max. 25VA		
INTERFACE		
RS-232C, USB device, LAN		
POWER SOURCE		
AC 100~240 V, 50-60Hz		
DIMENSION & WEIGHT		
270(W) x 110(H) x 350(D) mm, Approx. 2.9kg		

## ORDERING INFORMATION

**GPM-8213 with GPIB** Digital Power Meter (RS-232C/USB device/LAN/Opt.01 GPIB)  
**GPM-8213** Digital Power Meter (RS-232C/USB device/LAN)

ACCESSORIES :  
 Safety Sheet x 1, Power Cord x 1, Test Lead GTL-209 x 2, CD x 1 (User manual/ USB driver)

### OPTIONAL

Opt.01 GPIB card (factory installed)

### OPTIONAL ACCESSORIES

**GPM-001** Test Fixture  
**GTL-232** RS-232 Cable, 9-pin Female to 9-pin, null Modem for Computer  
**GTL-246** USB Cable, A-B type, approx. 1200mm  
**GTL-248** GPIB Cable, approx. 2000mm  
**GRA-422** Rack Mount Kit

## A. TWO DISPLAY MODES



Standard Mode (Setting & 8 Measurements)

GPM-8213 provides two display modes so as to maximize users' measurement effectiveness. Standard mode: simultaneously displays 8 measurement parameters (2 major measurements + 6 secondary



Simple Mode (4 Measurements)

measurements) and related measurement setting parameters; ideal for R&D, design, and engineering verification. Simple mode: displays four measurement parameters; ideal for production tests.

## B. VARIETY OF MEASUREMENT PARAMETERS

MEASUREMENT ITEMS	Symbols
Voltage	Vrms, V+pk, V-pk, Vdc*
Current	Irms, I+pk, I-pk, Idc*
Power	P, P+pk, P-pk, VA, VAR
Power Factor	PF
Crest Factor	CFV, CFI
Phase Angle	DEG
Frequency	VHz, IHz
Total Harmonic Distortion	THDV, THDI
INTEGRATION	WP, WP+, WP-, q, q+, q-

Note: \* \* Vdc/Idc is selectable only when measurement mode DC is selected

Comparing with products of the same category, GPM-8213 provides more diverse measurement items and functions, including voltage, current, frequency, active power, apparent power, reactive power, power factor, crest factor, and total harmonic distortion



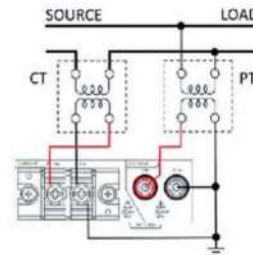
measurement. GPM-8213 also features the integral measurement function for DUT's power or current time. Users can set a time period to execute the transient power integration and divide the result by time to receive DUT's average power.

## C. OPTIMAL MEASUREMENT CAPABILITIES



Low Current Range & High Resolution

For IEC 62301/EN 50564 standby power consumption test requirement, GPM-8213 can fully meet the demand by its features, including measurement frequency bandwidth of DC~6kHz, minimum current level of 5mA (resolution: 0.1uA), power measurement resolutions (1uW for minimum current and voltage levels; 1mW for maximum current and voltage levels). Beyond that, time resolution for integral measurement is one second.



PT/CT Connection

With respect to large power measurement, users can utilize terminal on the rear panel to conduct 600V/20A measurement. Users can also use external potential transformer/current transformer for measurement and collocate with PT/CT to set multiplying factor (1~9999) to change readings to the original input voltage or current values without the trouble of additional calculation.

## D. VARIOUS STANDARD INTERFACES



The various practical interfaces, RS-232/USB device/LAN, are equipped as standard making control convenient and flexible for remote control and measurement result collection. Also, GPIB is available as optional.



# Automatic Distortion Meter



The GAD-201G distortion meter is aimed at total harmonic distortion (THD) and AC voltage measurement at audio frequency range, from 20 ~ 20kHz. Frequency and voltage are displayed simultaneously on dual meters, with measurement range automatically switching over full scale. The frequency keys cover 400Hz, 1kHz, and 10kHz for commonly used measurement frequencies. The output terminals can feed basic waveforms (X) and harmonic distortion (Y) to an external monitoring device. Residual distortion, including hum and noise, is kept to a minimum level of 0.03%, making GAD-201G ideal for high-end audio applications.

## GAD-201G

### FEATURES

- \* Automatic Level & Distortion Measurements
- \* Auto or Hold Function Can be Selectable
- \* 0.1% ~ 100% in 7 Distortion Measuring Ranges
- \* 20Hz ~ 20kHz in 3 Continuous Ranges
- \* 400Hz, 1kHz, 10kHz 3 Spot Frequency
- \* 1mVrms ~ 300Vrms in 12 ACV Measuring Ranges

### GTL-103 Test Lead

Banana-Alligator Heads  
Approx. 1.2m



SPECIFICATIONS	
DISTORTION MEASUREMENT	
Range	0.1% ~ 100% full scale in 7 ranges by auto ranging
Fundamental Frequency Range	20Hz ~ 20kHz in 3 continuous ranges with fine adjustment tuning and 3 spots for 400Hz, 1kHz and 10kHz only
Input Level	100mVrms ~ 300Vrms
Automatic Level Control Range	±10dB
Fundamental Rejection	80dB or above
Second Harmonic Accuracy	Within ±1dB at a basic frequency of 20Hz ~ 20kHz
Residual Distortion	(Including hum and noise) Less than 0.03%
AC VOLTAGE MEASUREMENT	
Range	1mVrms to 300Vrms full scale in 12 ranges by auto ranging
Frequency Response	20Hz ~ 200kHz ±1dB
Input Impedance	100kΩ±10%, 70pF or less(Unbalanced)
Accuracy	Within ±3% of full scale (at 1kHz)
Residual Noise	Less than 10μV (input short circuited)
Output Level	X : 1Vrms, Y : 500mVrms at meter full scale
Output Impedance	Approx. 600Ω
POWER SOURCE	
AC 100V/120V/220V/240V ±10%, 50/60Hz; Power Consumption : Max. 25VA	
DIMENSIONS & WEIGHT	
310(W) x 165(H) x 300(D)mm, Approx. 4.6 kg	

### ORDERING INFORMATION

<b>GAD-201G</b>	Automatic Distortion Meter
<b>ACCESSORIES :</b>	
User manual x 1 , Power cord x 1	
Test lead GTL-103 x 1	

# A.C. Millivolt Meter



GVT-427B (2CH)  
GVT-417B (1CH)



The GVT-427B/417B Series is a compact analog AC millivoltmeter ideal for low level voltage measurements with a remarkable  $300\mu\text{V}$  full scale sensitivity. GVT-427 has dual independent channels that can be used simultaneously or separately for measurement. Voltage scale is separated into 12 ranges, easily accessible by the large rotary selector. The wide measurement range, frequency (10Hz ~ 1MHz) and voltage (-70dB ~ +40dB), provides ample headroom for most applications.

## FEATURES

- \*  $300\mu\text{V}$  Full Scale Sensitivity
- \* Measures Frequency From 10Hz ~ 1MHz
- \* Measures From -70dB ~ +40dB in 12 Ranges
- \* Dual Channel ( GVT-427B )

## GTL-101 Test Lead

BNC-Alligator Heads  
Approx. 1.2m



## SPECIFICATIONS

INPUT	
Voltage Range	300 $\mu\text{V}$ ~ 100V of Full Scale in 12 ranges
Decibel Range	-70dB ~ +40dB in 12 ranges
Accuracy	$\pm 3\%$ of full scale
Operating Mode	GVT-427B : Ch1 and Ch2 separately or simultaneously at Ch1 GVT-417B : one Ch1 only
Frequency Response	20Hz ~ 200kHz $\pm 3\%$ , 10Hz ~ 1MHz $\pm 10\%$ (reference 1 kHz)
Impedance	1M $\Omega$ , approx, 40pF
OUTPUT	
Level	Approx. 0.1Vrms at full scale
Distortion	Less than 2%
POWER SOURCE	
AC 115V/230V $\pm 10\%$ , 50/60Hz; Power Consumption : Max. 10VA	
DIMENSIONS & WEIGHT	
130(W) x 210(H) x 295(D)mm; Approx. 2.8 kg	

## ORDERING INFORMATION

GVT-427B	2 Channels AC Millivolt Meter
GVT-417B	1 Channel AC Millivolt Meter

### ACCESSORIES :

User manual x 1 , Power cord x 1  
Test Lead GTL-101 x 2 for GVT-427B  
Test Lead GTL-101 x 1 for GVT-417B

Note : GVT-427B Without Approved

GVT-427B/417B

OTHER METERS



# Isolated Output High Precision Current Shunt Meter



## PCS-1000I



### FEATURES

- \* 6 1/2 Digit Voltage and Current Measurement Resolution
- \* Simultaneous Current and Voltage Measurement
- \* Five Current Measurement Levels(AC & DC) : 30mA/300mA/3A/30A/300A
- \* AC Voltage Measurement Levels : 200mV/2V/20V/200V/600V
- \* DC Voltage Measurement Levels : 200mV/2V/20V/200V/1000V
- \* Standard : USB Device & GPIB
- \* CE Verification

GW Instek rolls out the new PCS-1000I isolated output high precision current shunt meter, which inherits the simultaneous voltage and current measurement function of PCS-1000. PCS-1000I adopts five sets of independent shunt resistors to provide five current measurement levels, including 300A, 30A, 3A, 300mA, and 30mA to meet the requirements of different current level measurements. Internally, PCS-1000I utilizes two sets of 24bits ADCs and low temperature coefficient electronic components to mainly focus on the current measurement of power supply devices. High precision PCS-1000I can be used in adjusting and calibrating instruments. Additionally, temperature variation will not cause PCS-1000I to yield any measurement errors. PCS-1000I can automatically select optimal measurement level with the maximum resolution so as to replace manual selection to save operational time.

PCS-1000I provides a BNC output, which can connect with an oscilloscope to directly observe current waveform variation without using a current probe. General oscilloscopes do not have isolated channels and their input and output are structured at a common point, therefore, the output load will likely result in measurement errors. PCS-1000I's isolated current output design can prevent measurement errors from an oscilloscope with non-isolated outputs. PCS-1000I, a high precision AC/DC current shunt meter, not only provides USB and GPIB communications interfaces for users to remotely control the instrument but also conducts simultaneous voltage and current measurements. The SCPI communications commands of PCS-1000I allow users to remotely control PCS-1000I via a PC to operate measurement data read backs.

### SPECIFICATIONS

#### DC CHARACTERISTICS

##### DC Voltage

Range	1 Year 23 °C ± 5 °C	Temperature Coefficient/°C
200.0000 mV	0.0050 + 0.0035	0.0005 + 0.0005
2.000000 V	0.0050 + 0.0010	0.0005 + 0.0001
20.00000 V	0.0050 + 0.0010	0.0005 + 0.0001
200.0000 V	0.0050 + 0.0010	0.0005 + 0.0001
1000.000 V	0.0050 + 0.0020	0.0005 + 0.0001

Accuracy specification : ± (% of reading + % of range); voltage input resistance: 10MΩ for all DC voltage ranges

##### DC Current

Range	Burden Voltage	1 Year 23 °C ± 5 °C	Temperature Coefficient/°C
30.00000 mA	< 0.4 V	0.01 + 0.005	0.001 + 0.002
300.0000 mA	< 0.5 V	0.01 + 0.005	0.001 + 0.002
3.000000 A	< 0.8 V	0.01 + 0.005	0.001 + 0.002
30.00000 A*1	< 0.8 V	0.01 + 0.005	0.001 + 0.002
300.0000 A*1	< 0.8 V	0.02 + 0.005	0.001 + 0.002

Accuracy specification : ± (% of reading + % of range)

##### Isolated DC Current Monitor Accuracy

Range	Resolution(6 1/2)	DC Accuracy	Temperature Coefficient/°C
30.00000 mA	0.00001 mA	0.1 + 0.05	0.001
300.0000 mA	0.0001 mA	0.1 + 0.05	0.001
3.000000 A	0.000001 A	0.1 + 0.05	0.001
30.00000 A*1	0.00001 A	0.1 + 0.05	0.001
300.0000 A*1	0.0001 A	0.2 + 0.05	0.001

Accuracy specification : ± (% of output + % of full scale); monitor output voltage for the full scale current = 3V

#### AC CHARACTERISTICS

##### True RMS AC Voltage

Range	Frequency	1 Year 23 °C ± 5 °C	Temperature Coefficient/°C
200.0000 mV	45Hz~2kHz 2kHz~10kHz 10kHz~20kHz	0.5 + 0.05 1.0 + 0.05 2.0 + 0.10	0.005 + 0.005
2.000000 V			0.005 + 0.005
20.00000 V			0.005 + 0.005
200.0000 V			0.005 + 0.005
600.000 V			0.005 + 0.005

Accuracy specification : ± (% of reading + % of range)

##### True RMS AC Current

Range	Frequency	1 Year 23 °C ± 5 °C	Temperature Coefficient/°C
30.00000 mA	45Hz~2kHz 2kHz~10kHz	0.5 + 0.05 1.0 + 0.05	0.03 + 0.006
300.0000 mA			0.03 + 0.006
3.000000 A			0.03 + 0.006
30.00000 A*1	45Hz~400Hz	0.5 + 0.05	0.03 + 0.006
300.0000 A*1			0.03 + 0.006

Accuracy specification : ± (% of reading + % of range)



PCS-1000I

Rear Panel



## SPECIFICATIONS

### Isolated AC Current Monitor Accuracy

Range	Frequency	AC Accuracy	Temperature Coefficient/°C
30.00000 mA	45Hz~2kHz 2kHz~10kHz	0.2 + 0.05 0.5 + 0.05	0.001
300.0000 mA			0.001
3.000000 A			0.001
30.00000 A*1	45Hz~400Hz	0.5 + 0.05	0.001
300.0000 A*1			0.001

Accuracy specification :  $\pm$  (% of output + % of full scale); monitor output voltage for the full scale current = 3V; The specifications are only applicable when the input is 10% or greater of the full scale range

## GENERAL

Power Supply	100 V/120 V/220 V/240 V $\pm$ 10%
Power Line Frequency	50/60 Hz
Operating Environment	Full accuracy for 0 °C ~ 55 °C, Full accuracy to 80% R.H. at 40 °C
Storage Environment	-40 °C ~ 70 °C
Power Consumption	Max 35VA
Dimensions Weight	210(W) x 80(H) x 390(D)mm ; Approx. 5 kg

(The specifications apply when the PCS-1000I is powered on for at least 30 minutes to warm-up to a temperature of 18 °C ~ 28 °C, unless specified otherwise.)

Note: \*1 The accuracy for 30A/300A levels must be increased by a power factor of 8 ppm/watt.

## ORDERING INFORMATION

### PCS-1000I Isolated Output High Precision Current Shunt Meter

#### ACCESSORIES :

Quick Operation Guide, User Manual (CD) x 1, AC Power Cord x 1 (Region Dependant)

GTL-105A Alligator Clip Test Lead (3A Max)

GTL-207A Banana Plug Test Lead

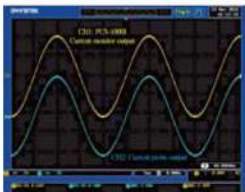
GTL-240 USB Cable

PCS-001 Basic Accessory Kit

#### OPTIONAL ACCESSORIES

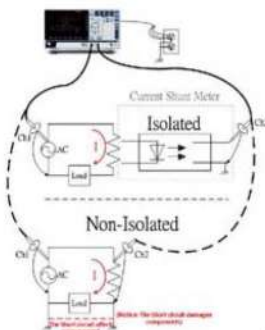
GRA-419-J Rack Mount Kit (JIS)

GRA-419-E Rack Mount Kit (EIA)



PCS-1000I

VS. Current Probe for Measurement

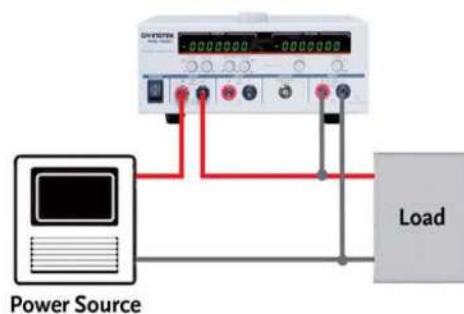


The Measurement Issue for Non-Isolated Shunt Meter



# Isolated Output High Precision Current Shunt Meter

## A. SIMULTANEOUS VOLTAGE AND CURRENT MEASUREMENT



PCS-1000I high precision AC and DC shunt meter can simultaneously measure current and voltage with the maximum 6 1/2 measurement resolution. The above diagram shows the connection method of

simultaneous measurement. Compared with the test of conventional meters from other brands, PCS-1000I is simple in connection and there is no requirement of any additional instrument.

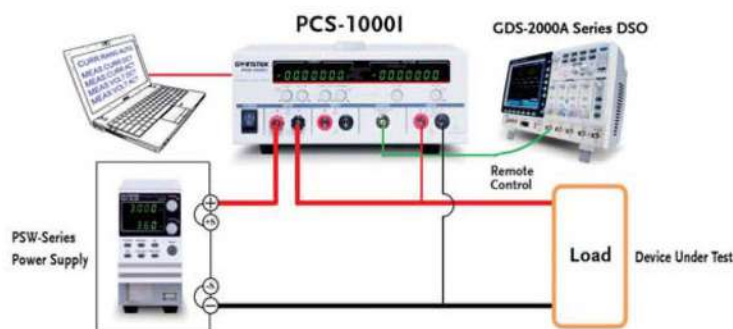
## B. FIVE SETS OF SHUNT RESISTORS TO SWITCH MEASUREMENT



The switching measurement of five independent shunt resistors provides excellent resolution than that of a single shunt resistor.

Under 30mA range, the resolution is 0.01 uA, which is ideal for very small current measurement.

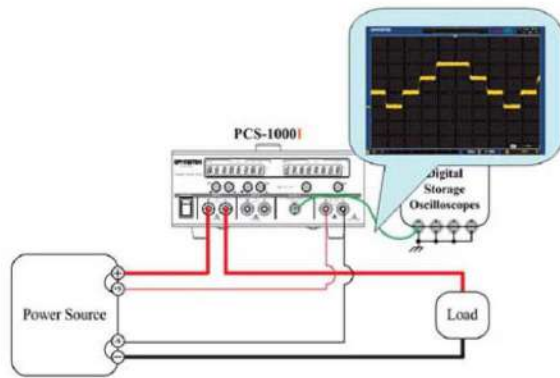
## C. REMOTE CONTROL APPLICATION



PCS-1000I is not only a high precision AC/DC shunt meter but also provides users with USB and GPIB communications interface so as to remotely control operational sequence. The SCPI commands of PCS-1000I allow users to read back measurement value via a computer remotely controlling PCS-1000I. As shown on the above diagram, the series connection between

PCS-1000I and DUT and the parallel connection between voltage input and DUT are arranged to conduct simultaneous voltage and current measurement on DUT. Via the connection between communications and a notebook computer, PCS-1000I can be remotely controlled by operating the notebook computer and edited sequence.

## D. ISOLATED OUTPUT CURRENT OUTPUT DESIGN



PCS-1000i adopts isolated current output design. Its BNC output can directly connect with an oscilloscope to avoid measurement errors resulted from the common ground of oscilloscope's analog input measurement.

## E. AUTOMATIC RANGE-SWITCHING MEASUREMENT FUNCTION

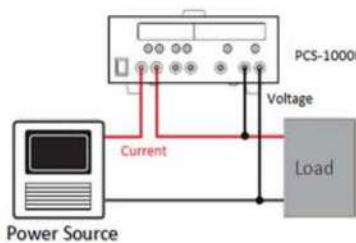


Press and hold Auto key, PCS-1000i will automatically select the maximum measurement resolution for users to save time in manual selection.

## F. CONNECTION COMPARISON

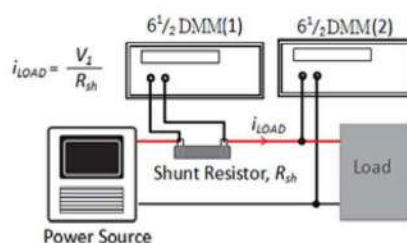
PCS-1000i can simultaneously measure current and voltage with 6 1/2 measurement resolution. The left diagram shows the connection method of simultaneous measurement. Compared with the test of conventional meters from other brands, PCS-1000i is simple in connection and there is no requirement of any additional instrument.

### PCS-1000i Conducts Simultaneous Voltage and Current Measurement



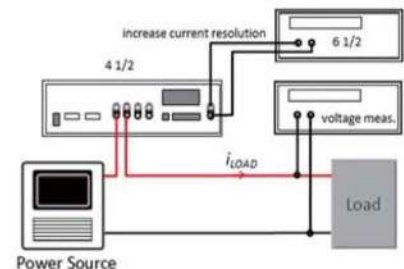
1. Only one PCS-1000i is needed to measure voltage and current
2. Easy connection
3. USB and GPIB communications on the rear panel can be used for data communication while connecting with a PC

### Shunt Resistor Conducts Current and Voltage Measurement



1. One voltage meter is needed to measure voltage on shunt and the voltage will be converted to current. For simultaneous voltage and current measurement, one extra voltage meter is required
2. Complex connection
3. For data communication with a PC, the PC must be connected to two voltage meters

### Conventional Shunt Meter Conducts Current and Voltage Measurement



1. This method requires one shunt meter, one current meter to increase current measurement resolution, and one voltage meter to measure voltage
2. Complex connection
3. For data communication with a PC, the PC must be connected to two meters



# Digital Frequency Counter



## GFC-8010H (120MHz)

GFC-8010H is a Digital Frequency Counter, particularly suitable for educational and laboratory use. It features a stable 5ppm time base, a low pass filter and an overflow indicator with a maximum operating rate of 120MHz. The clear 8 digit LED display coupled with a quick easy-to-use interface makes it a handy instrument on any bench-top.

### FEATURES

- \* 10Hz ~ 120MHz Range
- \* 8 Digit Display (0.3" LED)
- \* 15mVrms High Sensitivity
- \* 5ppm High Stability Time Base
- \* Frequency and Period Measurement
- \* Low Pass Filter Function
- \* Over-Flow Indicator

### SPECIFICATIONS

MAIN	
Display	8 Digit with Hz, kHz, MHz, S, mS, $\mu$ S, nS and overflow
Gate Time	0.1S, 1S, 10S switch selectable
Accuracy	$\pm(1 \text{ Digit} + \text{Time base accuracy})$
INPUT	
Sensitivity	10Hz ~ 10MHz < 15mVrms 10MHz ~ 40MHz < 20mVrms 40MHz ~ 80MHz < 35mVrms 80MHz ~ 120MHz < 50mVrms
Impedance	1M $\Omega$ //35pF
Coupling System	AC Coupling
Max Input Voltage	150Vrms
TIME BASE	
Oscillation Frequency	10MHz
Aging Rate	$\pm 1$ ppm per month
Temp. Stability	25°C $\pm 5$ °C : $\pm 5$ ppm
RESOLUTION	
The maximum resolution is 1 $\mu$ Hz for 10Hz and 0.1Hz for 100MHz Input respectively for frequency measurement and 1nS for 10Hz and 0.1 x 10 <sup>-15</sup> for 100MHz	
POWER SOURCE	
AC 100V/120V/220V/230V $\pm 10\%$ , 50/60Hz; Power Consumption : Max. 5Watts	
DIMENSIONS & WEIGHT	
230(W) x 95(H) x 280(D) mm, Approx. 1.7kg	

### GTL-101 Test Lead

BNC-Alligator Heads  
Approx. 1.1m



### ORDERING INFORMATION

**GFC-8010H** 120MHz Digital Frequency Counter

#### ACCESSORIES :

User Manual x 1, Power cord x 1  
Test Lead GTL-101 x 1

#### OPTIONAL ACCESSORIES

**GTL-110** BNC Cable, BNC(P/M)-BNC(P/M), 1000mm

# Intelligent Counter



## GFC-8270H (2.7GHz) GFC-8131H (1.3GHz)

### FEATURES

- \* Frequency and Period Measurement
- \* High Resolution at Both High and Low Frequency
- \* 0.01Hz~2.7GHz Frequency Range(GFC-8270H)
- \* 0.01Hz~1.3GHz Frequency Range(GFC-8131H)
- \* 10mV rms High Sensitivity
- \* 100nHz Resolution for 1Hz
- \* Variable Trigger Level Control
- \* Microprocessor Controlled Intelligent Counter(Only GFC-8270H)

### GTL-101 Test Lead

BNC-Alligator Heads  
Approx. 1.1m



### GTL-110 Test Lead

BNC-BNC Heads  
Approx. 1m



The GFC-8000 Series performs virtually all of the counting measurements required in laboratories, in terms of both period and frequency. A bright red 8 digit LED display with an included overflow indicator provides a clear view. Both models feature a stable time base with a maximum resolution of 100nHz and 10nS at 1Hz for frequency and period measurement, respectively. Gate time can be configured for fast response (5 digits/10ms) or accuracy (7 digits/s) for more control. For high frequency needs, GFC-8270H can operate at up to 2.7GHz. The GFC-8000 Series features easy operation with a simple front panel interface, suitable for both portable and bench-top use.

SPECIFICATIONS	
DISPLAY	
	8 digits with Hz, kHz, MHz, GHz, S, mS, $\mu$ S, nS and overflow
GATE TIME	
	Variable from 10ms to 10s, or 1 period of input depending on whichever is greater
ACCURACY	
	$\pm$ (Resolution $\pm$ timebase error)
CHANNEL A	
Range	DC coupled 0.01Hz ~ 120MHz AC coupled 30Hz ~ 120MHz
Sensitivity	10mV rms typical, 50mV rms max
Coupling	AC or DC, switchable
Filter	Low pass, switchable in or out for channel A -3dB point of nominally 100kHz
Impedance	1M $\Omega$ /40pF
Attenuator	1/1 or 1/20dB
Trigger Level	-2.5 VDC ~ +2.5 VDC
Adjustment	
Resolution	For frequency measurement, the maximum resolution is 100nHz for 1Hz and 0.1Hz for 100MHz inputs respectively. For period measurement, the maximum resolution is 10nS for 1Hz and $0.1 \times 10^{-8}$ S for 100MHz inputs respectively. At least, the display is 7 digits for 1sec, 6 digits for 100ms, 5 digits for 10ms gate time respectively. 8nS to 100S at least 7 digits displayed for per second of gate time
Period Range	
CHANNEL B	
Range	50MHz ~ 2.7GHz for GFC-8270H 50MHz ~ 1.3GHz for GFC-8131H
Sensitivity	$\leq 50$ mVrms (10mVrms typical) for GFC-8270H $\leq 40$ mVrms (10mVrms typical) for GFC-8131H
Coupling	AC only
TIME BASE	
Aging rate	1ppm per Month
Temperature	5ppm $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$
Line variation	0.005ppm for $\pm 10\%$ variation
POWER SOURCE	
AC 100V/120V/220V/230V $\pm 10\%$ , 50/60Hz ; Power Consumption : Max. 15VA	
DIMENSIONS & WEIGHT	
230(W) x 95(H) x 280(D)mm, Approx. 2.2kg	

### ORDERING INFORMATION

GFC-8131H 1.3GHz Intelligent Counter  
GFC-8270H 2.7GHz Intelligent Counter

#### ACCESSORIES :

User manual x 1, Power cord x 1, GTL-110 x 1, GTL-101 x 1



# ACCESSORIES

MODEL	DESCRIPTION	APPLICABLE DEVICE
GBM-01	4 Wire (kelvin clip) Test Lead, 90V (max.), Approx. 1100mm	GBM-3300/3080
GBM-02	4 Wire (single pin) Test Probe, 80V (max.), Approx. 1100mm	GBM-3300/3080
GBM-03	4 Wire (twin pin) Test Probe, 300V (max.), Approx. 1400mm	GBM-3300/3080
GBM-S1	Short Bar (for GBM-02/GBM-03)	GBM-02/03
GDM-01	Calibration Key	GDM-8261A/8255A
GDM-SC1A	Scanner Card, 16+2 Channels	GDM-8261A/8255A
GDM-TL1	Test Lead Set	All DMM-Series
GHT-108	H.V. Wiring Lead, Approx. 500mm	GSB-01/02
GHT-109	G.B. Wiring Lead, Approx. 450mm	GSB-02
GHT-113	High Voltage Test Pistol, Approx. 1000mm	All GPT-Series
GHT-114	High Voltage Test Lead, Approx. 1000mm	GPT-9900A/9900/9800/9600 Series
GHT-115	High Voltage / Continuity Test Lead, Approx. 1000mm	GPT-12000 Series
GHT-116B	High Voltage Test Lead (Black only), Approx. 1500mm	GSB-01/02, All GPT-Series
GHT-116R	High Voltage Test Lead (Red only), Approx. 1500mm	GSB-01/02, All GPT-Series
GHT-117	H.V. Adaptor (Universal or Europe type socket)	GPT-12003/12002/12001, GPT-9903A/9902A/9901A, GPT-9803/9802/9801, GPT-9600
GHT-118	H.V. / G.B. Adaptor (Universal or Europe type socket)	GPT-12004/9904/9804
GHT-119	Remote Terminal Cable, Approx. 500mm	All GPT-Series, GCT-9040
GHT-205	High Voltage Test Probe, Approx. 1100mm	All GPT-Series
GLC-01	Alligator Clips	GLC-9000
GLC-02	Foil Probe	GLC-9000
GPM-001	Test Fixture (Universal or Europe type socket)	GPM-8213
GRA-404	Rack Mount Kit, 19", 4U Size	LCR-8000G
GRA-417	Rack Mount Kit, 19", 4U Size	GPT-9900A/9800/9600, GCT-9040
GRA-419-E	Rack Mount Kit (EIA), 19", 2U Size	PCS-1000I
GRA-419-J	Rack Mount Kit (JIS), 19", 2U Size	PCS-1000I
GRA-422	Rack Mount Kit, 19", 2U Size	GDM-906X Series, GDM-8261A/8255A/8351/834X Series, LCR-6000 Series, GBM-Series, GPM-8213
GRA-433	Rack Mount Kit, 19", 4U Size	GPT-9904
GRA-438	Rack Mount Kit 19", 4U Size	GSB-01/02
GRA-440	Rack Mount Kit 19", 4U Size	GPT-12000
GSC-014	Soft Carrying Case for DMM Accessory	All GDM-Series
GTL-101	Test Lead, BNC (P/M) to Alligator, Approx. 1100mm	GFC-Series, GVT-Series
GTL-103	Test Lead, Banana to Alligator, Approx. 1200mm	GAD-201G
GTL-105A	Test Lead, Banana to Alligator, Current 3A max. Approx. 1000mm	PCS-1000I
GTL-108A	4 Wire (kelvin clip) Test Lead, Approx. 1100mm	GDM-8261A/8255A/8351
GTL-110	BNC Cable, BNC (P/M) to BNC (P/M), Approx. 1000mm	GFC-Series
GTL-115	G.B. Test Lead, U type to Alligator, Approx. 1000mm	GPT-9904/9804
GTL-116B	G.B. Test Lead (Black only), U type to Alligator, Approx. 1500mm	GSB-02, GPT-9904/9804
GTL-116R	G.B. Test Lead (Red only), U type to Alligator, Approx. 1500mm	GSB-02, GPT-9904/9804
GTL-117	Test Lead, Banana to Probe, Approx. 1200mm	GDM-8245
GTL-132	LINK Cable, Approx. 250mm	GCT-9040
GTL-205A	Temperature Probe Adaptor with Thermocouple (K-type), Approx. 1000mm	GDM-906X Series, GDM-8261A/8255A/8351/834X Series
GTL-207A	Test Lead, Banana to Probe, Approx. 1000mm	GDM-8261A/8255A/8351/834X Series, GLC-9000, PCS-1000I
GTL-209	Test Lead, Banana to Bare-wire, Approx. 1000mm	GPM-8213
GTL-210	Test Lead, Banana to Banana, Approx. 1000mm	GPM-001
GTL-215	G.B. Test Lead, U type to Alligator, Approx. 1000mm	GPT-12004, GCT-9040
GTL-217	Test Lead, Banana to Probe, Approx. 1400mm	GDM-906X Series
GTL-232	RS-232C Cable, 9-pin F-F type, null modem for computer, Approx. 2000mm	GDM-8261A/8255A/8351, GPT-12000/9900A/9900/9800, GLC-9000, GOM-805/804, GBM-Series, GPM-8213
GTL-234	RS-232C Cable, 9-pin F-F type, null modem for computer, Approx. 2000mm	GDM-906X Series, LCR-8200/8000G
GTL-235	Communication Cable, Approx. 700mm	GSB-01/02
GTL-240	USB Cable, USB 2.0 A-B type (L shape), Approx. 1200mm	GLC-9000, PCS-1000I
GTL-246	USB Cable, USB 2.0 A-B type, Approx. 1200mm	GDM-906X Series, GDM-8351/8342/8341, LCR-8200/6000, GPT-12000, GLC-9000, GOM-805/804, GBM-Series, GPM-8213
GTL-247	USB Cable, USB 1.1 A-A type, Approx. 1800mm	GDM-8261A/8255A, GPT-9900A/9900/9800, GCT-9040
GTL-248	GPIO Cable, Approx. 2000mm	GDM-906X Series, GDM-8261A/8342/8341, LCR-8200, GPT-12000/9900A/9900/9800, GLC-9000, GOM-805/804, GPM-8213
GTL-308	4 Wire (kelvin clip) + Shield Test Lead, Approx. 1500mm	GDM-906X Series, GOM-805/804
GTL-309	4 Wire (kelvin clip) + Shield Test Lead, Approx. 3000mm	GDM-906X Series, GOM-805/804
LCR-05	Test Fixture for Axial & Radial Leaded Components	LCR-8200/8000G/6000
LCR-05A	30MHz Test Fixture for Axial & Radial Leaded Components (including STD-LOAD kit)	LCR-8200
LCR-06B	Test Lead with Kelvin clip (4 wire type), Approx. 750mm	LCR-8200/8000G/6000
LCR-07	Test Lead with Alligator clip (2 wire type), Approx. 750mm	LCR-8200/8000G/6000
LCR-08	Test Fixture (Tweezers) for SMD/Chip Components, Approx. 750mm	LCR-8200/8000G/6000
LCR-10A	30MHz Test Fixture for Bottom Electrode Components (including STD-LOAD kit)	LCR-8200
LCR-12	Test Lead with Kelvin clip (4 wire type), Approx. 600mm	LCR-8000G
LCR-15	Test Fixture for SMD/Chip components	LCR-8200/8000G/6000
LCR-15A	30MHz Test Fixture for SMD/Chip components (including STD-LOAD kit)	LCR-8200
LCR-16	DC Bias Voltage Box (+/- 45V)	LCR-6000
LCR-17	DC Bias Current Box (+/- 2.5A)	LCR-6000
PCS-001	Basic Accessory Kit	PCS-1000I
PT-100	Temperature Probe, Approx. 1500mm	GOM-805/804





GBM-01 	GBM-02 	GBM-03 
GBM-S1 	GDM-01 	GDM-SC1A 
GDM-TL01 	GHT-108 	GHT-109 
GHT-113 	GHT-114 	GHT-115 
GHT-116B 	GHT-116R 	GHT-117 / GHT-117 (EU) 
GHT-118 	GHT-118 (EU) 	GHT-119 
GHT-205 	GLC-01 	GLC-02 



# ACCESSORIES





<p>GPM-001</p> 	<p>GPM-001 (EU)</p> 	<p>GSC-014</p> 
<p>GTL-101</p> 	<p>GTL-103</p> 	<p>GTL-105A</p> 
<p>GTL-108A</p> 	<p>GTL-110</p> 	<p>GTL-115</p> 
<p>GTL-116B</p> 	<p>GTL-116R</p> 	<p>GTL-117</p> 
<p>GTL-132</p> 	<p>GTL-205A</p> 	<p>GTL-207A</p> 
<p>GTL-209</p> 	<p>GTL-210</p> 	<p>GTL-215</p> 
<p>GTL-217</p> 	<p>GTL-308</p> 	<p>GTL-309</p> 

# ACCESSORIES

<p>GTL-232</p> 	<p>GTL-234</p> 	<p>GTL-235</p> 
<p>GTL-240</p> 	<p>GTL-246</p> 	<p>GTL-247</p> 
<p>GTL-248</p> 	<p>GTL-250</p> 	<p>GTL-253</p> 
<p>DC Bias Voltage Box (Optional)</p> 	<p>PT-100</p> 	

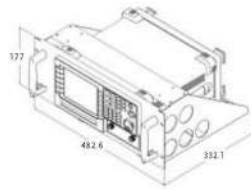


## ACCESSORIES

FIXTURE MODEL	DESCRIPTION	CONNECTION	DUT PACKAGE	APPLICATION
LCR-05 	Test fixture for measuring axial and radial lead components Frequency: DC to 1MHz Max. Voltage: +/- 35V	4 Wire	Axial & radial lead components	Suitable for axial & radial lead type L, C, R
LCR-05A 	Test Fixture for axial & radial leaded components Frequency: DC to 30MHz Max. Voltage: +/- 45V (Including SHORT Bar and STD LOAD)	4 Wire	Axial & radial lead components	Suitable for axial & radial lead type L, C, R
LCR-06B 	Kelvin clip test lead Frequency: DC to 1MHz Max. Voltage: +/- 45V	4 Wire (Kelvin clip)	Odd-shaped components	Suitable for low R or high C
LCR-07 	Test leads for conventional component measurement. Frequency: DC to 1MHz Max. Voltage: +/- 35V	2 Wire (Alligator clip)	Conventional component for in-circuit, board-mounted components	Suitable for low C or high R
LCR-08 	SMD/chip tweezers Frequency: DC to 1MHz Max. Voltage: +/- 35V	4 Wire (SMD/chip tweezers)	SMD components	Suitable for SMD type L, C, R
LCR-10A 	Test Fixture for bottom electrode components Frequency: DC to 30MHz Max. Voltage: +/- 45V	4 Wire (SMD/chip tweezers)	SMD/chip components	Range:0402 to 2512 (Including SHORT Bar and STD LOAD)
LCR-12 	Kelvin clip test lead Frequency : DC to 10MHz Max. Voltage : +/- 35V Approx. 0.6m	Kelvin clip test lead		
LCR-15 	SMD/chip test fixture Frequency: DC to 10MHz Max. Voltage: +/- 45V	4 Wire (SMD/chip test fixture)	SMD/chip components	Suitable for SMD Range:0201 to 1812
LCR-15A 	Test Fixture for SMD/Chip components Frequency: DC – 30MHz Max. Voltage: +/- 45V	4 Wire (SMD/chip test fixture)	SMD/chip components	Range: 0201 to 1812 (Including STD LOAD)
LCR-16 	External DC Bias voltage box Frequency: 40Hz to 1MHz Max. Voltage: +/- 45V			
LCR-17 	External DC Bias Current Box Frequency: 40Hz to 1MHz Max. Current: +/- 2.5A			

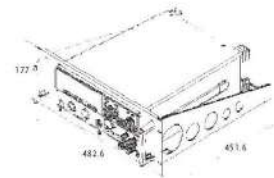
## GRA-404 Rack Mount Kit

For : LCR-8000G



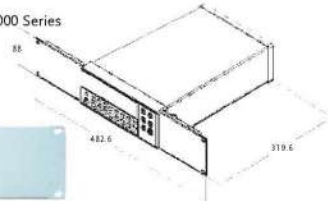
## GRA-417 Rack Mount Kit

For : GPT-9900/9800/9600 Series, GCT-9040



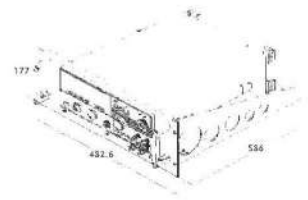
## GRA-422 Rack Mount Kit

For : GDM-8261A/8255A/8342/8341/8351, LCR-6000 Series



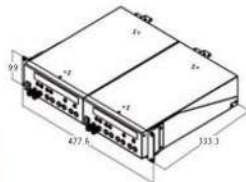
## GRA-433 Rack Mount Kit

For : GPT-9904



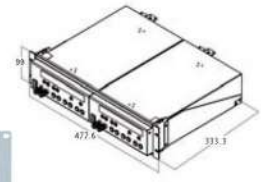
## GRA-419 EIA Rack Mount Kit

For : PCS-1000I



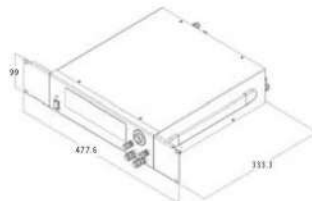
## GRA-419 JIS Rack Mount Kit

For : PCS-1000I



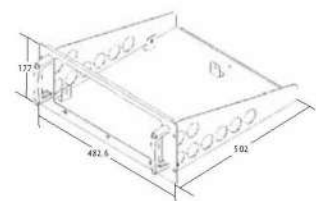
## GRA-438 Rack Mount Kit

For : GSB-01/02



## GRA-440 Rack Mount Kit

For : GPT-12000 Series





## NOTE

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