GW INSTEK

# Simply Reliable

2023~2024 Good Will Instrument Co., Ltd. GENERAL CATALOG



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 48 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.**

GW INSTEK

Simply Reliable




We take prides in creating more than 48 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.




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.




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.<br>Granted the National Small and Medium Enterprise Award.<br>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.<br>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.<br>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.<br>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.<br>Acquired Japan TEXIO technology corporation. |
| *2013* | Instek Digital was merged to become a member of GW Instek business group.<br>GW Instek cooperated with Hitachi and EMIC to establish GW Alliance in Suzhou, China.<br>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.<br>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.<br>GW Instek won Taiwan Excellence Award for GPT-12000 Series and SKTS-5000. |
| *2020* | GW Instek won Taiwan Excellence Award for C-3200 and GPM-8310. |
| *2021* | GW Instek won Taiwan Excellence Award for GDS-3000A Series, PPX-Series, GPP-3060/6030 and GSM-20H10 and GPM-8310. |





# Global Network







Suzhou Plant

Headquarters & Plant






Europe Subsidiary



Malaysia Subsidiary




India Subsidiary




China Subsidiary



Japan Subsidiary




Korea Subsidiary



U.S.A. Subsidiary

# Product Mix



## OSCILLOSCOPES

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



## SPECTRUM ANALYZERS & DEDICATED TESTER SERIES

- 3.25 GHz Spectrum Analyzer
- 3 GHz Spectrum Analyzer
- 1.8 GHz Spectrum Analyzer
- RF Training System



## SIGNAL SOURCES

- Arbitrary Function Generator
- Multi-Channel Function Generator
- DDS 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
- Precision Source Meter

## AC POWER SOURCES

- AC + DC Power Source
- AC Power Source

## ELECTRONIC LOADS

- Multi-channel Electronic Loads
- DC Electronic Load
- High Power DC Electronic Load
- AC & DC Electronic Load




## DIGITAL MULTIMETERS

- Digital Multimeter

## 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 Power Meter
- Automatic Distortion Meter
- AC Millvolt Meter
- Precision Current Shunt Meter

## A 650/350 MHz Digital Storage Oscilloscope

CE | USB High Speed | PC Software | Labview Driver

VPO
Visual Persistence Oscilloscope



NEW

台灣精品
TAIWAN EXCELLENCE

**GDS-3000A Series**

- ✲ 650/350MHz Bandwidth, 2 or 4 Input Channels
- ✲ 5GSa/s Real-time Sampling Rate(half channels); 2.5GSa/s Real-time Sampling Rate(all channels)
- ✲ Per Channel 200Mpts Memory Depth
- ✲ 200,000 wfm/s of Waveform Update Rate
- ✲ 10.2 inch 800 x 480 TFT LCD Display
- ✲ 490,000 Segments of Segmented Memory and the Waveform Search Function to Optimize the Efficiency of Record Length
- ✲ Zoom Window and Play/Pause Rapidly Navigate the Waveforms
- ✲ 38 sets of Automatic Measurement Offer Various Measurement Selections
- ✲ High Resolution Acquisition Mode
- ✲ $I^2C$/SPI/UART/CAN/LIN Serial Bus Trigger and Decoding Functions
- ✲ Dual Channel Spectrum Analyzer (DC~2.5GHz) with Spectrogram
- ✲ Dual Channel 25MHz Arbitrary Waveform Generator
- ✲ Optional 13 Sets of Power Analysis Measurements
- ✲ Optional 16 Digital Channels with a Logic Analyzer(MSO)
- ✲ Flexible Remote Control Connectivity (Standard: USB/LAN/RS-232; Option: GPIB)

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## D Two-channel/Three-channel Programmable Switching D.C. Power Supply

CE | GPIB | USB | LabVIEW Driver | Analog Control | LAN



NEW

**PSW-Multi Series**

- ✲ Multi-channel: Maximum 720W for Dual-channel Module and Maximum 1080W for Triple-channel Models; The PSW-Multi Series Aslo Features a New Built-in Function That Allows Individualor Synchronizd Output Control of Eachvoltage Module Output Latency Between Channels with the Same Voltage Module is Less Than 0.1ms
- ✲ Multiple Voltage Combinations: Low Voltage Combinations Can be Selected From 30V/40V/80V/160V; High Voltage Combinations Can be Selected From 250V/800V
- ✲ Advanced Web Server: Executes SCPI Commands; Web Controls Through Server; Data Log; Edit Sequence
- ✲ CC/CV Priority Mode Selection is Ideal for Battery and LED Industries
- ✲ Adjustable Rising and Falling Slew Rate
- ✲ 720W/1080W Adopt 1/3, 1/2 Rack Mount Frame Designs (Standard EIA/JIS)
- ✲ Standard Communications Interfaces: LAN, USB, External Analog Remote Control Terminal
- ✲ Optional Communications Interfaces: GPIB-USB Adapter, RS232-USB Cable
- ✲ Support LabVIEW Driver

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## D Source Measure Unit

CE | RS-232 | USB Host | USB Device | LAN | Digit I/O | GPIB



NEW

台灣精品
TAIWAN EXCELLENCE

**GSM-20H10**

- ✲ 4.3-inch TFT LCD
- ✲ Maximum Output ±210V/±1.05A/22W
- ✲ 0.012% Basic Measurement Accuracy with 6½-digit Resolution
- ✲ Variable Sampling Rate (Fast/Medium/Normal)
- ✲ 2-, 4-, and 6-wire Remote V-source and Measurement Sensing
- ✲ Provide SDM (Source Delay Measure) Cycle
- ✲ Built-in 4 Sequence Output Modes (Stair, Log, SRC-MEM, Custom), up to 2500 Points
- ✲ Built-in Limit Function, Supports 11 Groups of Limit Tests
- ✲ Built-in 5 Calculation Functions
- ✲ OVP/OTP Protection Function
- ✲ Provide Digital Number Keyboard Input
- ✲ Interface : RS-232, USBTMC, LAN, GPIB (Optional)

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## D Programmable High-precision D.C. Power Supply

CE | RS-232 | RS-485 | USB | LAN | Ext I/O | GPIB




NEW

台灣精品
TAIWAN EXCELLENCE

**PPX-Series**

- ✲ CV, CC Priority Start Function
- ✲ Four Levels of Current Measurement Resolution (min. 0.1μA)/Two Levels of Voltage Measurement Resolution (min. 0.1mV)
- ✲ Power Output ON/OFF Delay Function
- ✲ Adjustable Voltage and Current Slew Rate
- ✲ Bleeder Circuit Control
- ✲ Delayed Over-current Protection(OCP Delay)
- ✲ Sequential Power Output Function
- ✲ Remote Sensing Function & Data Logger
- ✲ 10 Sets of Memory Function
- ✲ Over Voltage Protection, Under Voltage Limit, Over Current Protection, Over Temperature Protection, AC Alarm Function
- ✲ Supports K Type Thermocouple Temperature Measurement
- ✲ Interfaces: USB, LAN, RS-232, RS-485, Analog Control; Opt: GPIB

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## D Triple-channel Programmable DC Power Supply

CE | RS-232 | GPIB | USB | LAN | Ext I/O



NEW

台灣精品 TAIWAN EXCELLENCE

**GPP-3060/6030/3650**

* 4.3"TFT LCD Display
* Setting Resolution: 1mV/0.1mA; Read Back Resolution: 0.1mV/0.1mA
* Low Ripple Noise: ≦1mVrms/≦2mArms
* Transient Response Time: ≦100μs
* Load Function (CC, CV, CR mode)
* 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
* Supports Setting Value, Measurement Value and Output Waveform Display
* 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-3060/6030 Supports a USB (Type A) Output Terminal
* Intelligent Temperature Control Fan Effectively Reduces Noise
* Standard: RS-232, USB, Ext I/O Optional (manufacturer installed only): LAN, LAN+GPIB

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## D Programmable AC/DC Power Source

CE | RS-232 | GPIB | USB | LAN | Ext I/O



NEW

**ASR-3000 Series**

* Output Rating: AC 0 ~ 400 Vrms, DC 0 ~ ± 570 V
* Output Frequency up to 999.9 Hz
* DC Output (100% of Rated Power)
* Measurement Items: Vrms,Vavg,Vpeak,Irms,IpkH,Iavg,Ipeak,P,S,Q,PF,CF
* Voltage and Current Harmonic Analysis (THDv, THDi)
* Remote Sensing Capability
* OCP, OPP, OTP, AC Fail Detection and Fan Fail Alarm
* Support Arbitrary Waveform Function
* Output Capacity: 2kVA/ 3kVA/4kVA
* Customized Phase Angle for Output On/Off
* Sequence and Simulation Function (up to 10 sets)
* Interface(std): USB, LAN, RS-232, GPIB
* Built-in External Control I/O and External Signal Input
* Built-in Output Relay Control & Memory Function (up to 10 sets)
* Built-in Web Server

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## D Programmable D.C. Electronic Load

CE | RS-232 | GPIB | USB | LabVIEW Driver | LAN



NEW

**PEL-2000A(B) Series**

* Sequence Function to do High Speed Load Simulations
* Flexible Configuration with Mainframes and Load Capacity
* Program Mode to Create Work Routines for Repetitive Tests
* OPP/OCP/OVP/OTP/RVP/UVP Protections
* External Channel Control/Monitoring via Analog Control Connector
* Multi Interface :
  PEL-2000A Series : (Standard) USB and RS-232; (Option) LAN and GPIB
  PEL-2000B Series : (Standard) USB, RS-232C/RS485 and LAN;
  (Option) GPIB

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## D High Power DC Electronic Load

CE | RS-232 | GPIB | USB | LAN



NEW

**PEL-5000C Series**

* Maximum Power up to 192kW
* Up to 8 units of Master/Slave Parallel Control
* 5-digit Digital Voltage, Current and Power Meter
* Large LCD Display
* Display Voltage Value, Current Value, Watt Value at the Same Time
* Suitable for Power Factor Regulator (PFC) Testing (600V, 1200V Models)
* Automatically Perform OCP, OPP Test
* The Power-on State Value Can be Set
* Constant Current, Constant Resistance, Constant Voltage, Constant Power, Constant Current + Constant Voltage, Constant Power + Constant Voltage, Dynamic and Short Circuit Modes
* Short Circuit Time Can be Set During Short Circuit Test
* Over Current, Over Power, Over Temperature Protection and Over Voltage Warning
* Voltage Polarity Display Can be Set to Positive Value ("+") or Negative Value ("-")
* Support Solar Panel MPPT Test
* Optional Interface: GPIB, RS232, USB, LAN

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## D DC Electronic Load

CE RS-232 USB



NEW

### PEL-500 Series

* 5-digit Digital Voltage, Current and Power Meter
* Simultaneous Display of Voltage, Current, and Watts
* Short-circuit Time Can be Set During Short-circuit Test
* Automatic Test Function of Overcurrent Protection/Overpower Protection
* The Battery Discharge Test Function Can Set the Discharge Stop Voltage(Vbatt), Discharge Capacity(AH, WH) and Stop Discharge Time
* Surge Test Can Simulate Boot Overshoot Current and Transient Current From Hot Plugging
* Constant Current, Constant Resistance, Constant Voltage, Constant Power and Dynamic Mode
* Overvoltage, Overcurrent, Overpower, Over Temperature Protection and Reverse Polarity Detection
* Voltage Polarity Display Can be set to Positive Value"+" or Negative Value"-"
* Communications Interface: RS232, USB

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## D AC & DC Electronic Load

CE RS-232 GPIB USB LAN



NEW

### AEL-5000 Series

* Turbo Mode (Multiplier Mode) Can Withstand up to 2 Times the Rating Current and Power of the Electronic Load in a Short Period of Time
* Operating Mode: CC, linear CC, CR, CV, CP and AC Rectifier Loads
* Measurement Items: Voltage Value(Vrms, Vpeak, Vmax., Vmin), Current Value(Irms, Ipeak, Imax., Imin.), Watt Value, Volt-ampere Value(VA), Frequency Value, Crest Factor, Power Factor, Voltage Total Distortion(V THD, VH), Current Total Distortion(I THD, IH), Etc
* Eight Units Connected in Parallel up to 180kW for Single-phase and 540kW for Three-phase
* Support Loading and Unloading Angle Control, Loading and Unloading Angle Control Can be set at the Full Range of 0-359 Degrees
* Support Positive Half Cycle or Negative Half Cycle Load
* Support SCR/TRIAC Current Phase Modulation Waveform, 90-degree Trailing Edge and Leading Edge
* Support the Capacitive Load (Inrush Current) when the Power Supply is Turned on and the Transient Current (Surge Current) Test when the Load is Suddenly Connected (Hot Plug-in) During Operation
* Crest Factor Range: 1.414~5.0
* Power Factor Range: 0.1~1.0 Leading or Trailing
* Frequency Range: DC, 40~440Hz(AEL-5003-480-18.75/AEL-5004-480-28: DC, 40~70Hz) , and 800Hz and 1kHz Need to be Customized
* Optional Control Interfaces: GPIB, RS-232, USB, LAN

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## D High Power DC Electronic Load

CE RS-232 GPIB USB LAN UKCA



NEW

### PEL-5000G Series

* 4U/6K High Power Density Design Also for Bench Testing
* Turbo Mode Function, Which Allows 1.5 Times the Rated Power or Current to be Used Within Two Seconds
* Turbo Mode can be Used with OCP/OPP/BMS/Short Mode/Surge Mode/ Hot Plug-In Testing
* High Tolerance to Environmental Temperature, with 4k/5kW Models not Affected by Environmental Temperature in Power Usage
* Can set the Power-on Status Value
* Short Circuit Duration Can be set Within Short Circuit Test Voltage Meter Display Can be Configured as Polarity Positive ("+") or Negative("-")
* Optional Interface : GPIB, RS232, USB, LAN
* Protection function Testing for Battery BMS
* Protection Against V, I, W, and ℃

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## E High Frequency LCR Meter

CE USB Device USB Host LAN RS-232 Handler Trigger GPIB PC Software



NEW

### LCR-8200(A) Series

* Wide Test Frequency :
  LCR-8200A : DC, 10Hz ~ 50/30/20/10/5 MHz
  LCR-8200 : DC, 10Hz ~ 30/20/10/5/1 MHZ
* 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
* Equivalent Circuit Model Analysis (LCR-8200A only)
* 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

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# New Products

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

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



NEW

### GPT-15000 Series

- ✲ 500VA AC Test Capacity (short circuit current > 200mA)
- ✲ 7" TFT LCD
- ✲ Comply with IEC 61010-2-034 Design Requirement
- ✲ Manual Test Mode/Auto Test Mode
- ✲ RMS Current Measurement
- ✲ Zero Crossing Turn-on Operation
- ✲ Setting Data Export/Import
- ✲ Rear Panel Output Available
- ✲ Standard Interface : RS-232C, USB host/device and Signal I/O
- ✲ Optional Interface : GPIB or LAN
- ✲ Universal Power Input
- ✲ Controllable Ramp-up & Ramp-down Time
- ✲ Statistics & Analysis Function
- ✲ Capacitive Load Testing Capability up to 47μF
- ✲ Sweep Function for DUT Characteristic Analysis
- ✲ Convenience Listed AUTO Mode Easy to Read Result and Judge
- ✲ Internal Storage and USB Storage Available
- ✲ Barcode Function Available

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## E Multi-Channel Hipot Tester

CE | USB Host | USB Device | RS-232 | Signal I/O



NEW

### GPT-9500 Series

- ✲ 150VA AC Test Capacity
- ✲ 3 in 1 Tester : AC, DC, IR
- ✲ Built-in 8 Channel Scanner
- ✲ 480 x 272 Color TFT LCD
- ✲ Test Parameter Export/Import Through USB Host
- ✲ Statistics (Counter) Function
- ✲ Insulation Resistance Measurement up to 10GΩ
- ✲ Open/Short Check (OSC)
- ✲ ARC Detection
- ✲ Multi-language : Traditional/Simplified Chinese, English
- ✲ Interface : RS-232C, USB Host/Device and Signal I/O

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## E Leakage Current Tester

CE | RS-232 | GPIB | USB Device | USB Host | LAN | Signal I/O



NEW

### GLC-10000

- ✲ Suitable for Medical Electrical & General Electrical of Leakage Current Measurement
- ✲ 7" Touch Pane with Color LCD
- ✲ 11 Different Measurement Network to Simulate the Resistance of Human Body (Including IEC 60601-1:2020 3.2rd)
- ✲ The Measurement of Maximum Allowable Leakage Current is Up to 50mA
- ✲ External Terminal for Extension MD Connection
- ✲ MD OUT Terminal can be Connected to an Oscilloscope for Convenient Comparison of Measured Waveforms
- ✲ 30 Sets Memories for Test Parameter; 1000 Sets Memories for Measured Data.
- ✲ Test Parameter Export/Import Function Through USB Host
- ✲ USB Storage for Measurement Data/Screen Capture
- ✲ Various Standard Interfaces: RS-232C, USB Host & Device, LAN, Signal I/O and GPIB (Optional)

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## E Digital Power Meter

CE | USB Host | USB Device | LAN | RS-232 | GPIB | DA12



NEW

### GPM-8320/8330

- ✲ 5" TFT LCD
- ✲ Voltage/Current Meter Test Freq. Bandwidth: DC, 0.1Hz ~ 100kHz
- ✲ Waveform Display : V (Voltage), I (Current), P (Wattage)
- ✲ Distorted wave Current/Voltage Measurement: Full Range for CF=3, and Half Range for CF=6 (or 6A)
- ✲ Meeting IEC 61000-4-7 Harmonic Measurement (50/60Hz)
- ✲ Wiring Selecting Button (1P3W, 3P3W, 3P4W, 3V3A)
- ✲ Harmonic Measurement & Analysis up to 50 Orders
- ✲ Auto Ranging Function for Integration Mode
- ✲ Screen Capture Through USB Host
- ✲ Provide External Current Sensor Input (EXT1/EXT2)
- ✲ Standard Interface: RS-232C, USB Device/Host, LAN
- ✲ Optional Interface: GPM-DA12 - GPIB + Digital I/O (Factory Installed Only)

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# Model Number Index


| | | |
|---|---|---|
| **AD** | | |
| ADB-002 | Accessory -- DC Block BNC 50 Ohm 10MHz to 2.2GHz | B25 |
| ADB-006 | Accessory -- DC Block N-TYPE 50 Ohm 10MHz to 6GHz | B25 |
| ADB-008 | Accessory -- DC Block SMA 50 Ohm 0.1MHz to 8GHz | B25 |
| ADP-001 | Accessory -- Adaptor, 50Ω, BNC(J/F) - N(P/M) | B25 |
| ADP-002 | Accessory -- Adaptor, 50Ω, SMA(J/F) - N(P/M) | B25 |
| ADP-003 | Accessory -- Adaptor, 50Ω, N(J/F) - SMA(J/F) | C34 |
| ADP-101 | Accessory -- Adaptor, 75Ω BNC(J/F) - 50Ω BNC(P/M) | B25 |
| **AE** | | |
| AEL-5002-350-18.75 | 50V/18.75A/1875W AC & DC Electronic Load | D119 |
| AEL-5003-350-28 | 350V/28A/2800W AC & DC Electronic Load | D119 |
| AEL-5004-350-37.5 | 350V/37.5A/3750W AC & DC Electronic Load | D119 |
| AEL-5006-350-56 | 350V/56A/5600W AC & DC Electronic Load | D119 |
| AEL-5008-350-75 | 350V/75A/7500W AC & DC Electronic Load | D119 |
| AEL-5012-350-112.5 | 350V/112.5A/111250W AC & DC Electronic Load | D119 |
| AEL-5015-350-112.5 | 350V/112.5A/15000W AC & DC Electronic Load | D119 |
| AEL-5019-350-112.5 | 350V/112.5A/18750W AC & DC Electronic Load | D119 |
| AEL-5023-350-112.5 | 350V/112.5A/22500W AC & DC Electronic Load | D119 |
| AEL-5002-425-18.75 | 425V/18.75A/1875W AC & DC Electronic Load | D119 |
| AEL-5003-425-28 | 425V/28A/2800W AC & DC Electronic Load | D119 |
| AEL-5004-425-37.5 | 425V/37.5A/3750W AC & DC Electronic Load | D119 |
| AEL-5006-425-56 | 425V/56A/5600W AC & DC Electronic Load | D119 |
| AEL-5008-425-75 | 425V/75A/7500W AC & DC Electronic Load | D119 |
| AEL-5012-425-112.5 | 425V/112.5A/11250W AC & DC Electronic Load | D119 |
| AEL-5015-425-112.5 | 425V/112.5A/15000W AC & DC Electronic Load | D119 |
| AEL-5019-425-112.5 | 425V/112.5A/18750W AC & DC Electronic Load | D119 |
| AEL-5023-425-112.5 | 425V/112.5A/22500W AC & DC Electronic Load | D119 |
| AEL-5003-480-18.75 | 480V/18.75A/2800W AC & DC Electronic Load | D119 |
| AEL-5004-480-28 | 480V/28A/3750W AC & DC Electronic Load | D119 |
| **AF** | | |
| AFG-2005 | 5MHz Arbitrary Waveform Function Generator | C26 |
| AFG-2012 | 12MHz Arbitrary Waveform Function Generator | C26 |
| AFG-2025 | 25MHz Arbitrary Waveform Function Generator | C26 |
| AFG-2105 | 5MHz Arbitrary Waveform Function Generator with Sweep Mode, AM/FM/FSK Modulation & Ext. Counter | C26 |
| AFG-2112 | 12MHz Arbitrary Waveform Function Generator with Sweep Mode, AM/FM/FSK Modulation & Ext. Counter | C26 |
| AFG-2125 | 25MHz Arbitrary Waveform Function Generator with Sweep Mode, AM/FM/FSK Modulation & Ext. Counter | C26 |
| AFG-2225 | 25MHz True Dual Channel, Arbitrary Function Generator | C26 |
| AFG-3031 | 30MHz Single Channel Arbitrary Function Generator | C6 |
| AFG-3032 | 30MHz Dual Channel Arbitrary Function Generator | C6 |
| AFG-3021 | 20MHz Single Channel Arbitrary Function Generator | C6 |
| AFG-3022 | 20MHz Dual Channel Arbitrary Function Generator | C6 |
| AFG-3051 | 50MHz Arbitrary Function Generator | C14 |
| AFG-3081 | 80MHz Arbitrary Function Generator | C14 |
| **AP** | | |
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| APS-002 | Accessory -- RS-232/USB Interface Card | D129 |
| APS-003 | Accessory -- Output Voltage Capacity (0 – 600Vrms) | D129 |
| APS-004 | Accessory -- Output Frequency Capacity (45~999.9Hz) | D129 |
| APS-007 | Accessory -- RS-232 Interface Card | D129 |
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| ASR-002 | Accessory -- External Three Phase Control Unit | D129 |
| ASR-2050 | 500VA Programmable AC/DC Power Source | D79 |
| ASR-2100 | 1000VA Programmable AC/DC Power Source | D79 |
| ASR-2050R | 500VA Programmable AC/DC Power Source for 3U 1/2 Rack Mount | D79 |
| ASR-2100R | 1000VA Programmable AC/DC Power Source for 3U 1/2 Rack Mount | D79 |
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| ASR-3300 | 3kVA Programmable AC/DC Power Source | D73 |
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| ASR-3400HF | 4kVA Programmable AC/DC Power Source | D73 |
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| ATA-001 | Accessory -- Antenna, General FM Antenna, BNC(M) | B25 |
| ATN-100 | Accessory -- Adaptor, 10dB Attenuator, 50Ω, N(J/F)-N(P/M) | B25 |

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|---|---|---|
| **DS** | | |
| DS2-08LA | Accessory -- 8-Channel Logic Analyzer, Includes 8-channel Logic Analyzer Card(GLA-08) and 8-channel Logic Analyser Probe(GTL-08LA) | A42 |
| DS2-16LA | Accessory -- 16-Channel Logic Analyzer, Includes 16-channel Logic Analyzer Card(GLA-16) and 16-channel Logic Analyser Probe(GTL-16LA) | A42 |
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| DS3A-PWR | Accessory -- 13 sets of Power Analysis Measurements | A42 |
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| DS3-PWR | Accessory -- Power Analysis Software: Power Quality/Harmonic/Ripple/In-rush Current Measurement | A42 |
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| GAG-810 | 1MHz Audio Generator with Low Distortion | C31 |
| GAK-001 | Accessory -- Adaptor, 50Ω Termination, N(P/M) | B25 |
| GAK-002 | Accessory -- Adaptor, Cap with Chain, N(P/M) | B25 |
| GAK-003 | Accessory -- Adaptor, 50Ω Termination, BNC(P/M) | A42 |
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| GBM-01 | Accessory -- 4 Wire (kelvin clip) Test Lead, 90V (max.), Approx. 1100mm | E61 |
| GBM-02 | Accessory -- 4 Wire (single pin) Test Probe, 80V (max.), Approx. 1100mm | E61 |
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| GDM-532 | 9999 Counts Hand-Held DMM with True RMS Measurement | E17 |
| GDM-533 | 6000 Counts Hand-Held DMM with True RMS Measurement and USB Interface | E17 |
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| GDM-8342 | 50,000 Counts Dual Measurement Multimeter | E13 |
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## GR

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## GS

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## GT

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| **GTL-131** | Accessory -- Test Clip, Suitable for GDP-040D | A42 |
| **GTL-132** | Accessory -- LINK Cable, Approx. 250mm | E83 |
| **GTL-134** | Accessory -- Test Leads for Rear Panel, 1200mm, 10A, 16 AWG | D129 |
| **GTL-137** | Accessory -- Output Power wire(load wire_10AWG:50A, 600V/sense wire_16AWG:20A, 600V) | D129 |
| **GTL-202** | Accessory -- Sense Lead, Banana to Banana Lead, European Terminal, 200mm | D129 |
| **GTL-203A** | Accessory -- Test Lead, Banana to Alligator, European Terminal, Max. Current 3A, 1000mm | D129 |
| **GTL-204A** | Accessory -- Test Lead, Banana to Alligator, European Terminal, Max. Current 10A, 1000mm | D129 |
| **GTL-205A** | Accessory -- Temperature Probe Adaptor with Thermocouple (K-type), Approx. 1000mm | A42 |
| **GTL-207A** | Accessory -- Test Lead, Banana to Probe Test Lead, 800mm | A42 |
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| **MDO-2102E(G/X)** | 100MHz,2Channel,Digital Storage Oscilloscope,Spectrum Analyzer,Dual Channel 25MHz AWG | A21 |
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| **MFG-2120** | 20MHz Single Channel Arbitrary Function Generator with Pulse Generator | C16 |
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| **PCS-1000I** | High Precision Current Shunt Meter | E79 |
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| **PEL-008** | Accessory -- Connect Cu Plate | D129 |
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| **PEL-504-80-70** | 80V/70A/350W DC Electronic Load | D117 |
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| **PEL-2030A(B)** | 200W, Dual Channel D.C. Electronic Load Module, (1~80V, 5A, 30W) & (1~80V, 40A, 250W) | D105 |
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| **PEL-3212** | 2100W Programmable D.C. Electronic Load | D93 |
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| **PEL-3533** | 5250W Programmable D.C. Electronic Load | D93 |
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| **PEL-3744H** | 7350W Programmable D.C. Electronic Load | D93 |
| **PEL-3955H** | 9450W Programmable D.C. Electronic Load | D93 |
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| **PEL-3032E** | 500V/15A/300W Programmable Single-channel D.C. Electronic Load | D99 |
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| **PEL-5008C-150-800** | 150V/800A/8kW High Power DC Electronic Load | D109 |
| **PEL-5010C-150-1000** | 150V/1000A/10kW High Power DC Electronic Load | D109 |
| **PEL-5012C-150-1200** | 150V/1200A/12kW High Power DC Electronic Load | D109 |
| **PEL-5015C-150-1500** | 150V/1500A/15kW High Power DC Electronic Load | D109 |
| **PEL-5018C-150-1800** | 150V/1800A/18kW High Power DC Electronic Load | D109 |
| **PEL-5020C-150-2000** | 150V/2000A/20kW High Power DC Electronic Load | D109 |
| **PEL-5024C-150-2000** | 150V/2000A/24kW High Power DC Electronic Load | D109 |
| **PEL-5006C-600-420** | 600V/420A/6kW High Power DC Electronic Load | D109 |
| **PEL-5008C-600-560** | 600V/560A/8kW High Power DC Electronic Load | D109 |
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| **PEL-5012C-600-840** | 600V/840A/12kW High Power DC Electronic Load | D109 |
| **PEL-5015C-600-1050** | 600V/1050A/15kW High Power DC Electronic Load | D109 |
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| **PEL-5024C-1200-960** | 1200V/960A/24kW High Power DC Electronic Load | D109 |
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| **PEL-5006G-600-420** | 600V/420A/6000kW High Power DC Electronic Load | D125 |
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| **PEL-5006G-1200-240** | 1200V/240A/6000kW High Power DC Electronic Load | D125 |

## PF

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| **PFR-100M** | Fanless Multi-range D.C. Power Supply | D27 |
| **PFR-100L** | Fanless Multi-range D.C. Power Supply | D27 |

## PP

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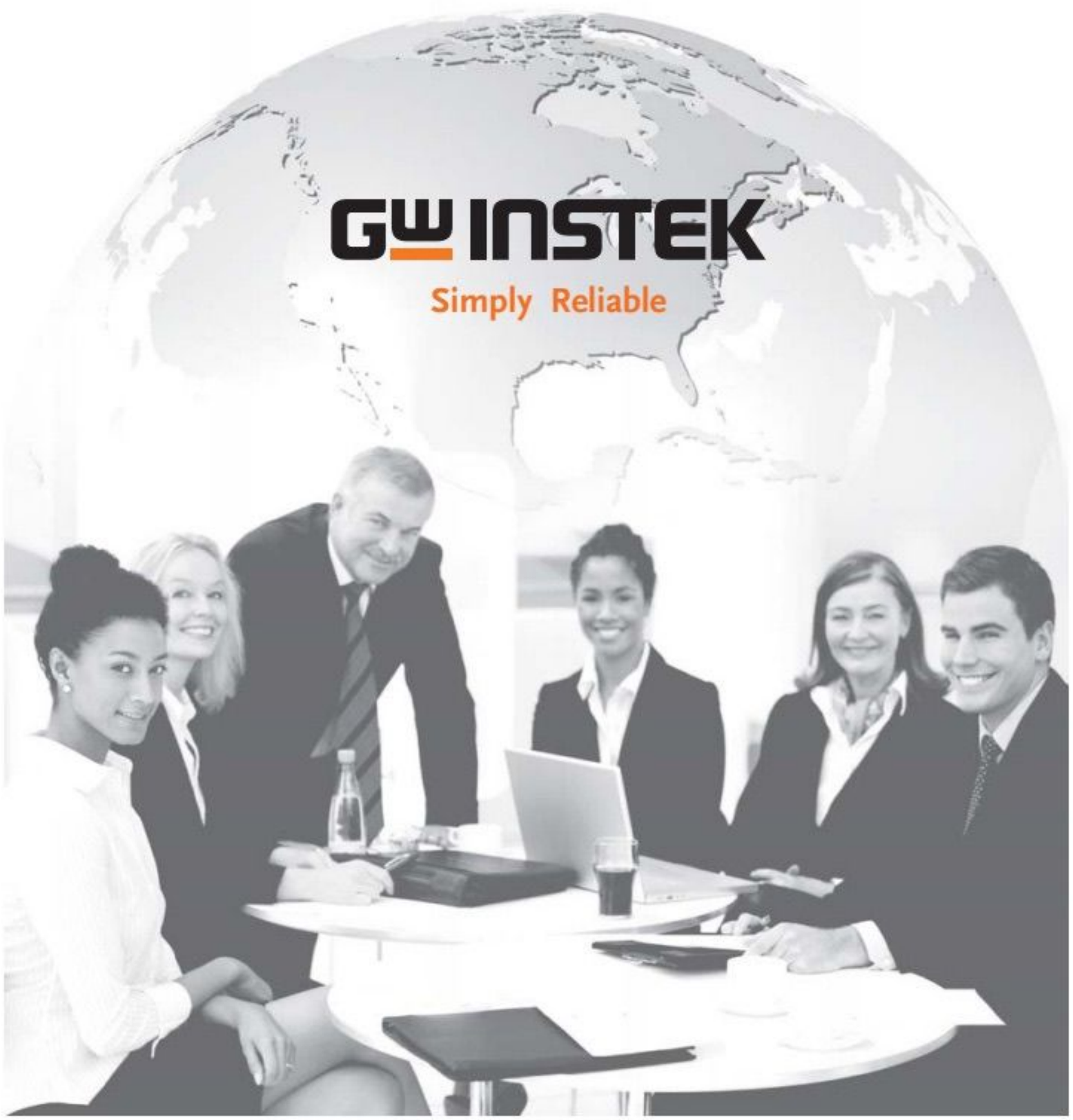
## PS

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| **PSB-001** | Accessory -- GPIB Card | D29 |
| **PSB-003** | Accessory -- Parallel Connection kit (for horizontal installation), Kit includes: (PSB-007 Joint Kit,Horizontal bus bar x 2 , PSB-005 x1) | D29 |
| **PSB-004** | Accessory -- Parallel Connection kit (for vertical installation) Kit includes:(PSB-007 Joint Kit,Verical bus bar x 2,PSB-005x1) | D29 |
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| **PSB-006** | Accessory -- Serial Connection Signal Cable | D29 |
| **PSB-007** | Accessory -- Joint Kit: Includes 4 Joining plates, [M3x6]screws x 4 ; [M3x8]screw x 2 | D29 |
| **PSB-008** | Accessory -- RS232C Cable (PSB-2000 Only) | D29 |
| **PSB-101** | Accessory -- Cable for 2 units | D33 |
| **PSB-102** | Accessory -- Cable for 3 units | D33 |
| **PSB-103** | Accessory -- Cable for 4 units | D33 |
| **PSB-104** | Accessory -- Cable for 2 units | D33 |
| **PSB-105** | Accessory -- GPIB Card | D33 |
| **PSB-106** | Accessory -- Basic Accessory Kit | D33 |
| **PSB-1400L** | 40V/40A/400W Programmable Multi-Range D.C. Power Supply | D33 |
| **PSB-1400M** | 160V/10A/400W Programmable Multi-Range D.C. Power Supply | D33 |
| **PSB-1800L** | 40V/80A/800W Programmable Multi-Range D.C. Power Supply | D33 |
| **PSB-1800M** | 160V/20A/800W Programmable Multi-Range D.C. Power Supply | D33 |
| **PSB-2400H** | 400W Multi-Range Programmable Switching D.C. Power Supply | D29 |
| **PSB-2400L** | 400W Multi-Range Programmable Switching D.C. Power Supply | D29 |
| **PSB-2400L2** | 800W Multi-Range, 2-Channel, Programmable Switching D.C. Power Supply | D29 |
| **PSB-2800H** | 800W Multi-Range Programmable Switching D.C. Power Supply | D29 |
| **PSB-2800L** | 800W Multi-Range Programmable Switching D.C. Power Supply | D29 |
| **PSB-2800LS** | 800W Slave (Booster) Unit For Current Extension Only | D29 |
| **PSH-2018A** | 360W Programmable Switching D.C. Power Supply | D35 |
| **PSH-3610A** | 360W Programmable Switching D.C. Power Supply | D35 |
| **PSH-3620A** | 720W Programmable Switching D.C. Power Supply | D35 |
| **PSH-3630A** | 1080W Programmable Switching D.C. Power Supply | D35 |
| **PSM-2010** | 200W Programmable Dual-Range Linear D.C. Power Supply | D59 |
| **PSM-3004** | 120W Programmable Dual-Range Linear D.C. Power Supply | D59 |
| **PSM-6003** | 200W Programmable Dual-Range Linear D.C. Power Supply | D59 |
| **PSP-2010** | 200W Programmable Switching D.C. Power Supply | D36 |
| **PSP-405** | 200W Programmable Switching D.C. Power Supply | D36 |
| **PSP-603** | 200W Programmable Switching D.C. Power Supply | D36 |
| **PSS-2005** | 100W Programmable Linear D.C. Power Supply | D60 |
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| **PSU 8-180** | 1440W Programmable Switching DC Power Supply | D19 |
| **PSU 12.5-120** | 1500W Programmable Switching DC Power Supply | D19 |
| **PSU 15-100** | 1500W Programmable Switching DC Power Supply | D19 |
| **PSU 20-76** | 1520W Programmable Switching DC Power Supply | D19 |
| **PSU 30-50** | 1500W Programmable Switching DC Power Supply | D19 |
| **PSU 40-38** | 1520W Programmable Switching DC Power Supply | D19 |
| **PSU 50-30** | 1500W Programmable Switching DC Power Supply | D19 |
| **PSU 60-25** | 1500W Programmable Switching DC Power Supply | D19 |
| **PSU 80-19** | 1520W Programmable Switching DC Power Supply | D19 |
| **PSU 100-15** | 1500W Programmable Switching DC Power Supply | D19 |
| **PSU 150-10** | 1500W Programmable Switching DC Power Supply | D19 |
| **PSU 300-5** | 1500W Programmable Switching DC Power Supply | D19 |
| **PSU 400-3.8** | 1520W Programmable Switching DC Power Supply | D19 |
| **PSU 600-2.6** | 1560W Programmable Switching DC Power Supply | D19 |

# Model Number Index


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| **PSU-01B** | Accessory -- Bus Bar for 2 units in Parallel Operation | D19 |
| **PSU-01C** | Accessory -- Cable for 2 units in Parallel Operation | D19 |
| **PSU-02A** | Accessory -- Joins a Vertical Stack of 3 PSU units Together. 3U-sized handles x2, Joining Plates x2 | D19 |
| **PSU-02B** | Accessory -- Bus Bar for 3 units in Parallel Operation | D19 |
| **PSU-02C** | Accessory -- Cable for 3 units in Parallel Operation | D19 |
| **PSU-03A** | Accessory -- Joins a Vertical Stack of 4 PSU units Together. 4U-sized Handles x2, Joining Plates x2 | D19 |
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| **PSU-ISO-I** | Accessory -- Isolated Current Remote Control Card (Factory Installed) | D19 |
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| **PSW160-7.2** | 360W Multi-Range Programmable Switching D.C. Power Supply | D15 |
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| **PSW-720L44** | 80V/13.5A*2 720W Multi-Range D.C. Power Supply | D9 |
| **PSW-720L45** | 80V/13.5A*1 160V/7.2A*1 720W Multi-Range D.C. Power Supply | D9 |
| **PSW-720L55** | 160V/7.2A*2 720W Multi-Range D.C. Power Supply | D9 |
| **PSW-720H66** | 250V/4.5A*2 720W Multi-Range D.C. Power Supply | D9 |
| **PSW-720H68** | 250V/4.5A*1 800V/1.44A*1 720W Multi-Range D.C. Power Supply | D9 |
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| **PSW80-40.5** | 1080W Multi-Range Programmable Switching D.C. Power Supply | D15 |
| **PSW-1080L111** | 30V/36A*3 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L112** | 30V/36A*2 40V/27A*1 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L114** | 30V/36A*2 80V/13.5A*1 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L115** | 30V/36A*2 160V/7.2A*1 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L122** | 30V/36A*1 40V/27A*2 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L124** | 30V/36A*1 40V/27A*1 80V/13.5A*1 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L125** | 30V/36A*1 40V/27A*1 160V/7.2A 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L144** | 30V/36A*1 80V/13.5A*2 1080W Multi-Range D.C. Power supply | D9 |
| **PSW-1080L145** | 30V/36A*1 80V/13.5A*1 160V/7.2A*1 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L155** | 30V/36A*1 160V/7.2A*2 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L222** | 40V/27A*3 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L224** | 40V/27A*2 80V/13.5A*1 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L225** | 40V/27A*2 160V/7.2A*1 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L244** | 40V/27A*1 80V/13.5A*2 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L245** | 40V/27A*1 80V/13.5A*1 160V/7.2A*1 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080L255** | 40V/27A*1 160V/7.2A*2 1080W Multi-Range D.C. Power supply | D9 |
| **PSW-1080L444** | 80V/13.5A*3 1080W Multi-Range D.C. Power supply | D9 |
| **PSW-1080L445** | 80V/13.5A*2 160V/7.2A*1 1080W Multi-Range D.C. Power supply | D9 |
| **PSW-1080L455** | 80V/13.5A*1 160V/7.2A*2 1080W Multi-Range D.C. Power supply | D9 |
| **PSW-1080L555** | 160V/7.2A*3 1080W Multi-Range D.C. Power supply | D9 |
| **PSW-1080H666** | 250V/4.5A*3 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080H668** | 250V/4.5A*2 800V/1.44A*1 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080H688** | 250V/4.5A*1 800V/1.44A*2 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-1080H888** | 800V/1.44A*3 1080W Multi-Range D.C. Power Supply | D9 |
| **PSW-001** | Accessory -- Accessory Kits | D15 |
| **PSW-002** | Accessory -- Simple IDC Tool | D15 |
| **PSW-003** | Accessory -- Contact Removal Tool | D15 |
| **PSW-004** | Accessory -- Basic Accessory Kit for 30V/80V/160V Models | D15 |
| **PSW-005** | Accessory -- Series Operation Cable for 2 units(for 30V/80V/160V) | D15 |
| **PSW-006** | Accessory -- Parallel Operation Cable for 2 units | D15 |
| **PSW-007** | Accessory -- Parallel Operation Cable for 3 units | D15 |
| **PSW-008** | Accessory -- Basic Accessory Kit for 250V/800V Models | D15 |
| **PSW-009** | Accessory -- Output Terminal Cover for 30V/80V/160V Models | D15 |
| **PSW-010** | Accessory -- Large Filter (Type II/III) | D15 |
| **PSW-011** | Accessory -- Output Terminal Cover for 250V/800V Models | D15 |
| **PSW-012** | Accessory -- High Voltage Output Terminal for 250V/800V Model | D15 |
| **PT** | | |
| **PT-100** | Accessory -- Temperature Probe, Approx. 1500mm | E83 |
| **RL** | | |
| **RLB-001** | Accessory -- Return Loss Bride, 10MHz - 1GHz, Source/Load: N(J/F), Coupling: N(P/M) | B25 |
| **SF** | | |
| **SFG-1003** | 3MHz DDS Function Generator | C29 |
| **SFG-1013** | 3MHz Dual Display DDS Function Generator | C29 |
| **SP** | | |
| **SPD-3606** | 375W, 3-Channel, Programmable Switching D.C. Power Supply | D38 |
| **SPS-1230** | 360W Switching D.C. Power Supply | D37 |
| **SPS-1820** | 360W Switching D.C. Power Supply | D37 |
| **SPS-2415** | 360W Switching D.C. Power Supply | D37 |
| **SPS-3610** | 360W Switching D.C. Power Supply | D37 |
| **SPS-606** | 360W Switching D.C. Power Supply | D37 |
| **US** | | |
| **USG-LF44** | 35MHz – 4400MHz, USB RF Signal Generator | C32 |

NOTE





# OSCILLOSCOPES

The frequency bandwidth ranges from 50MHz to the high-class 650MHz. In addition, up to 5GSa/s realtime sampling rate and 200M 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 GDS-3000A Series is the flagship product of GW Instek's digital storage oscilloscope. Its highest frequency bandwidth has been elevated to 650MHz, and the 350MHz model is also available. The memory depth of each channel is up to 200Mpts. The sampling rate is 5GSa/s interleaved. The display is 10.2" TFT LCD and the RGB display output is 8bits each, allowing users to clearly analyze the strength distribution of the measured signal.

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**

# OSCILLOSCOPES

## 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.



| Oscilloscope Lineup \ Bandwidth | Type | 650MHz | 500MHz | 350MHz | 300MHz | 250MHz | 200MHz | 150MHz | 100MHz | 70MHz | 50MHz | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDS-3000A Series | Digital | ✓ | | ✓ | | | | | | | | A5-10 |
| GDS-3000 Series | Digital | | ✓ | | | | | | | | | A11-12 |
| GDS-2000A Series | Digital | | | | ✓ | | ✓ | | ✓ | ✓ | | A13-14 |
| MSO-2000E Series | Digital | | | | | | ✓ | | ✓ | ✓ | | A15-20 |
| MDO-2000A Series | Digital | | | | ✓ | | ✓ | | ✓ | | | A21-26 |
| MDO-2000E Series | Digital | | | | | | ✓ | | ✓ | ✓ | | A27-30 |
| GDS-2000E Series | Digital | | | | | | ✓ | | ✓ | ✓ | | A31-32 |
| GDS-300/200 Series | Digital | | | | | | ✓ | | ✓ | ✓ | | A33-34 |
| GDS-1000B Series | Digital | | | | | | ✓ | | ✓ | ✓ | ✓ | A35-40 |

| MODEL \ FUNCTION | Collocation Instrument | Page |
|---|---|---|
| GDB-03 | GDS-3000A/GDS-3000/GDS-2000A/GDS-2000E/MSO-2000E/GDS-1000B Series | A41 |

## 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.

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.

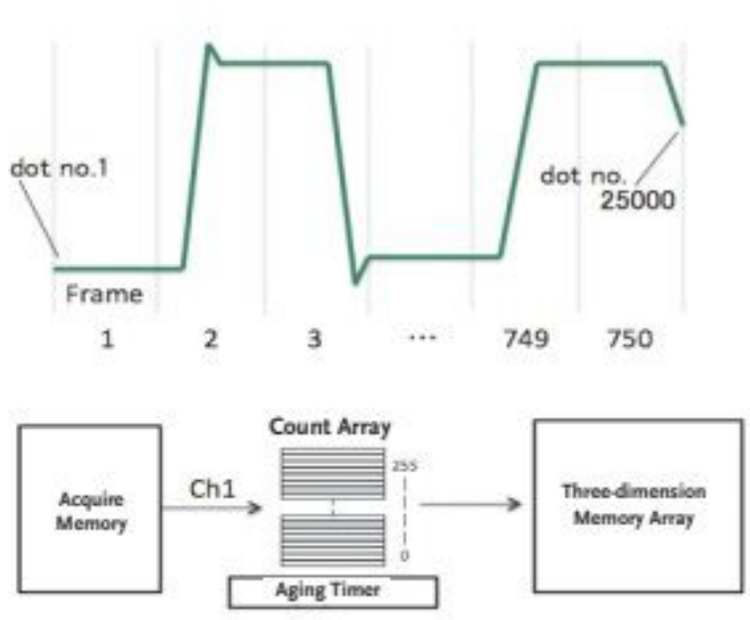



**Figure A. The compression and quantization of waveform data**

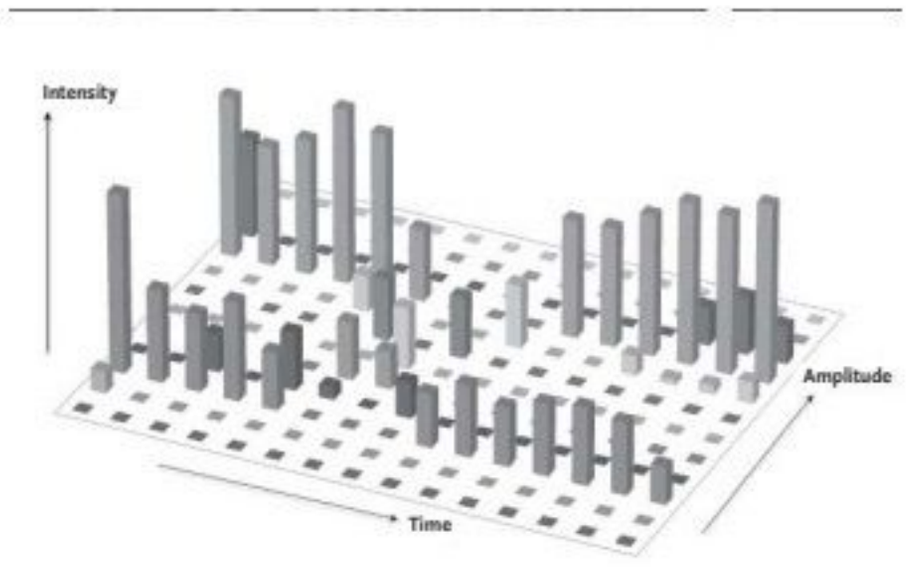



**Figure B. Structure of 3D waveform data array**

## 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.

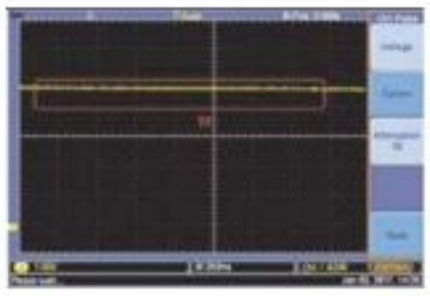
**Total Waveform Points Sampled = Record Duration /Sample Period=Record Duration X Sampling Rate**
**If Total Waveform Points Sampled > DSO Memory Depth, all excessive points sampled need to be abandoned and the effective sampling rate is forced to slow down**
**Memory Depth= Record Duration X Effective Sampling Rate**
**Effective Sampling Rate = Memory Depth/ Record Duration**
**When Record Duration is long, Longer DSO Memory Depth means Faster Effective Sampling Rate**

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

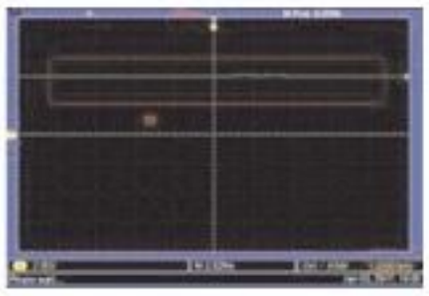
# DIGITAL STORAGE OSCILLOSCOPES

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 Nyqeist 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

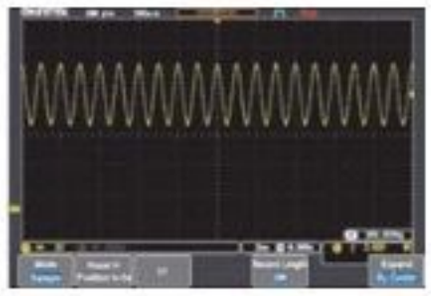


After pressing pause and zooming in, signal is obviously distorted

For GDS-1102B under 200ms/div, its 5MSa/s can satisfy the requirement of sample rate which is 2x higher than input frequency. As a result, GDS-1102B revealed genuine waveforms without Aliasing.



Waveforms entered roll mode under 200ms/div



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



## DIGITAL STORAGE OSCILLOSCOPE SELECTION GUIDE

| MODEL / MAIN FUNCTION | GDS-3000A Series | GDS-3000 Series | GDS-2000A Series | MSO-2000E Series | MDO-2000A Series | MDO-2000E Series | GDS-2000E Series | GDS-1000B Series |
|---|---|---|---|---|---|---|---|---|
| Bandwidth | 650/350MHz | 500MHz | 300/200/100/ 70 MHz | 200/100/70MHz | 300/200/100MHz | 200/100/70MHz | 200/100/70MHz | 200/100/70/50MHz |
| Display | 10.2" TFTLCD WVGA | 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 |
| VPO | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Memory Depth | 200M/ch | 25k/ch | 2M | 10M/ch | 20M/ch | 10M/ch | 10M/ch | 10M/ch |
| Real Time Sampling Rate | 5GSa/s | 4GSa/s | 2GSa/s | 1GSa/s | 2GSa/s | 1GSa/s | 1GSa/s | 1GSa/s |
| Channel | 2 or 4 | 2 or 4 | 2 or 4 | 2 or 4 | 2 | 2 or 4 | 2 or 4 | 2 or 4 ✲ |
| Input Impedance | 1M/50Ω | 1M/75/50Ω | 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 1mV~10V/div (@1MΩ) 1mV~1V/div (@50Ω) | 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 |
| Time Base Range | 1ns~1000s/div | 1ns~100s/div | 1ns~100s/div | 1ns~100s/div | 1ns~100s/div | 1ns~100s/div | 1ns~100s/div | 5ns~100s/div |
| Auto Measurement | 38 | 28 | 36 | 38 | 38 | 38 | 38 | 36 |
| 1M FFT | Yes | - | - | Yes | Yes | Yes | Yes | Yes |
| Split Screen | - | Yes | - | - | - | - | - | - |
| Auto Range | - | Yes | - | - | - | - | - | - |
| Power Analysis | Optional | Yes | - | - | - | - | - | - |
| Serial Bus Decode | Yes ($I^2C$,SPI,UART, CAN,LIN) | Optional ($I^2C$,SPI,UART) | Yes ($I^2C$,SPI,UART ,CAN,LIN) | Yes ($I^2C$,SPI,UART ,CAN,LIN) | Yes ($I^2C$,UART,CAN, LIN) | Yes ($I^2C$,SPI,UART ,CAN,LIN) | Yes ($I^2C$,SPI,UART ,CAN,LIN) | - |
| Waveform Search | Yes | - | Yes | - | Yes | Yes | - | - |
| Segmented Memory | Yes | - | Yes | - | Yes | Yes | - | - |
| Logic Analyzer | Optional 16CH | - | Optional 8 or 16 CH | Standard 16CH | - | - | - | - |
| Arbitrary Waveform Generator | Standard provide dual Channel 25MHz | - | 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; RS232C;Go/NoGo BNC; GPIB (optional) | 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 |
| Page | A5-10 | A11-12 | A13-14 | A15-20 | A21-26 | A27-30 | A31-32 | A35-40 |

* 200/100/70MHz:2CH
100/70/50MHz:4CH

# 650/350 MHz Digital Storage Oscilloscope

VPO
Visual Persistence Oscilloscope



## GDS-3000A Series (650/350 MHz)

NEW

CE | USB Full Speed | PC Software | Labview Driver | RS-232 | GPIB | Ethernet

## FEATURES

- ✲ 650/350MHz Bandwidth, 2 or 4 Input Channels
- ✲ 5GSa/s Real-time Sampling Rate(half channels); 2.5GSa/s Real-time Sampling Rate(all channels)
- ✲ Per Channel 200Mpts Memory Depth
- ✲ 200,000 wfm/s of Waveform Update Rate
- ✲ 10.2 inch 800 x 480 TFT LCD Display
- ✲ 490,000 Segments of Segmented Memory and the Waveform Search Function to Optimize the Efficiency of Record Length
- ✲ Zoom Window and Play/Pause Rapidly Navigate the Waveforms
- ✲ 38 sets of Automatic Measurement Offer Various Measurement Selections
- ✲ High resolution acquisition mode
- ✲ $I^2C$/SPI/UART/CAN/LIN Serial Bus Trigger and Decoding Functions
- ✲ Dual Channel Spectrum Analyzer (DC~2.5GHz) with spectrogram
- ✲ Dual Channel 25MHz Arbitrary Waveform Generator
- ✲ Optional 13 Sets of Power Analysis Measurements
- ✲ Optional 16 Digital Channels with a Logic Analyzer(MSO)
- ✲ Flexible Remote Control Connectivity (Standard: USB/LAN/RS-232; Option: GPIB)

GDS-3000A digital storage oscilloscopes have 650MHz and 350MHz models with two-channel, four-channel and 16-channel logic analyzer options. The series features the memory length of each channel up to 200Mpts; the sampling rate of 5GSa/s half channels and 2.5GSa/s on all channels. Its display is 10.2" TFT LCD and it provides the color display mode.

**Accurate Signal Acquisition and Analysis**

GDS-3000A strengthens many functions and specifications required for oscilloscope measurements including the memory depth of up to 200Mpts per channel. The advantage of long memory is that it allows users to maintain high sampling rate even at low speed time settings; the waveform update rate is up to 200,000wfm/s; and the segmented memory can capture and analyze up to 490,000 segments. For measurement, GDS-3000A incorporates the Fine scale function to allow users to fine-tune the vertical scale according to the requirements so as to achieve full scale measurement to improve its measurement accuracy. With a 10.2" large screen display and the acquisition method with the high resolution mode allow low-noise signals under high-bandwidth measurements.

In addition, the series is equipped with 1M ohm and 50 ohm input impedance selections, which can be set according to different DUT measurement requirements to achieve the effect of impedance matching. The search function can quickly find the signals that meet the conditions according to the needs of the test. The cursor mark function allows users to clearly observe the voltage (or current), time and delta data of each point measured by the cursor. Via the indicator function, the measured range is to be shown at the specific section of the waveform.

**Dual Domain Measurement**

For frequency domain measurement, it is equipped with a dual channel spectrum analyzer, which allows users to measure and analyze the frequency domain signals of two channels at the same time. It is also equipped with Spectrogram function, which allows users to easily observe complex frequency domain fluctuations that are proportionally decomposed into simple superimposed waves so as to understand the signal strength distribution. The soft keys allow users to have more intuitive settings for operation, which can improve the measurement efficiency.

**13 Sets of Switching Mode Power Supply Measurements**

GDS-3000A provides a rich measurement items for switch mode power supply testing. The provided power supply test items include AC input analysis items: Power Quality, Harmonics, Inrush Current; DC output analysis required test items: Ripple/Noise, Transient Response Analysis, Turn On/OFF, Efficiency; Control Loop response(Bode) and PSRR(Power Supply Rejection Ratio); Complete switching component analysis items: Modulation, Switching loss, SOA(Safe Operation Area) and Magnetics analysis: B-H curve. On one side of GDS-3000A, a power supply for 50MHz (GCP-530) and 100MHz(GCP-1030) current probes is provided. This feature can save users the cost of purchasing the power supply for current probes and relief the burden of carrying the power supply when going out. GDS-3000A is standardly equipped with a dual-channel 25MHz arbitrary waveform generator and the frequency response analysis function. The FRA has the load function, which can load multiple FRA measurement results for comparison. User define shortcut key provides user-definable shortcut keys. The use of the shortcut key can improve measurement efficiency. GDS-3000A provides a rich communication interfaces. In addition to the commonly used USB Host, USB Device port, and LAN port, it also includes a highly stable RS232 interface and an optional GPIB interface.

**SPECIFICATIONS**

| | GDS-3352A | GDS-3354A | GDS-3652A | GDS-3654A |
|---|---|---|---|---|
| **VERTICAL** | | | | |
| Channels | 2Ch+EXT | 4Ch+EXT | 2Ch+EXT | 4Ch+EXT |
| Bandwidth | DC~350MHz(-3dB)@50Ω/1MΩ input impedance | | DC~650MHz(-3dB)@50Ω input impedance; DC~500MHz(-3dB)@1MΩ input impedance | |
| Calculated Rise Time | 1ns | | 535ps | |
| Bandwidth Limit | 20M/100M/200MHz*1 | | 20M/100M/200M/300MHz*1 | |
| Vertical Resolution | 8 bits(Max.12bits with Hi Res) | | | |
| Vertical Resolution(1MΩ) | 1mV*2 ~ 10V/div | | | |
| Vertical Resolution(50Ω) | 1mV*2 ~ 1V/div | | | |
| Input Coupling | AC, DC, GND | | | |
| Input Impedance | 1MΩ// 22pF approx. | | | |
| DC Gain Accuracy | 1mV : ±5% full scale ; ≥2mV : ±3% full scale | | | |
| Polarity | Normal , Invert | | | |
| Maximum Input Voltage(1MΩ) | 300Vrms, CAT II | | | |
| Maximum Input Voltage(50Ω) | 5 Vrms | | | |
| Offset Position Range | For 1MΩ input impedance:1mV/div~20mV/div:±1V;50mV/div~500mV/div:±10V; 1V/div~5V/div:±100V;10V/div:±1000V<br>For 50Ω input impedance:1mV/div~50mV/div:±1V;100mV/div~1V/div:±10V | | | |
| Waveform Signal Process | +, -, X,÷, FFT, User Defined Expression 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 models: CH1, CH2, Line , EXT ; 4CH models: CH1 , CH2 , CH3 , CH4 , Line , EXT | | | |
| Trigger Mode | Auto(Supports Roll Mode for 100ms/div and slower), Normal, Single | | | |
| Trigger Type | Edge, Pulse Width(Glitch), Video, Pulse Runt, Rise & Fall(Slope),Time out, Alternate, Event-Delay(1~65,535 events),Time-Delay(Duration, 4ns~10s),Bus($I^2C$,SPI,UART,CAN,LIN) | | | |
| Trigger Holdoff Range | 4ns~10s | | | |
| Coupling | AC, DC, LF rej. , HF rej. , Noise rej. | | | |
| Sensitivity | 1div | | | |
| **EXT TRIGGER** | | | | |
| Range | ±20V | | | |
| Sensitivity | DC ~ 100MHz Approx. 100mV<br>100MHz ~ 350MHz Approx. 150mV | | | |
| Input Impedance | 1MΩ±3% ~ 22pF | | | |
| **HORIZONTAL** | | | | |
| Range | 1ns/div ~ 1000s/div (1-2-5 increments); ROLL : 100ms/div ~ 1000s/div | | | |
| Pre-trigger | 10 div maximum | | | |
| Post-trigger | 10,000,000 div max ( depend on time base ) | | | |
| Accuracy | ±5ppm, about ±2ppm increase in error per year | | | |
| **X-Y MODE** | | | | |
| X-Axis Input/Y-Axis Input | Channel 1, Channel 3 (for 4CH models); Channel 2, Channel 4 (for 4CH models) | | | |
| Phase Shift | ±3° at 100kHz | | | |
| **SIGNAL ACQUISITION** | | | | |
| Real Time Sample Rate | 5GSa/s half channels; 2.5GSa/s all channels | | | |
| Record Length | Max.200M pts/CH | | | |
| Acquisition Mode | Normal, Average, Peak detect, High resolution, Single | | | |
| | Average: Selectable from 2 ~ 256, Peak detect: 400ps | | | |
| Number of Segments | 1 ~ 490,000 maximum | | | |
| **CURSORS AND MEASUREMENT** | | | | |
| Cursors | Amplitude, Time, Gating available;Unit:Seconds(s),Hz(1/s),Phase(degree),Ratio(%) | | | |
| Automatic Measurement | 38 sets with indicator: 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. | | | |
| 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", "Fit Screen"/ "AC Priority" mode, and "Fine Scale" functions. | | | |
| Save Setup | 20 sets | | | |
| Save Waveform | 20 sets | | | |
| Save Reference Waveform | 4 sets | | | |
| **POWER MEASUREMENTS (Option)** | | | | |
| | Power Quality, Harmonics, Ripple, In-rush current, Switching Loss, Modulation, SOA, Transient, Efficiency, B-H curve, Control Loop Response, PSRR, Turn On/Off | | | |

*1. The tolerance of bandwidth limit is±10%.
*2. The bandwidth is limited to 20MHz at 1mV/div and 2mV/div.

## SPECIFICATIONS

| | GDS-3352A | GDS-3354A | GDS-3652A | GDS-3654A |
|---|---|---|---|---|
| **AWG** | | | | |
| 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, 50Ω | | | |
| Output Resolution | 1mV | | | |
| Output Accuracy | 2% (1 kHz) | | | |
| Offset Range | ±2.5 V ac+dc, High Z;±1.25 V ac+dc, 50Ω | | | |
| Offset Resolution | 1mV | | | |
| Sine | Frequency Range:100mHz~25MHz;Flatness(relative to 1kHz):±0.5 dB<15MHz,±1dB(15MHz~25MHz); 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% | | | |
| **SPECTRUM ANALYZER** | | | | |
| Frequency Range | DC ~ 2.5GHz(Max.) dual channel with spectrogram (based on advanced FFT). Notice: Frequency which exceeds analog front end bandwidth is uncalibrated | | | |
| Span | 1kHz ~ 2.5GHz(Max.) | | | |
| Resolution Bandwidth | 1Hz ~ 2.5MHz(Max.) | | | |
| Reference Level | -80 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 < -40dBm, Avg : 16 ; 100mV/div < -60dBm, Avg : 16 ; 10mV/div < -80dBm, Avg : 16 | | | |
| Spurious Response | 2nd harmonic distortion<35dBc ; 3rd harmonic distortion< 40dBc | | | |
| 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 | | | |
| **LOGIC ANALYZER (Option)** | | | | |
| 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 ($I^2C$, SPI, UART, 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 | | | |
| Vertical Resolution | 1 bit | | | |
| **FREQUENCY RESPONSE ANALYSIS** | | | | |
| Frequency Range | 20 Hz ~ 25 MHz | | | |
| Input and Output Sources | Channel 1 ~ 2 for 2CH models ; Channel 1 ~ 4 for 4CH models | | | |
| Number of Test Points | 10,15,30,45,90 points per decade selectable for logarithm scale;2~1000 points selectable for linear scale | | | |
| Dynamic Range | > 80 dB (typical) | | | |
| Test Amplitude | 10mVpp to 2.5Vpp into 50Ω, 20mVpp to 5Vpp into High-Z, Fixed test amplitude or custom amplitude for each decade | | | |
| Test Results | Logarithmic or linear overlaid gain and phase plot, may also overlay with reference plots for cross comparison. Test results saved in csv format for offline analysis | | | |
| Manual Measurements | Tracking gain and phase markers | | | |
| Plot Scaling | Auto-scaled during test | | | |
| **DISPLAY SYSTEM** | | | | |
| TFT LCD Type | 10.2" TFT LCD WVGA color display | | | |
| Waveform Update Rate | 200,000 wfms/sec max. | | | |
| Display Resolution | 800 horizontal x 480 vertical pixels (WVGA) | | | |
| Interpolation | Sin(x)/x | | | |
| Waveform Display | Dots, Vectors, Variable persistence(16ms~4s), Infinite persistence,gray and color waveforms | | | |
| Display Graticule | 8 x 10 divisions | | | |
| Display Mode | YT,XY | | | |
| **INTERFACE** | | | | |
| RS-232C | DB-9 male connector | | | |
| USB Port | USB 2.0 high-speed host port x 1 ; USB high-speed 2.0 device port x 1 | | | |
| Ethernet Port | RJ-45 connector, 10/100Mbps with HP Auto-MDIX | | | |
| VGA Video Port | DB-15 female connector, monitor output for display on VGA monitor | | | |
| Optional GPIB Module | Fully programmable with IEEE488.2 compliance | | | |
| Go/NoGo BNC | 5V Max/10mA open collector output | | | |
| Kensington Style Lock | Rear-panel security slot connects to standard Kensington-style lock | | | |
| Power Supply Receptacles | ±12V/500mA for current probe usage.2 sets for 2CH models;4 sets for 4CH models | | | |
| **MISCELLANEOUS** | | | | |
| Operating | 0°C ~ 50°C, Relative Humidity≤80% at 40°C or below ;≤ 45% at 41°C~50°C | | | |
| Line Voltage Range | AC 100V ~ 240V, 50Hz ~ 60Hz, auto selection. power consumption:100W | | | |
| Multi-Language Menu | Available | | | |
| On-Line Help | Available | | | |
| Time Clock | Time and date, provide the date/time for saved data | | | |
| Internal Flash Disk | 800M bytes Single-Level Cell flash memory | | | |
| Installed APP | Go/NoGo, DVM, DataLog, Digital Filter, Frequency Response Analyzer, Mask, Mount Remote Disk, Demo | | | |
| User Define Key | User can select one of the several different preset functions as shortcut key | | | |
| **DIMENSIONS & WEIGHT** | | | | |
| 420(W) X 253(H) X 113.8(D)mm, Approx. 4.6 kg | | | | |

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

## Rear Panel



## DS3A-16LA 16 Channel Logic Analyzer



## GRA-443 Rack Adapter Panel

Rack Mounting (19" , 6U)



## GKT-100 Deskew Fixture



## ORDERING INFORMATION

| | |
|---|---|
| **GDS-3652A** | 650MHz, 2-Channel, Digital Storage Oscilloscope |
| **GDS-3654A** | 650MHz, 4-Channel, Digital Storage Oscilloscope |
| **GDS-3352A** | 350MHz, 2-Channel, Digital Storage Oscilloscope |
| **GDS-3354A** | 350MHz, 4-Channel, Digital Storage Oscilloscope |

ACCESSORIES
User manual CD x 1, Power cord x 1
GTP-351R:350MHz 10:1 passive probe for GDS-3352A/3354A(one per channel)
GTP-501R:500MHz 10:1 passive probe for GDS-3652A/3654A (one per channel)

### Option

| | | | | | |
|---|---|---|---|---|---|
| **DS3A-PWR** | Power Analysis Software | **DS3A-GPIB** | GPIB Interface | **DS3A-16LA** | 16 Channel Logic Analyzer |

### Optional Accessories

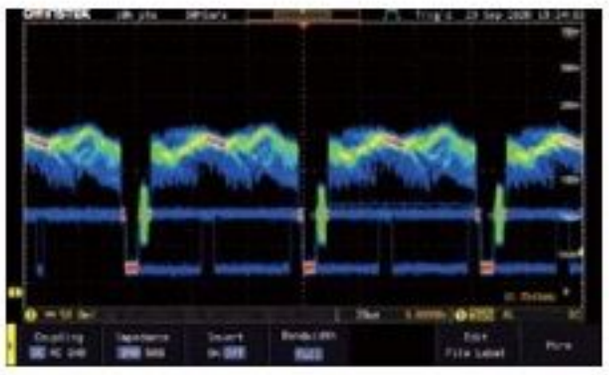
| | | | |
|---|---|---|---|
| **GTP-033A** | 35MHz 1:1 Passive probe | **GCP-1030** | 100MHz/30A Current probe |
| **GTP-352R** | 350MHz 20:1 Passive probe | **GTL-248** | GPIB Cable, Double Shielded, 2000mm |
| **GDP-025** | 25MHz High voltage differential probe | **GTL-110** | Test lead, BNC to BNC connector |
| **GDP-050** | 50MHz High voltage differential probe | **GTL-232** | RS-232C cable, 9-pin female to 9-pin female, Null modem for computer |
| **GDP-100** | 100MHz High voltage differential probe | **GTL-246** | USB 2.0 cable, A-B type cable 4P, 1800mm |
| **GCP-300** | 300kHz/200A Current probe | **GRA-443** | Rack Adapter Panel |
| **GCP-500** | 500kHz/150A Current probe | **GKT-100** | Deskew Fixture |
| **GCP-530** | 50MHz/30A Current probe | | |
| **GCP-1000** | 1MHz/70A Current probe | | |

### Free Download

| | | | |
|---|---|---|---|
| **PC Software** | OpenWave software | **Driver** | LabView driver |

# 650/350 MHz Digital Storage Oscilloscope

## A. 10.2 INCH, 8 BITS RGB COLOR GRADIENT DISPLAY



With respect to the waveform display technology, the GDS-3000A series oscilloscope is capable of displaying RGB color gradients with 8 bits each which can delineate the profound gradational fluctuations; as if it can recreate the analog oscilloscope display capability. When a composite signal is input, the GDS-3000A series, 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, it allows users to easily determine and analyze waveforms.

## B. 200M MEMORY DEPTH PER CHANNEL INDEPENDENTLY



The GDS-3000A series oscilloscope has a powerful and incomparable memory depth for the data retrieving. 200M memory depth per channel independently surpasses the specification of the industry's 3000 series DSO boundary. 200M memory depth allows users to easily seize the waveform detail while conducting fundamental measurement applications.

## C. FINE SCALE



The Fine scale function is incorporated to allow users to fine-tune the vertical scale according to their needs to achieve full-scale measurement and improve the accuracy of the voltage or current measurements.

## D. HIGH RESOLUTION ACQUISITION MODE



The acquisition method with high resolution mode is provided to effectively remove noise and improve the accuracy of automatic measurement.

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





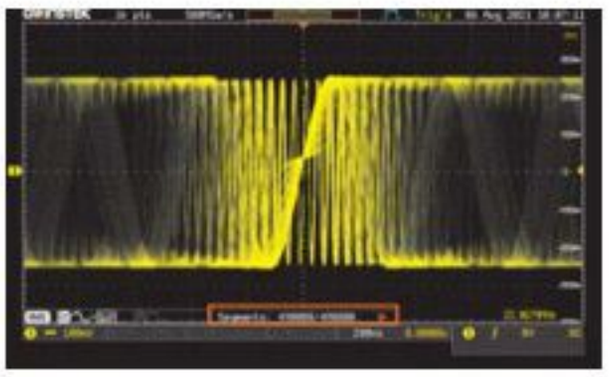


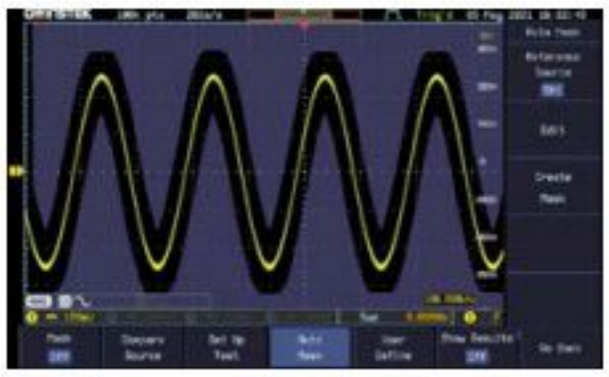
The GDS-3000A series soundly provides 38 measurement items. Based upon the parameters such as voltage, current, time, frequency, and delay measurement, users can decide which measurement items to choose. On the single display screen, the GDS-3000A series provides 8 measurement selections.

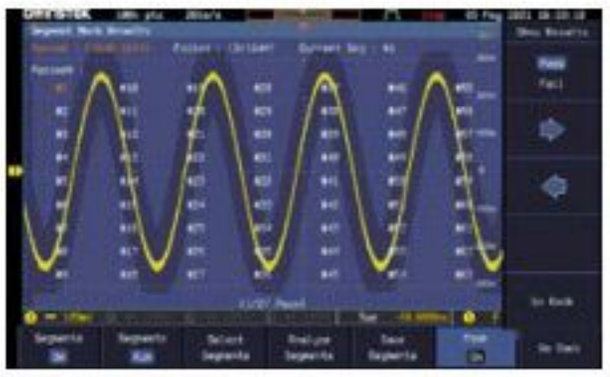
The statistics mode can also be selected for users to analyze the mean value, the maximum, the minimum, and standard deviation of the retrieved waveforms to ensure signal's integrity and identify abnormal waveforms.

Users can also use the Measure Shortcuts function to select the item to be measured, and then store the selected item in Shortcut 1~4, which can be selected to conduct measurements for the same product next time. Users just select the previously stored Shortcut 1~4 without making new selections from Add measurement, and all the measurement items will be displayed on the screen to improve the measurement efficiency.

## F. 490,000 SEGMENTED MEMORY







**In addition, GDS-3000A incorporates the Mask determination function under Segment, allowing users to quickly analyze abnormal waveforms that exceed the target range.**

As the length of the sampling memory increases to 200Mpts, the number of acquisitions that can be set in the GDS-3000A's segmented memory at one time has also increased significantly, and up to 490,000 waveforms can be stored continuously (under the condition of the memory length of 1,000pts).

The segmented memory allows users to capture and observe interesting waveforms. Through the statistical function, it is especially helpful for finding sporadic problems in continuous events.

## G. WAVEFORM SEARCH FUNCTION



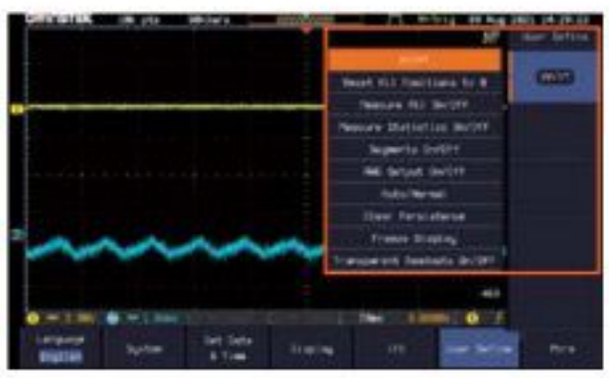



Users can rapidly search desired waveforms according to the trigger condition. After activating the search function, hollow inverted triangles will show the location met the trigger condition. The upper left hand corner Overall will show the total number of waveforms met the trigger condition. Users 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 GDS-3000A 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.

## H. USER DEFINE KEY



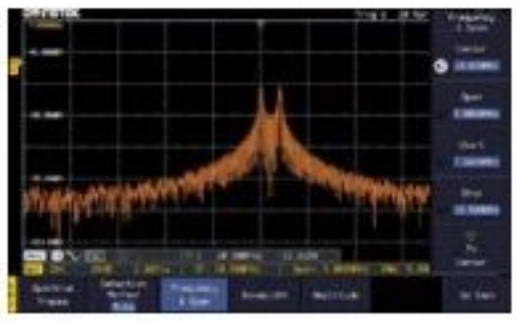



GDS-3000A incorporates a User Define key to allow users to set any one of the ten functions of User Define based upon the measurement requirement, including XY/YT; Reset all positons to 0; Measure all On/Off; Measure statistics On/Off; Segments On/Off; AWG output On/Off; Auto/Normal; Clear persistence; Freeze display and transparent readouts On/Off.

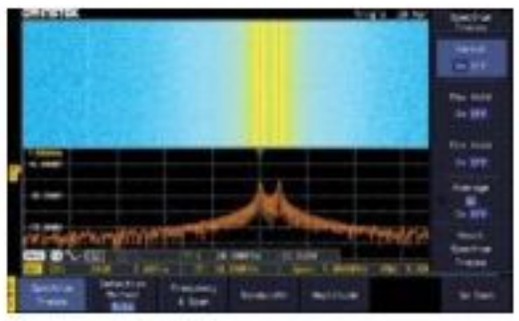
Users can quickly select the function setting by just pressing a key to quickly meet the measurement needs so as to improve the measurement efficiency.

# 650/350 MHz Digital Storage Oscilloscope

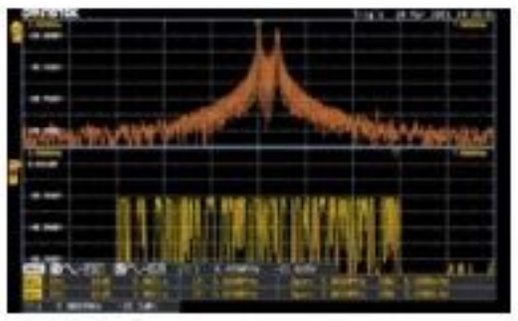
## I. SPECTRUM ANALYZER FUNCTION



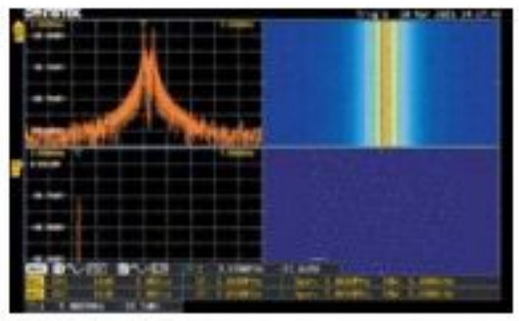
Spectrum Analyzer



Spectrum Analyzer + Spectrogram



Dual Spectrum Analyzer



Dual Spectrum Analyzer + Spectrogram

For frequency domain measurement, dual channel spectrum analyzer is equipped. Users can measure and analyze dual channel frequency domain signals at the same time. It also includes the Spectrogram function, which allows users to easily observe the signal's strength distribution and the relationship of the spectrum distribution over time. The independent numeric key input on the panel makes the operation more convenient for users, thereby improving the measurement efficiency. For promotion selling point, dual Spectrum Analyzer and Spectrogram can test the frequency response of the left and right channels of the Audio Amplifier at the same time.

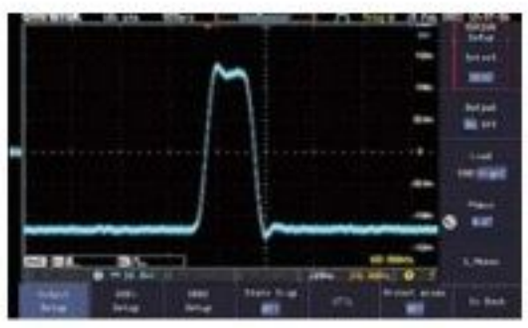
The above displays are :

1. Spectrum Analyzer
2. Spectrum Analyzer + Spectrogram
3. Dual Spectrum Analyzer
   (Dual channels can set different conditions)
4. Dual Spectrum Analyzer + Spectrogram

## J. 25MHZ DUAL CHANNEL ARBITRARY WAVEFORM GENERATOR



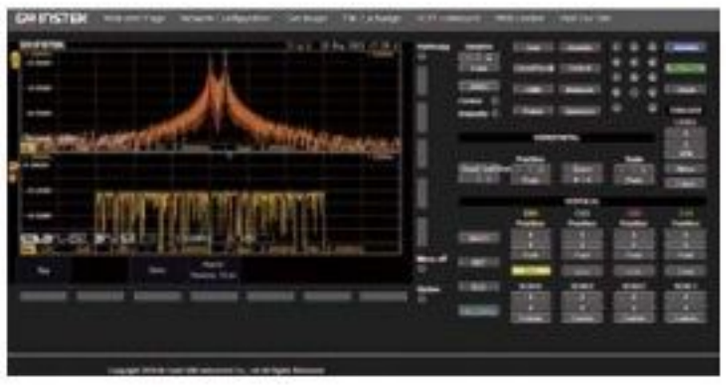


*** The above two displays are load from CH1, and then it was generated by AWG to CH3**

GDS-3000A is standardly equipped with a 25MHz dual channel arbitrary waveform generator, and provides built-in Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaston, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac and other waveforms. Users can be directly input the amplitude and frequency of the signal through the numeric keys. Compared with the previous model, the new function is that users can select the arbitrary waveform function of the AWG to store the signal measured by the analog channel of the oscilloscope to the arbitrary waveform of the signal source (UAW file), or it can directly output this signal from the signal generator, which is a new function that allows users to conveniently generate various measured signals to simulate diversified signal outputs.

## K. PC REMOTE CONTROL (WEB SERVER FUNCTION)



GDS-3000A has a built-in Web Server function to allow users to connect GDS-3000A's Web Server by using a browser in the same network domain via Ethernet connection. System information can be obtained and the oscilloscope screen (. png file) can be observed and captured remotely.

GDS-3000A can be controlled remotely through GUI to download and upload configuration files and test SCPI commands. Users can use this function to obtain oscilloscope information and configuration files, and operate remote control even if they are not on-site.

## L. POWER ANALYSIS FUNCTIONS



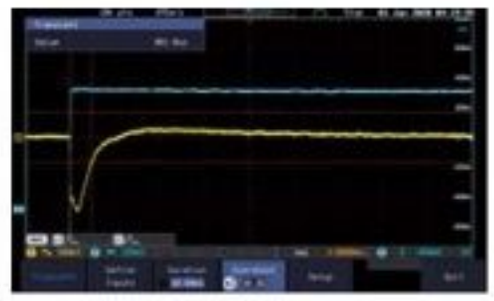
### 13 Sets of Switching Mode Power Supply Measurements

In daily life, switching power supplies have become the mainstream of power supplies. Engineers often have to rack their brains in order to improve product performance and reduce switching loss, and Ripple/Noise.
GDS-3000A has an option of rich measurement items for switching mode power supply testing. To meet engineers' measurement needs for switching mode power supply, rich measurement function can help engineers save a lot of measurement computing time and improve product development efficiency.



**Power Quality**

For AC voltage and current measurement, its distortion and other abnormal phenomena will affect the power consumption, efficiency and reliability of the power supply.
Measurement items: current/voltage root mean square value, actual power, reactive power, frequency, power factor, phase angle, +/- V Peak, +/- I Peak, AC/DC voltage and current, voltage/current crest factor, impedance, resistance and reactance.



**Transient Response Analysis**

Output analysis required test items: Ripple/Noise, Transient response analysis, Turn On/OFF and Efficiency. It measures the time required for the output DC voltage to reach the stable level expected by users when the output load changes suddenly.
Measurement item: transient response value (s).



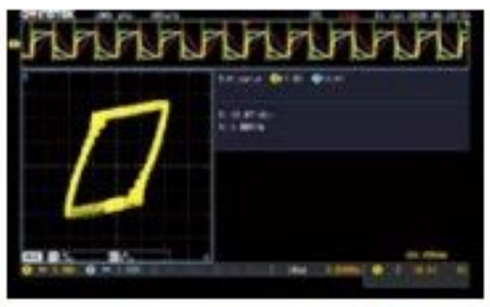
**Switching Loss**

Switching component analysis items: Switching loss, SOA (Safe Operation Area) and Modulation analysis.Analyze the integral of the product of the voltage and current of the switching device (MOSFET or IGBT) in the power supply, and then measure the switching loss of the device, including Turn-on switching loss, Turn-off switching loss and Conduction loss.
The higher the switching frequency, the higher the Turn-on and Turn-off switching loss.
Measurement items: power loss, energy loss & Rds(on)/Vce(sat).



**Control Loop Response**

Control Loop Response and PSRR (Power Supply Rejection Ratio)
PSRR: Power supply rejection ratio (PSRR) analysis, which is used to confirm that power equipment suppresses ripple noise in different frequency ranges.
Measurement items: frequency and PSRR (dB).



**Magnetics Analysis**

Magnetics Analysis(B-H Curve): The characteristics of magnetic materials are divided into magnetic flux density (B), magnetic field strength (H) and material magnetic permeability (μ). The B-H diagram is usually used to verify the saturation of the magnetic components in the switch power supply.
Measurement items: Measure the voltage and current flowing through the magnetic component and draw a B-H diagram.

## M. OPTIONAL 16-CHANNEL LOGIC ANALYZER



GDS-3000A can be upgraded to a mixed-signal oscilloscope (MSO) by selecting an optional 16-channel logic analyzer, which is a plugin. When you have several GDS-3000As, you can plug in an optional logic analyzer to other unit at any time without installing any software.



Users can analyze digital signals, $I^2C$, SPI, UART, CAN, LIN and parallel bus through a logic analyzer.

# 500 MHz Digital Storage Oscilloscope

VPO
Visual Persistence Oscilloscope

Patent No.ZL201220307783.4
ZL201210216179



## GDS-3000 Series (500MHz)

CE | RS-232 | GPIB | Ethernet | USB High Speed | PC Software | Labview Driver | PictBridge Compatible | VGA Output

## FEATURES

* 500MHz Bandwidth, 2/4 Input Channels
* 4GSa/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 I²C, SPI and UART Interfaces

## SPECIFICATIONS

| | GDS-3502 | GDS-3504 |
|---|---|---|
| **VERTICAL** | | |
| Channels | 2Ch+EXT | 4Ch+EXT |
| Bandwidth | DC–500MHz(-3dB) | DC–500MHz(-3dB) |
| Calculated Rise Time | 700ps | 700ps |
| Bandwidth Limit | 20M/100M/200/350MHz | 20M/100M/200/350MHz |
| | The bandwidth of the 75Ω input impedance is limited to 150MHz only. | |
| Vertical Resolution | 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 | |
| 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),I²C,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 | 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 | 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<br>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 (△V) Time difference between cursors (△T) | |
| 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-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 | |
| **GPIB** | GPIB-to-USB Adapter (Optional) | |
| **Go/NoGo BNC** | 5V Max/10mA 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

**GDS-3502** 500MHz, 2-Channel, Digital Storage Oscilloscope
**GDS-3504** 500MHz, 4-Channel, Digital Storage Oscilloscope

ACCESSORIES
User manual CD x 1 ,Power cord x 1
GTP-501R : 500MHz 10:1 passive probe for GDS-3502/3504 (one per channel)

### Option

**DS3-PWR** Power analysis software: Power quality/Harmonic/Ripple/In-rush current measurements
**DS3-SBD** Serial Bus analysis software: I²C/SPI/UART(only 4 channel models support SPI function)

### Optional Accessories

**GUG-001** GPIB to USB adapter
**GTP-033A** 35MHz 1:1 Passive probe
**GCP-300** 300kHz/200A Current probe
**GCP-530** 50MHz/30A Current probe
**GCP-500** 500kHz/150A Current probe
**GCP-1030** 100MHz/30A Current probe
**GCP-1000** 1MHz/70A Current probe
**GCP-206P** Power supply for current probe (2 input channel)
**GCP-425P** Power supply for current probe (4 input channel)
**GTL-248** GPIB Cable, Double Shielded, 2000mm
**GDP-025** 25MHz High voltage differential probe
**GDP-050** 50MHz High voltage differential probe
**GDP-100** 100MHz High voltage differential probe
**GSC-008** Soft Carrying Case
**GTL-110** Test lead, BNC to BNC connector
**GTL-232** RS-232C cable, 9-pin female to 9-pin female, Null modem for computer
**GTL-246** USB 2.0 cable, A-B type cable 4P,1800mm
**GRA-411** Rack Mount Kit
**GDB-03** Oscilloscope Education and Training Kit
**GKT-100** Deskew fixture

### Free Download

**PC Software** FreeWave software **Driver** USB driver ; LabView driver

## Rear Panel



## GUG-001 GPIB 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)

CE | USB Full Speed | PC Software | Labview Driver | RS-232 | GPIB | Ethernet | PictBridge Compatible

## 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 $I^2C$, 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 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) | |
| **Calculated Rise Time** | 5ns | | 3.5ns | | 1.75ns | | 1.17ns | |
| **Bandwidth Limit** | 20MHz | | 20MHz | | 20M/100MHz | | 20M/100M/200MHz | |
| **Vertical Resolution** | 8 bits@1M : 1mV*–10V<br>( * : 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<br>±(5% X \|Readout\| + 0.1div + 1mV) when 1mV/div is selected<br>( ** : The measurement type is average of≥16 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 ;<br>5V/div–10V/div : ±250V | | | | | | | |
| **Waveform Signal Process** | +, -, x, ÷, FFT, d/dt, ∫dt, √‾<br>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<br>**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 ;<br>200MHz – 300MHz Approx. 2div or 20mV |

### EXT TRIGGER

| | |
|---|---|
| **Range** | ±15V |
| **Sensitivity** | DC – 100MHz Approx. 100mV<br>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, RPREShoot, FPREShoot, 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) |
| **Go/NoGo BNC** | 5V Max/10mA 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 ($I^2C$, 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 |
| **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 | |

## 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-GPIB** GPIB Interface

**DS2-FGN** DDS Function Generator

**DS2-16LA** 16-Channel Logic Analyzer includes
16 Channel Logic Analyzer Card(GLA-16)
16-Channel Logic Analyzer Probe(GTL-16LA)

**DS2-08LA** 8-Channel Logic Analyzer : includes
8-Channel Logic Analyzer Card(GLA-08)
8-Channel Logic Analyzer Probe(GTL-08LA)

### OPTIONAL ACCESSORIES

| | | | |
|---|---|---|---|
| **GTL-08LA** | 8-Channel Logic Analyzer Probe | **GCP-300** | 300kHz/200A Current probe |
| **GTL-16LA** | 16-Channel Logic Analyzer Probe | **GCP-530** | 50MHz/30A Current probe |
| **GLA-08** | 8-Channel Logic Analyzer Card | **GCP-500** | 500kHz/150A Current probe |
| **GLA-16** | 16-Channel Logic Analyzer Card | **GCP-1030** | 100MHz/30A Current probe |
| **GRA-420** | Rack Mount Kit | **GCP-1000** | 1MHz/70A Current probe |
| **GAK-003** | 50Ω Impedance Adapter | **GCP-206P** | Power supply for current probe (2 input channel) |
| **GTL-232** | RS-232C Cable, 9-pin, F-F Type, null modem, 2000mm | **GCP-425P** | Power supply for current probe (4 input channel) |
| **GTL-246** | USB Cable, USB 2.0, A-B Type, 1200mm | **GSC-008** | Soft Carrying Case |
| **GTL-248** | GPIB Cable, Double Shielded, 2000mm | **GDP-025** | 25MHz High voltage differential probe |
| **GTP-033A** | Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M) | **GDP-050** | 50MHz High voltage differential probe |
| **GDB-03** | Oscilloscope Education & Training Kit | **GDP-100** | 100MHz High voltage differential probe |

### FREE DOWNLOAD

**PC Software** FreeWave software

**Driver** USB driver, LabView Driver

## 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

VPO
Visual Persistence Oscilloscope



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

CE | USB high Speed | PC Software | Labview Driver | Ethernet | PictBridge Compatible

## 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 Display Technology
- ✲ Waveform Update Rate up to 120,000 wfm/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
- ✲ $I^2C$/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) | |
| Calculated 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, Uesr Defined Expression<br>FFT : 1Mpts ; FFT : Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS ;<br>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, 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 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 Hish-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 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 ($I^2C$,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

### Rear Panel



## 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, High Z; 10 mVpp to 2.5 Vpp, 50 Ω | | | | | |
| Output Resolution | 1mV | | | | | |
| Output Accuracy | 2% (1 kHz) | | | | | |
| Offset Range | ±2.5 V ac+dc, High Z; ±1.25 V ac+dc, 50 Ω | | | | | |
| 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: ≤80%, 40°C or below; ≤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

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

| | | | |
|---|---|---|---|
| **GTL-16E** | 16-Channel Logic Analyzer Probe | **GCP-530** | 50MHz/30A Current probe |
| **GRA-426** | Rack Mount Kit | **GCP-500** | 500kHz/150A Current probe |
| **GAK-003** | 50Ω Impedance Adapter | **GCP-1030** | 100MHz/30A Current probe |
| **GSC-008** | Soft Carrying Case | **GCP-1000** | 1MHz/70A Current probe |
| **GTL-246** | USB Cable, USB 2.0, A-B Type, 1200mm | **GCP-206P** | Power supply for current probe (2 input channel) |
| **GDB-03** | Oscilloscope Education & Training Kit | **GCP-425P** | Power supply for current probe (4 input channel) |
| **GTP-033A** | Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M) | **GCP-201** | Probe Clip, 20PCS |
| | | **GDP-025** | 25MHz High voltage differential probe |
| **GCP-300** | 300kHz/200A Current probe | **GDP-050** | 50MHz High voltage differential probe |
| | | **GDP-100** | 100MHz High voltage differential probe |

## FREE DOWNLOAD

**PC Software** OpenWave software **Driver** USB driver ; LabView driver

### 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, 100MH, 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.

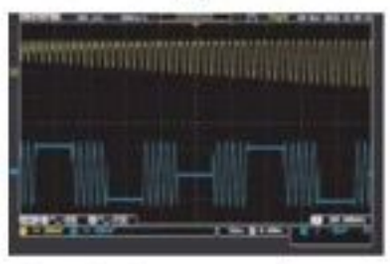
For analog channels, the MSO-2000E series provides 10M long memory for users to completely retrieve and analyze waveforms. Users, based upon the application requirements, can select 1k, 10k, 100k, 1M or 10M memory depth. Short memory depth collocating with the high sampling rate allows users to observe 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 ±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 $I^2C$, 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.



CAN Bus Trigger and Decode

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.



Dual Channel Arbitrary Waveform Generator

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.



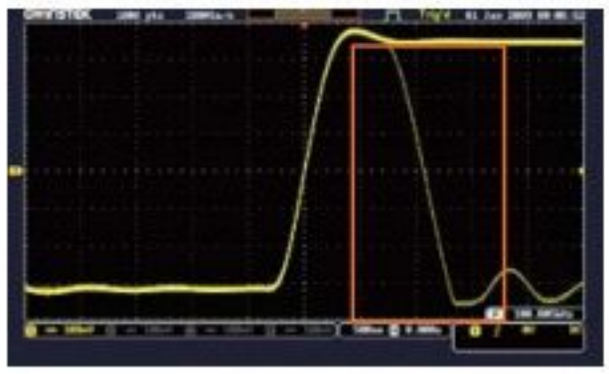
FRA of RC high-pass filter

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.



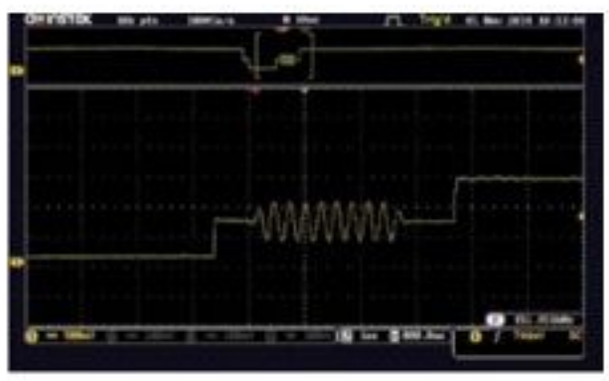
Cursor measurement for the determination at 3dB cut-off frequency of the high-pass filter.

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



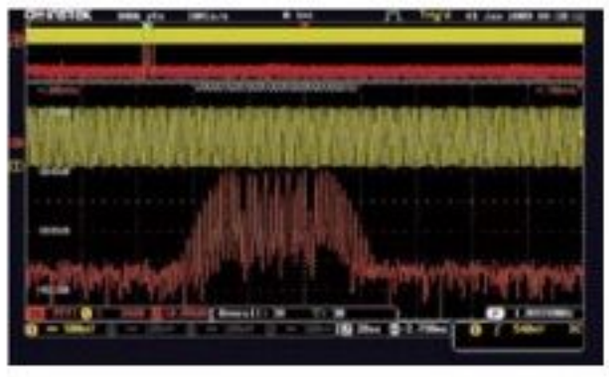
The MSO-2000E series oscilloscope allows users to easily and completely observe inrush signals and rare transient waveforms to increase waveform debugging efficiency by using features, including advanced VPO (Visual Persistence Oscilloscope) signal processing technology, waveform update rate as high 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 I²C, SPI, UART, CAN, LIN BUS TRIGGER AND DECODING FUNCTION



Decode by Analog Channel



Decode by digital Channel

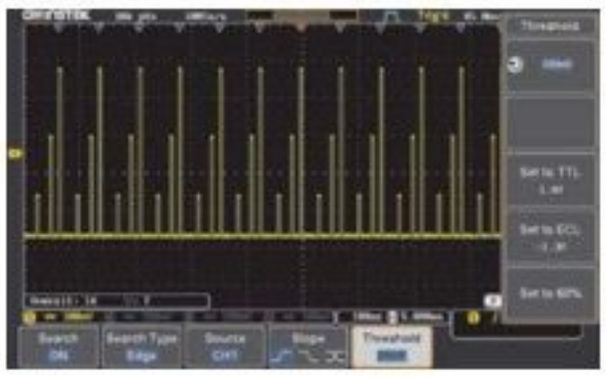


Display analog waveform converted from digital signal

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 channles to trigger, decode, and analyze frequently used I²C, 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 funciton can verify and analyze the conversion between analog and digial 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.

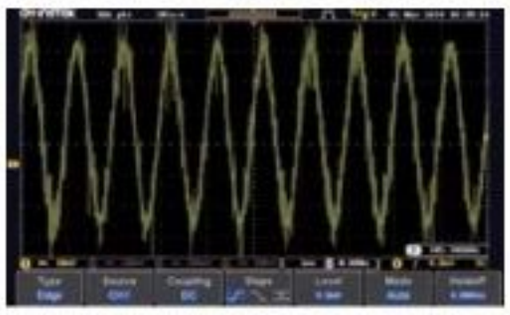
## F. WAVEFORM SEARCH FUNCTION



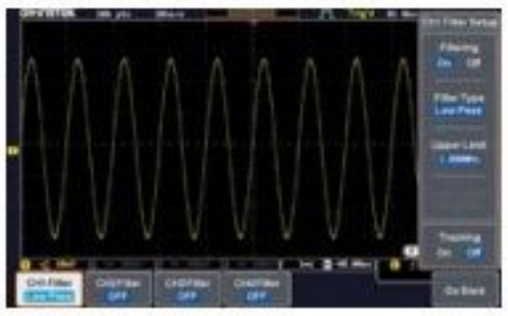



Users can rapidly search desired waveforms according to the trigger condition. After activating the search function, hollow inverted triangles will show the location met the trigger condition. The upper left hand corner Overall will show the total number of waveforms met the trigger condition. Users 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



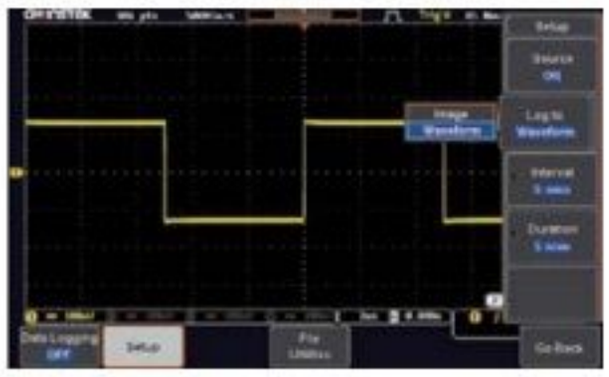
**Unfiltered Waveform with Noise Interference**



**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

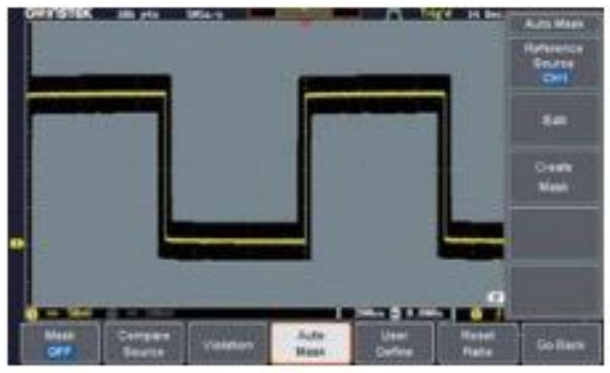




**Users Can Also Select "Analyze Segments" to Conveniently Obtain The Analysis Results.**

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)

CE | USB high Speed | PC Software | Labview Driver | Ethernet | PictBridge Compatible

## 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 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
- ✲ $I^2C$/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) |
| Calculated 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, Uesr Defined Expression<br>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, 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 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 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 (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 ac+dc, High Z; ±1.25 V ac+dc, 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(relative to 1kHz): ±0.5dB<15MHz; ±1 dB 15MHz~25MHz; Harmonic Distortion:-40dBc;Stray(Non-harmonic):-40dBc;Total Harmonic Distortion:1%;S/N Ratio:40dB | | |
| **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: ≤80% at 40°C or below; ≤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

**GRA-426** Rack Adapter Panel
**GAK-003** 50Ω Impedance Adapter
**GSC-008** Soft Carrying Case
**GTL-246** USB Cable, USB 2.0, A-B Type, 1200mm
**GTP-033A** Oscilloscope Probe, 35MHz 1:1 Passive Probe
**GDP-025** Differential Probe, 25M High Voltage Differntial Probe
**GDP-050** Differential Probe, 50M High Voltage Differntial Probe

**GCP-300** 300kHz/200A Current probe
**GCP-530** 50MHz/30A Current probe
**GCP-500** 500kHz/150A Current probe
**GCP-1030** 100MHz/30A Current probe
**GCP-1000** 1MHz/70A Current probe
**GCP-206P** Power supply for current probe (2 input channel)
**GCP-425P** Current Probe - Power Supply, 4 Channel Power Supply for GCP-530/1030

## FREE DOWNLOAD

**PC Software** OpenWave software
**Driver** USB driver ; LabView driver

# 300/200/100MHz Mixed-domain Oscilloscope

## SELECTION GUIDE

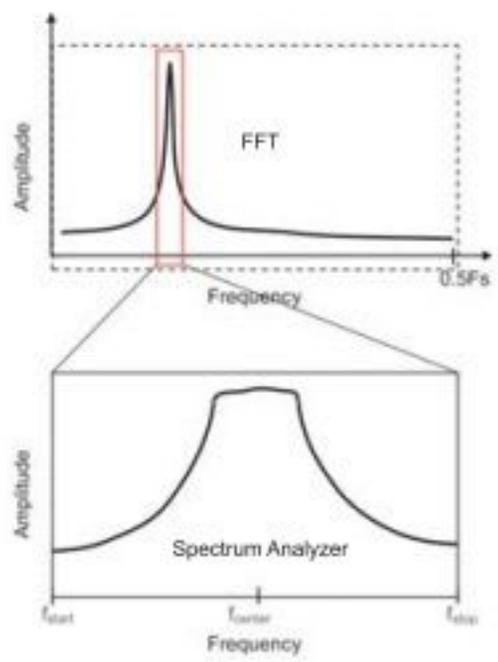
| MODEL | MDO-2302AG | MDO-2202AG | MDO-2102AG | MDO-2302A | MDO-2202A | MDO-2102A |
|---|---|---|---|---|---|---|
| Bandwidth | 300MHz | 200MHz | 100MHz | 300MHz | 200MHz | 100MHz |
| Channels | 2 | 2 | 2 | 2 | 2 | 2 |
| Record Length | 20M / ch | 20M / ch | 20M / ch | 20M / ch | 20M / ch | 20M / ch |
| 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<br>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.

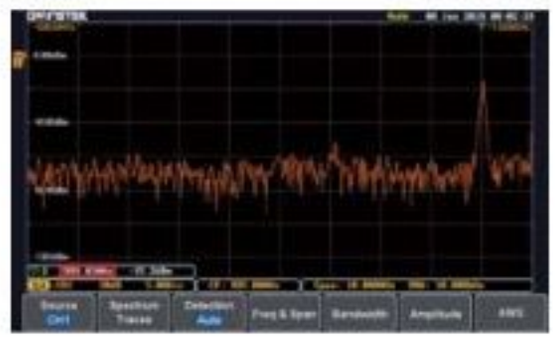
In addition to advanced oscilloscope specifications, the MDO-2000A series is also a dual-domain test platform. For frequency domain analysis, the spectrum analyzer measurement mode is provided to allow users to have frequency domain analysis with higher resolution. The FFT operation on the oscilloscope 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.



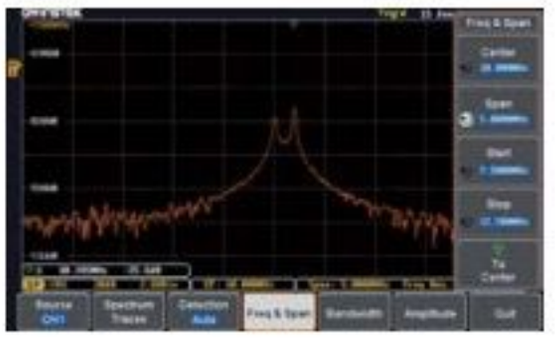
The figure on the right shows why the resolution of the spectrum analysis is better than that of the FFT of the general oscilloscope. Therefore, using the frequency domain signal of the spectrum analysis, the frequency domain peaks and the components of each composition can be correctly captured, which is impossible for the general FFT. Conventional DSO's FFT always calculates the entire signal bandwidth up to half the sampling rate (Fs). 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).



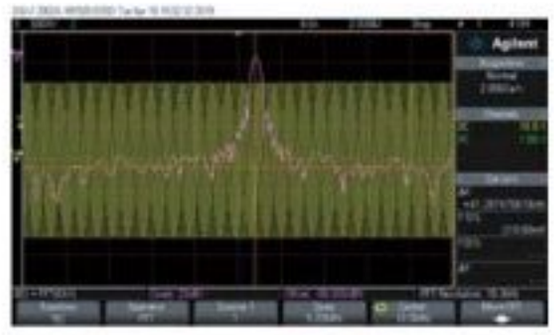

MDO-2000A's spectrum analyzer's frequency measurement range is from DC to 1GHz, which can meet the requirements of the low frequency test of audio and vibration. The general spectrum analyzer cannot measure the signals below 9kHz. The highest frequency of 1GHz is shown on the right. MDO-2000A uses a 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 Key sight 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.



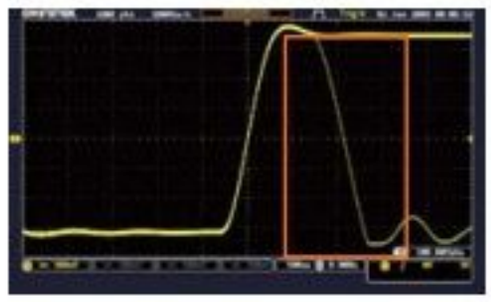
Users can use the Search function to search and mark several amplitudes and frequencies. Search methods include Max. peak and threshold. Measurement results can be displayed and saved.

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.

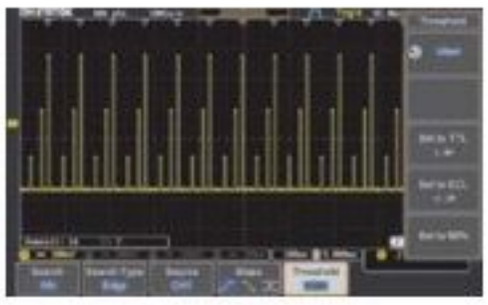
## B. SUPPORT I²C, UART, CAN, LIN BUS TRIGGER AND DECODING FUNCTIONS



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, I²C. 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 I²C and UART serial bus and CAN/LIN bus, which is often used by automotive communications.

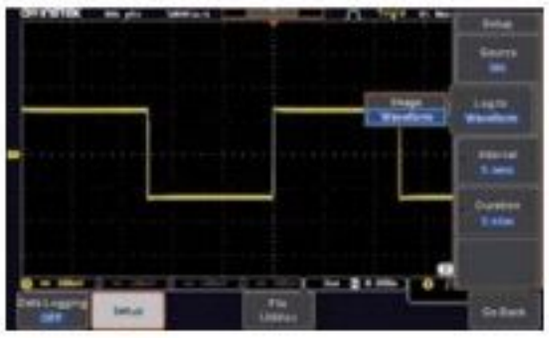
## C. WAVEFORM SEARCH FUNCTION



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

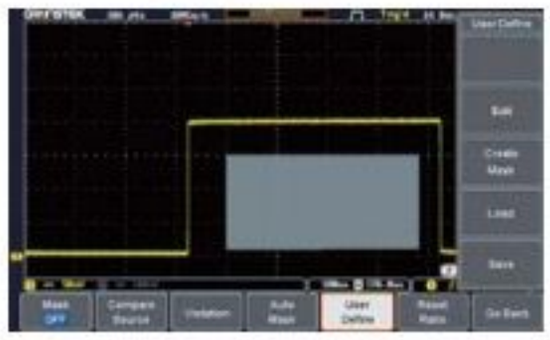


**Users Can Select "Analyze Segments" to Conveniently Obtain The Analysis Results.**

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.

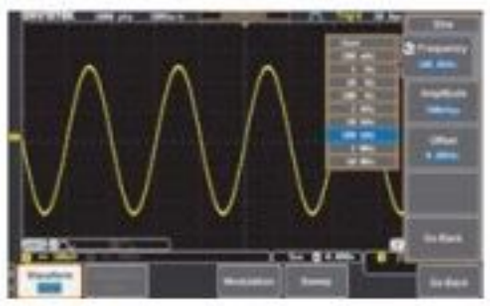
The segmented memory function of the MDO-2000A series allows users to select the number of sections. The maximum sections can be selected are 29,000. After activating the function, users can select and observe waveform for each segment by turning the Variable knob. The ultimate application of memory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

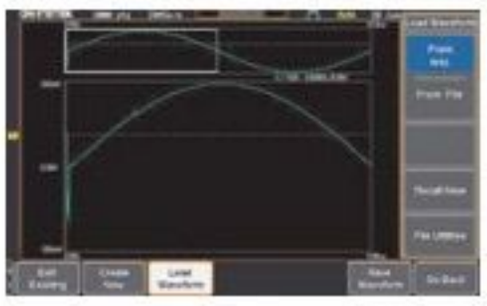
## F. MASK FUNCTION



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



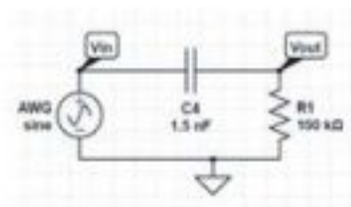


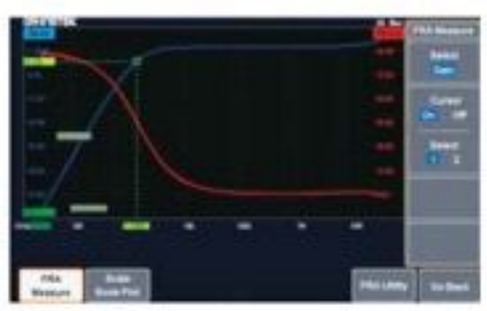
☆ MDO-2000AG only



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= 1.06kHz(F=1/2*π*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 InfiniiVision 3000T's option. More points per decade allow users to get higher accurate test results.

# 200/100/70MHz Mixed-domain Oscilloscope

VPO
Visual Persistence Oscilloscope



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

CE | USB high Speed | PC Software | Labview Driver | Ethernet | PictBridge Compatible

## 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
- ✲ $I^2C$/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
- ✲ True RMS Measurement in DMM 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 | 4Ch | 2Ch+EXT | 4Ch |
| **Bandwidth** | DC~70MHz(-3dB) | | DC~100MHz(-3dB) | | DC~200MHz(-3dB) | |
| **Calculated 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 , Uesr Defined Expression<br>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 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, High Z ; 10 mVpp to 2.5 Vpp, 50Ω | | | | | |
| **Output Resolution** | 1mV | | | | | |
| **Output Accuracy** | 2% (1 kHz) | | | | | |
| **Offset Range** | ±2.5 V ac+dc, High Z; ±1.25 V ac+dc, 50Ω | | | | | |
| **Offset Resolution** | 1mV | | | | | |
| **Sine** | Frequency Range: 100mHz~25MHz ; Flatness(relative to 1kHz): ±0.5dB<15MHz; ±1 dB 15MHz~25MHz; Harmonic Distortion: -40dBc; Stray(Non-harmonic): -40dBc; Total Harmonic Distortion:1%; S/N Ratio: 40dB | | | | | |
| **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 ±(0.1% reading + 5 digits) | | | | | |
| Input Impedance | 10MΩ | | | | | |
| DC Current | 50mA, 500mA, 10A 3 ranges | | | | | |
| Accuracy | 50mA~500mA (0.5% reading+0.05mA), 10A ±(0.5% reading + 50mA) | | | | | |
| AC Voltage | 50mV, 500mV, 5V, 50V, 700V 5 ranges | | | | | |
| Accuracy | 50mV, 500mV, 5V, 50V, 700V ±(1.5% reading + 15 digits) at 50Hz~1kHz<br>* Amplitude greater than 0.2% of the full scale reading. | | | | | |
| AC Current | 50mA, 500mA, 10A 3 ranges | | | | | |
| Accuracy | 50mA, 500mA, ±(1.5% reading + 0.05mA)at 50Hz~1kHz ; 10A ±(3% reading + 50mA) at 50Hz~1kHz<br>* Measure range: >10mA | | | | | |
| Resistance | 500Ω, 5kΩ, 50kΩ, 500kΩ, 5MΩ, 5 ranges | | | | | |
| Accuracy | 500Ω, 5kΩ, 50kΩ, 500kΩ ±(0.3% reading + 3 digits); 5MΩ ±(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 | ±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: ≤ 80% at 40°C or below; ≤ 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

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

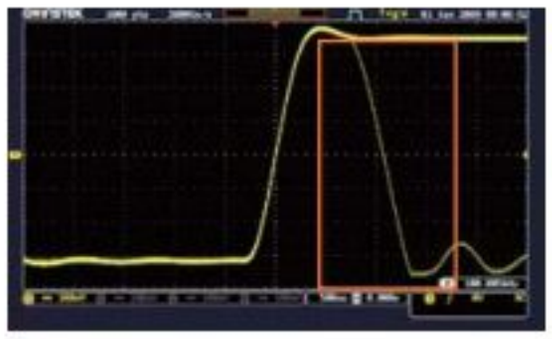
| | | | |
|---|---|---|---|
| **GRA-426** | Rack Adapter Panel | **GCP-300** | 300kHz/200A Current probe |
| **GAK-003** | 50Ω Impedance Adapter | **GCP-530** | 50MHz/30A Current probe |
| **GTL-246** | USB Cable, USB 2.0, A-B Type, 1200mm | **GCP-500** | 500kHz/150A Current probe |
| **GTL-205A** | Temperature probe adaptor with thermocouple (K type) | **GCP-1030** | 100MHz/30A Current probe |
| | | **GCP-1000** | 1MHz/70A Current probe |
| **GDP-025** | 25MHz High voltage differential probe | **GCP-206P** | Power supply for current probe (2 input channel) |
| **GDP-050** | 50MHz High voltage differential probe | **GCP-425P** | Current Probe - Power Supply, 4 Channel Power Supply for GCP-530/1030 |
| **GDP-100** | 100MHz High voltage differential probe | | |
| **GSC-008** | Soft Carrying Case | **GTP-033A** | Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M) |

## FREE DOWNLOAD

**PC Software** OpenWave software
**Driver** USB driver ; LabView driver

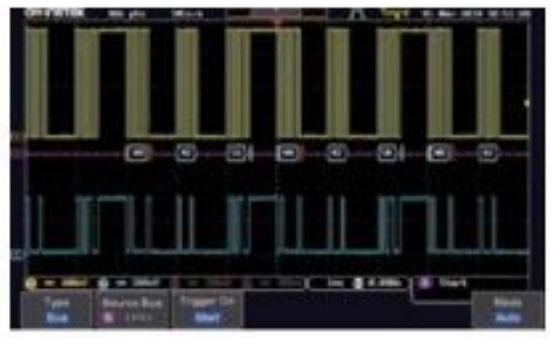
# 200/100/70MHz Mixed-domain Oscilloscope

## 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 $I^2C$,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, $I^2C$, 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 $I^2C$, SPI and UART serial bus and CAN/LIN bus, which is often used by automotive communications.

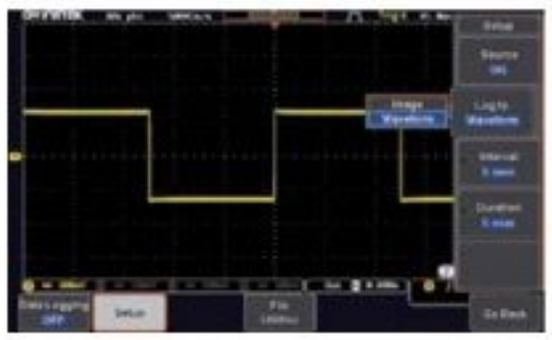
## C. WAVEFORM SEARCH FUNCTION






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.

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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.

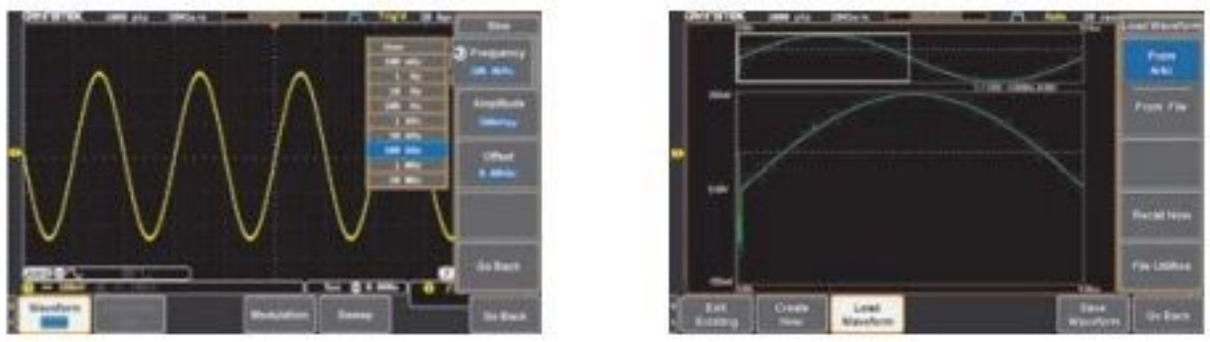
## F. SEGMENTED MEMORY FUNCTION



**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.

# 200/100/70MHz Digital Storage Oscilloscope

VPO Visual Persistence Oscilloscope

台灣精品 TAIWAN EXCELLENCE



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

CE | USB high Speed | PC Software | Labview Driver | Ethernet | PictBridge Compatible

## 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
- ☆ $I^2C$/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) | |
| Calculated 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 , FFTrms , Uesr defined expression.<br>FFT : 1Mpts ; FFT : Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS ;<br>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<br>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 | 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 (Degrees), Ratio(%) | | | | | |
| Automatic Measurement | 36 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, 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 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: ≤80%, 40°C or below; ≤45%, 41°C – 50°C | | | | | |
| **DIMENSIONS & WEIGHT** | | | | | | |
| | 384(W) X 208(H) X 127.3(D)mm, Approx. 2.8 kg | | | | | |





## Rear Panel

# GDS-2000E Series

## ORDERING INFORMATION

| | |
|---|---|
| **GDS-2204E** | 200MHz, 4-Channel, Digital Storage Oscilloscope |
| **GDS-2202E** | 200MHz, 2-Channel, Digital Storage Oscilloscope |
| **GDS-2104E** | 100MHz, 4-Channel, Digital Storage Oscilloscope |
| **GDS-2102E** | 100MHz, 2-Channel, Digital Storage Oscilloscope |
| **GDS-2074E** | 70MHz, 4-Channel, Digital Storage Oscilloscope |
| **GDS-2072E** | 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

| | |
|---|---|
| **GRA-426** | Rack Adapter Panel |
| **GAK-003** | 50Ω Impedance Adapter |
| **GSC-008** | Soft Carrying Case |
| **GTL-246** | USB Cable, USB 2.0, A-B Type, 1200mm |
| **GCP-300** | 300kHz/200A Current probe |
| **GCP-530** | 50MHz/30A Current probe |
| **GCP-500** | 500kHz/150A Current probe |
| **GCP-1030** | 100MHz/30A Current probe |
| **GCP-1000** | 1MHz/70A Current probe |
| **GCP-206P** | Power supply for current probe (2 input channel) |
| **GCP-425P** | Power supply for current probe (4 input channel) |
| **GTP-033A** | Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M) |
| **GDP-025** | 25MHz High voltage differential probe |
| **GDP-050** | 50MHz High voltage differential probe |
| **GDP-100** | 100MHz High voltage differential probe |

## FREE DOWNLOAD

| | |
|---|---|
| **PC Software** | OpenWave software |
| **Driver** | USB driver ; LabView driver |

## 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)

台灣精品
TAIWAN EXCELLENCE



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

CE | USB | PC Software | Labview Driver | DMM | UN38.8 | IEC62133 | Built-in Flash Memory | Li-polymer Battery

## 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
- ✲ True RMS Measurement in DMM Function
- ✲ 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

| | GDS-307 | GDS-310 | GDS-320 | GDS-207 | GDS-210 | GDS-220 |
|---|---|---|---|---|---|---|
| **VERTICAL** | | | | | | |
| Channels | 2 (BNC-Shield) | | | | | |
| Input Impedance | 1MΩ±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) |
| Calculated 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 | | | | | |
| Waveform Signal Process | +,-, ×, ÷, FFT, FFTrms | | | | | |
| **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(△V), Time difference between cursors(△T), frequency measure(1/△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 6000mAh, 7.4V (Built-in) | | | | | |
| Charge time | 5.0 hour (75%) | | | | | |
| Operation time | 4 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 | | |
| | CAT II 600VRMS, CAT III 300VRMS | | | | | |
| DC Voltage* Range | 50mV, 500mV, 5V, 50V, 500V, 1000V 6 ranges *Input protection 10V only on mV ranges. | | | | | |
| Accuracy | GDS-320/310/307: 50mV, 500mV, 5V, 50V, 500V: ±(0.05%+0.1%); 1000V: ±(0.1%+0.1%) | | | | | |
| | GDS-220/210/207: 50mV, 500mV, 5V, 50V, 500V: ±(0.1%+0.1%); 1000V: ±(0.1%+0.1%) | | | | | |
| Input Impedance | 10MΩ | | | | | |
| DC Current Range | 50mA, 500mA, 10A 3 ranges | | | | | |
| Accuracy | GDS-320/310/307: 50mA, 500mA: ±(0.1%+0.1%),10A: ±(0.5%+0.1%) | | | | | |
| | GDS-220/210/207: 50mA, 500mA: ±(0.5%+0.1%),10A: ±(0.5%+0.5%) | | | | | |
| AC Voltage* Range | 50mV, 500mV, 5V, 50V, 700V 5 ranges *Input protection 10V only on mV ranges. | | | | | |
| Accuracy | 50mV, 500mV, 5V, 50V, 700V: ±(1.5%+1.5%) at 50Hz–1kH | | | | | |
| AC Current Range | 50mA, 500mA, 10A 3 ranges | | | | | |
| Accuracy | 50mA, 500mA, ±(1.5%+0.1%) at 50Hz–1kHz; 10A: ±(3%+0.5%) at 50Hz–1kHz *Measure range:>10mA | | | | | |
| RESISTANCE* Range | 500Ω, 5KΩ, 50KΩ, 500KΩ, 5MΩ 5 ranges | | | | | |
| Accuracy | 500Ω, 5KΩ, 50KΩ, 500KΩ ±(0.3%+0.01%); 5MΩ±(0.5%+0.1%) *Measure range:50Ω~5MΩ | | | | | |
| Diode Test | Maximum forward voltage 1.5V, Open voltage 2.8V | | | | | |
| Temperature* Range | -50°C ~ +1000°C | | | | | |
| (thermocouple) Resolution | 0.1°C | | | | | |
| Thermocouple | B, E, J, K, N, R, S, T *Specifications do not include probe accuracy. Temperature specifications only apply to the GDS-320/310/307 | | | | | |
| Continuity Beep | < 15 Ω | | | | | |
| Functions | Auto Range, Max, Min, Hold, Trend plot *Accuracy:±(% of Reading + % of Range). | | | | | |
| **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
**GTL-253** USB Cable, USB 2.0, A-mini B Type, 1400mm
**GTL-131** Test Clip, Suitable for GDP-040D
**GTL-205** Temperature probe adaptor with thermocouple (K type)
**GCL-001** Vertical Calibration Cable
**GPF-700** Protective Films for 7" Touch Screen
**GTL-253** USB Cable, USB 2.0 A-mini B type, Approx. 1400mm

**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



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



## GDS-1000B Series

CE | USB | PC Software | Labview Driver | Ethernet | PictBridge Compatible

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.

## 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
- ✲ $I^2C$/SPI/UART/CAN/LIN Serial Bus Trigger and Decoding Functions
- ✲ Zero Key Function For Horizontal Time, Vertical Voltage and Triggering
- ✲ Compact And Innovative Exterior Design

## 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) |
| Calculated Rise Time | 7ns | 5ns | 5ns | 3.5ns | 3.5ns | 1.75ns |
| Bandwidth Limit | 20MHz | 20MHz | 20MHz | 20MHz | 20MHz | 20MHz |
| Vertical Sensitivity | 8 bit : 1mV–10V/div | | | | | |
| Resolution | | | | | | |
| 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 | ±2.5V | | | | | |
| 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, RPREShoot, FPREShoot, 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 | | | | | |



## Rear Panel



# GDS-1000B Series

| 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 x 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 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 Environment | Temperature : 0°C – 50°C. Relative Humidity ≤80% at 40°C or below; ≤ 45% at 41°C – 50°C | | | | | |
| Online Help | Available | | | | | |
| **DIMENSIONS & WEIGHT** | | | | | | |
| 380(W) x 208 (H) x 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.

## GDB-03 Oscilloscope Education and Training Kit

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



## ORDERING INFORMATION

| | |
|---|---|
| **GDS-1202B** | 200MHz, 2 channels, Digital Storage Oscilloscope |
| **GDS-1104B** | 100MHz, 4 channels, Digital Storage Oscilloscope |
| **GDS-1102B** | 100MHz, 2 channels, Digital Storage Oscilloscope |
| **GDS-1074B** | 70MHz, 4 channels, Digital Storage Oscilloscope |
| **GDS-1072B** | 70MHz, 2 channels, Digital Storage Oscilloscope |
| **GDS-1054B** | 50MHz, 4 channels, 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-1074B,GDS-1072B,GDS-1054B(one per channel)
GTP-100B-4 : 100MHz(10:1/1:1) Switchable passive probe for GDS-1104B, GDS-1102B(one per channel)
GTP-200B-4 : 200MHz(10:1/1:1) Switchable passive probe for GDS-1202B(one per channel)

### OPTIONAL ASSESSORIES

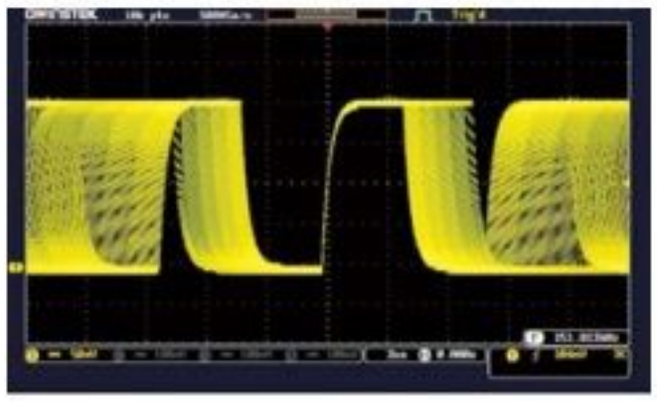
| | |
|---|---|
| **GRA-426** | Rack Adapter Panel |
| **GAK-003** | 50Ω Impedance Adapter |
| **GSC-008** | Soft Carrying Case |
| **GTL-246** | USB Cable, USB 2.0, A-B Type, 1200mm |
| **GCP-300** | 300kHz/200A Current probe |
| **GCP-530** | 50MHz/30A Current probe |
| **GCP-500** | 500kHz/150A Current probe |
| **GCP-1030** | 100MHz/30A Current probe |
| **GCP-1000** | 1MHz/70A Current probe |
| **GCP-206P** | Power supply for current probe (2 input channel) |
| **GCP-425P** | Power supply for current probe (4 input channel) |
| **GTP-033A** | Oscilloscope Probe, 35MHz 1:1 Passive Probe, BNC(P/M) |
| **GDP-025** | 25MHz High voltage differential probe |
| **GDP-050** | 50MHz High voltage differential probe |
| **GDP-100** | 100MHz High voltage differential probe |

### FREE DOWNLOAD

| | |
|---|---|
| **Software** | OpenWave Software |
| **Driver** | USB Driver ; LabView Driver |

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

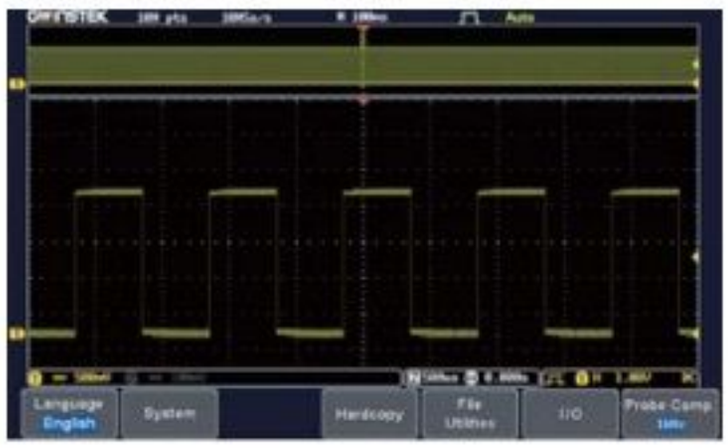
## A. WAVEFORM UPDATE RATE UP TO 50,000wfms/s AND VPO DISPLAY TECHNOLOGY



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

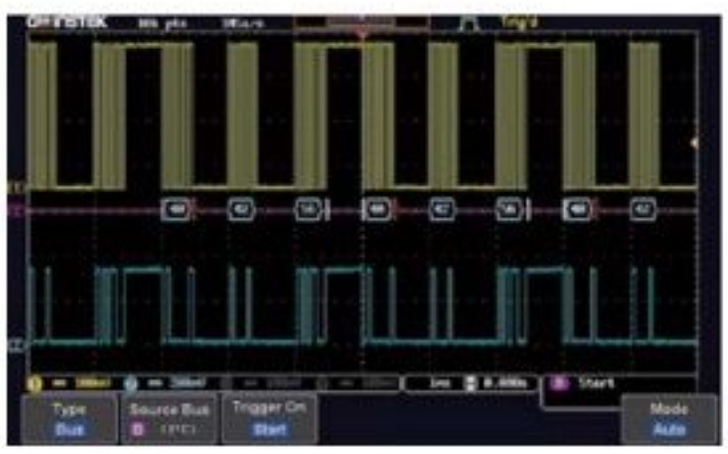





With respect to the waveform display technology, the GDS-1000B Series oscilloscope is capable of displaying 256 color gradients which can delineate the profound gradational fluctuations; as if it can recreate the analog oscilloscope display capability. When a multi-layer video signal is input, the GDS-1000B 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 intents to bring to the general purpose oscilloscope arena.

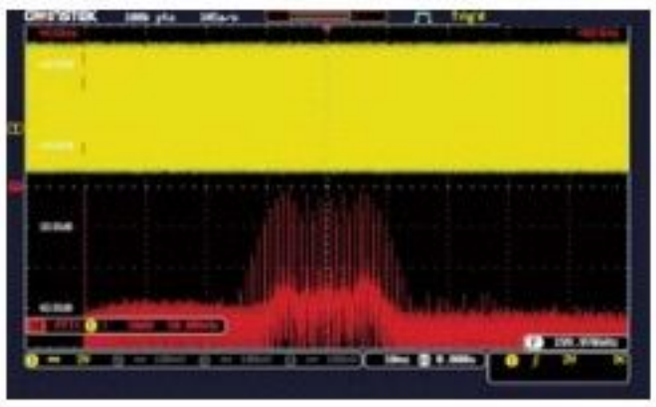
The GDS-1000B Series oscilloscope has a powerful and incomparable memory depth for the data retrieving. 10M memory depth per channel independently surpasses the specification of the industry's 1000 Series boundary. 10M memory depth allows users to easily seize the waveform detail while conducting fundamental measurement applications. If a long serial sequent sine waveformis 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 I²C ,SPI ,UART,CAN, LIN BUS TRIGGER AND DECODING FUNCTIONS



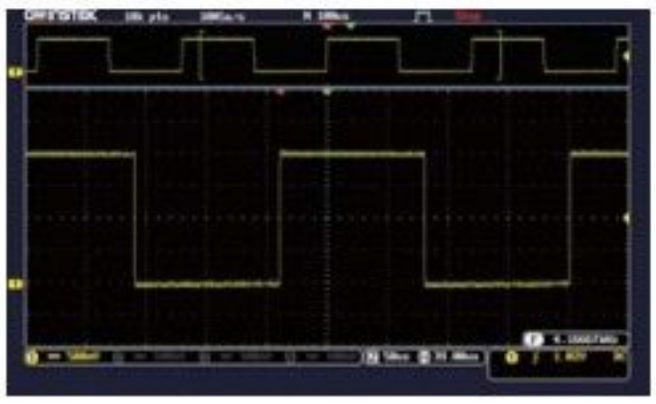

The serial bus technology has been widely applied in the present embedded application design. The IoT devices connecting sensors and the peripheral components are using serial bus such as UART, I²C, and SPI. To rapidly and correctly trigger and analyze serial bus data has posed a difficult challenge to engineers. The GDS-1000B series provides serial bus analysis function with 10M long memory depth. Users can trigger, decode, and analyze frequently used I²C, SPI and UART serial bus and CAN/LIN bus, which is often used by automotive communications.

## D. 1M FFT MATHEMATICAL SAMPLING ANALYSIS MODE



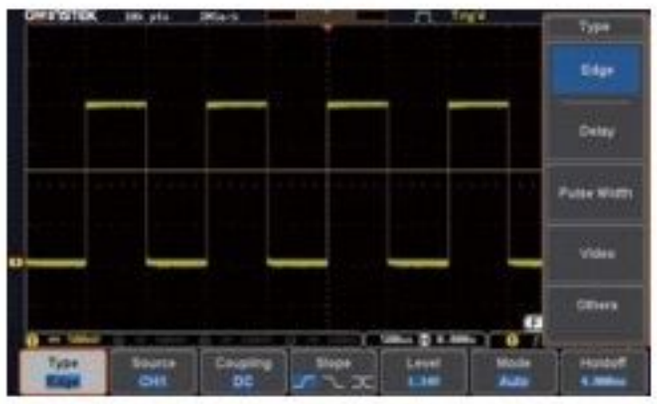
The GDS-1000B Series oscilloscope, under the Fast Fourier Transform mathematical analysis mode, is equipped with the 1M memory depth retrieving mode. For the conventional digital oscilloscopes, the FFT mode often has only 1000 point retrieving length; therefore, they can not show the strength distribution 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



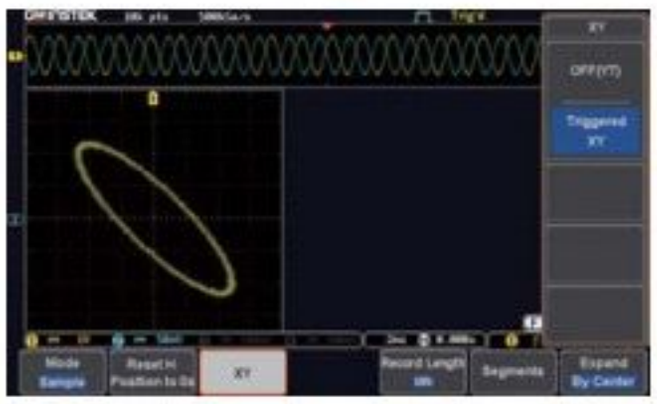
The GDS-1000B series provides engineers with partial waveform zoom in function to observe waveform in great details. The display screen can be split into two windows: the upper window shows waveform data log in a long period of time and the marked vicinity of the waveform needed to be zoomed in; the 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



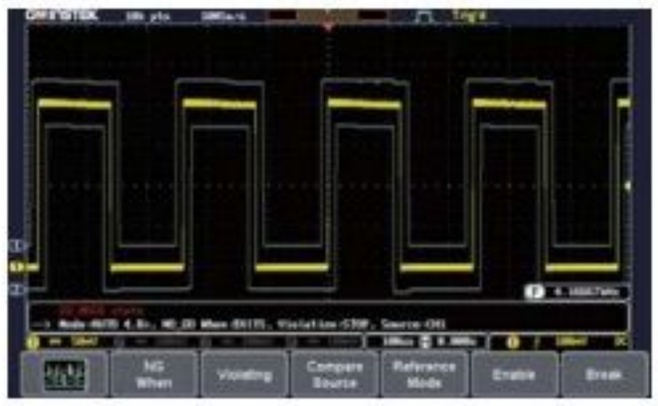

The GDS-1000B series oscilloscope is equipped with diversified trigger functions, including Edge Trigger, Delay Trigger, Pulse Width Trigger, and Video Trigger. Engineers, based upon different waveform measurements, can select different trigger functions to lock waveforms in order to identify the root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

## G. X-Y MODE DISPLAY



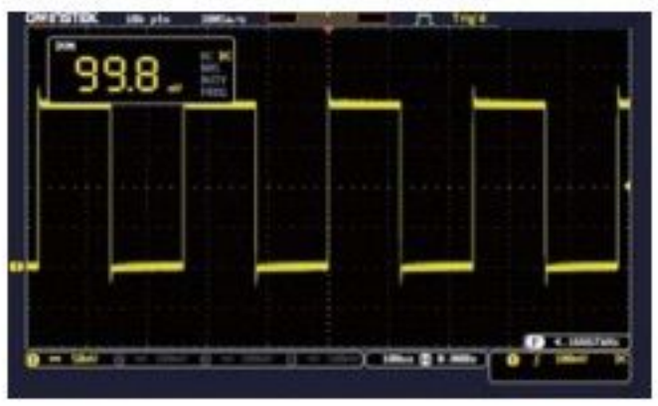

The GDS-1000B series oscilloscope provides the educational market with some powerful measurement functions. Among them, the X-Y mode display is an excellent example. Teachers and students can use X-Y mode display to conduct Lissajou diagram teaching, which allows users to easily understand the relation 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.

## 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.

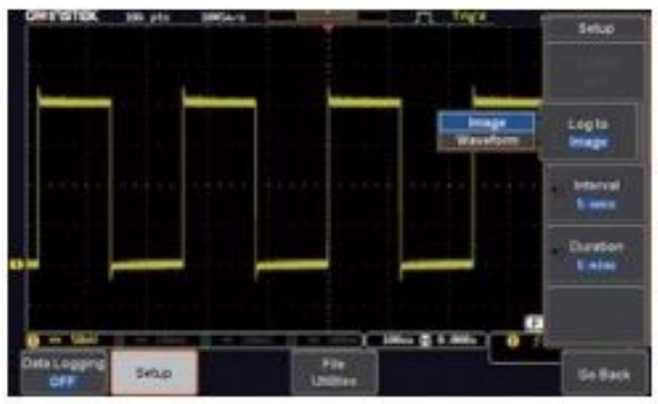
## I. DIGITAL VOLTAGE METER FUNCTION




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

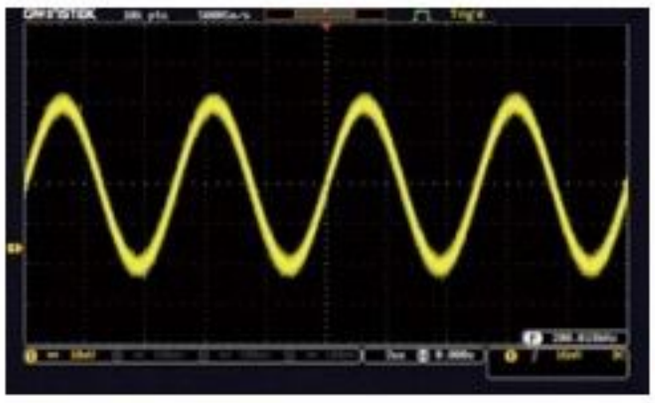
## J. DATA LOG FUNCTION




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

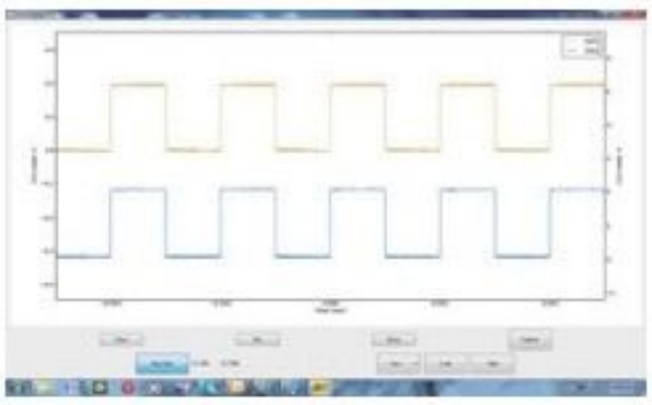






The GDS-1000B series oscilloscope is equipped with 36 different automatic measurement parameter functions. Users, after obtaining measured waveforms, can select different measurement parameters from Measure key according to different measurement requirements. The GDS-1000B Series shows simultaneously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

# Oscilloscope Education And Training Kit



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.

## GDB-03





**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 $I^2C$ 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
Singnal demo board with instructions
GTL-246 USB 2.0 A-B Type cable

# ACCESSORIES

| MODEL | DESCRIPTION | APPLICABLE DEVICE |
|---|---|---|
| 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-GPIB | GPIB Interface | GDS-2000A Series |
| DS3A-GPIB | GPIB Interface | GDS-3000A Series |
| DS2-LAN | Ethernet & SVGA Output | GDS-2000A Series |
| DS3A-PWR | 13 sets of Power Analysis Measurements | GDS-3000A Series |
| DS3A-GPIB | GPIB Interface | GDS-3000A Series |
| DS3A-16LA | 16 Channel Logic Analyzer | GDS-3000A 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, GSP-Series |
| GAP-001 | AC-DC Adaptor | GDS-300/200 Series |
| GCL-001 | Vertical Calibration Cable | GDS-300/200 Series |
| GCP-1030 | Current Probe, DC ~ 100MHz, 30Arms | GDS-3000A Series,GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series |
| GCP-206P | Current Probe - Power Supply, 2 Channel Power Supply for GCP-530/1030 | GDS-3000A Series,GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series |
| GCP-300 | 300kHz/200A Current probe | GDS-3000A Series, GDS-3000 Series, GDS-2000A Series, MDO-2000A Series, MDO-2000 Series, MSO-2000E Series, GDS-2000E Series, GDS-1000B 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 |
| GCP-500 | 500kHz/150A Current probe | GDS-3000A Series, GDS-3000 Series, GDS-2000A Series, MDO-2000A Series, MDO-2000 Series, MSO-2000E Series, GDS-2000E Series, GDS-1000B Series |
| GCP-530 | Current Probe, DC ~ 50MHz, 30Arms | GDS-3000A Series, GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B Series |
| GCP-1000 | 1MHz/70A Current probe | GDS-3000A Series, GDS-3000 Series, GDS-2000A Series, MDO-2000A Series, MDO-2000 Series, MSO-2000E Series, GDS-2000E Series, GDS-1000B Series |
| GCP-1030 | 100MHz/30A Current probe | GDS-3000A Series, GDS-3000 Series, GDS-2000A Series, MDO-2000A Series, MDO-2000 Series, MSO-2000E Series, GDS-2000E Series |
| GDB-03 | Digital Storage Oscilloscope Demo Kit | GDS-3000A Series,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 Differntial Probe | GDS-3000A Series, 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 Differntial Probe | GDS-300/200 Series |
| GDP-050 | 50MHz High Voltage Differntial Probe | GDS-3000A Series, 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 Differntial Probe | GDS-3000A Series, 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-3000A Series, 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 |
| GRA-443-E | Rack Mount Kit | GDS-3000A 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-3000A Series, GDS-3000 Series, GDS-2000A Series, GDS-2000E 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-3000A Series, 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-3000A Series, GDS-3000 Series, GDS-2000A Series |
| GTL-250 | GPIB Cable, Double Shielded, 600mm | GDS-3000A Series,GDS-3000 Series, GDS-2000A Series |
| GTL-253 | USB Cable, USB 2.0 A-mini B type, Approx. 1400mm | GDS-200/300 Series |
| GTP-033A | Oscilloscope Probe, 35MHz 1:1 Passive Probe | GDS-3000A Series, GDS-3000 Series, MSO-2000E Series, MDO-2000A Series, MDO-2000E Series, GDS-2000A Series, GDS-2000E Series, GDS-1000B 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-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-1000B Series |
| GTP-150A-2 | Oscilloscope Probe, 150MHz (10:1/1:1) Switching Passive Probe, BNC(P/M) | GDS-2000A Series |
| GTP-150B-2 | Oscilloscope Probe, 150MHz (10:1/1:1) Switching Passive Probe, BNC(P/M) | GDS-300/200 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 |
| 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-3000A Series,GDS-3000 Series |
| GTP-352R | Oscilloscope Probe, 350MHz 20:1 Passive Probe, BNC(P/M) | GDS-3000A Series,GDS-3000 Series |
| GTP-501R | Oscilloscope Probe, 500MHz 10:1 Passive Probe, BNC(P/M) | GDS-3000A Series,GDS-3000 Series |
| GUG-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<br>4.Screw driver 5.IC tip 6.Adjusting tool 7.Earth tip | |

## GTP-100B-4

For: GDS-2102A/2104A,
GDS-2102E/2104E



The GTP-100B-4 is a passive high impendence 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<br>4.Insulating tip 5.IC tip 6.Adjusting tool 7.Earth tip | |

## GTP-150A-2

For: GDS-2102A/2104A



The GTP-150A-2 is a passive high impendence oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1MΩ shunted by 56pF. 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 | 56pF |
| Att. Ratio | 1/10 | 1/1 |
| Max. Input Voltage | 500V CAT Ⅰ, 300V CAT Ⅱ (DC + peak AC) | 300V CAT Ⅰ, 150V CAT Ⅱ (DC + peak AC) |
| Accessories | 1.Channel identifier clip 2.hook 3.Ground lead<br>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 impendence 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<br>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 impendence 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<br>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 impendence 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<br>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-008 Soft Carrying Case for GDS-2000E Series
If an accessory is ordered along with the main product, please indicate the option number of the accessory when placing order.
Example : GDS-3502 500MHz, 2-Channel, Visual Persistance DSO , GSC-008 Soft Carrying Case

# ACCESSORIES

## GTP-151R

For : GDS-3000 Series

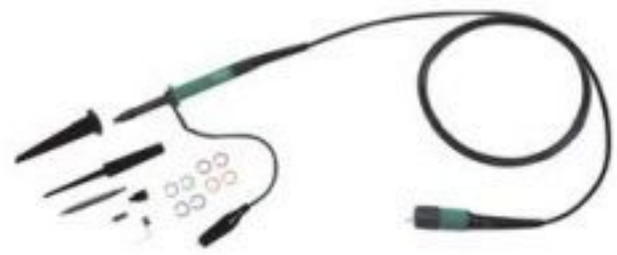


The GTP-151R is compatible with readout function oscilloscopes that automatically detect and display the attenuation factor of the probe.

| 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 impendence 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: MDO-2000A Series



The GTP-300B-4 is a passive high impendence 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.Measuring tip 8. Sprung earth tip | |

## GTP-351R/352R

For: GDS-3000A Series



Both GTP-351R and GTP-352R are passive high impendence oscilloscope probes designed and calibrated for use on instrument. GTP-351R has an input impendence of 1 MΩ shunted by 20pF while GTP-352R has an input impendence of 1 MΩ shunted by 15pF. However, GTP-351R may be compensated for use with instruments having an input capacitance of 10~35pF while GPT-352R has an input impendence 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-2302A/2304A



The GTP-350A-2 is a passive high impendence 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 or GDS-3000A 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-3000A Series
GDS-3000 Series



The GTP-501R is a passive high impendence oscilloscope probe designed and calibrated for use on instrument having an input impedance of 1MΩ 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 | ~10MΩ |
| 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 x 1, attenuator modular probe. Designed for use with DC to 35MHz oscilloscope with input impedance of 1MΩ 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(±3dB) |
| Input R | 1MΩ (Oscilloscope) |
| Input C | ~83pF |
| Att. Ratio | 1/1 |
| Max. Input Voltage | <300 CATI |
| 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



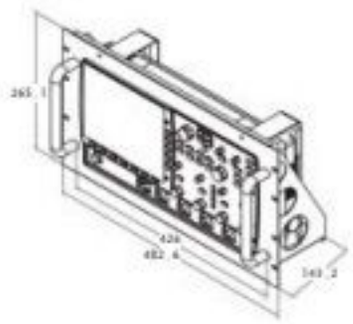
## GTL-205A



## GRA-411 Rack Mount Kit

For : GDS-3000 Series

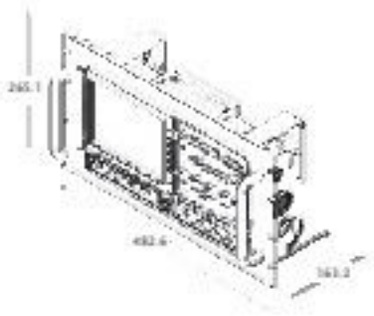




## GRA-420 Rack Mount Kit

For : GDS-2000A Series

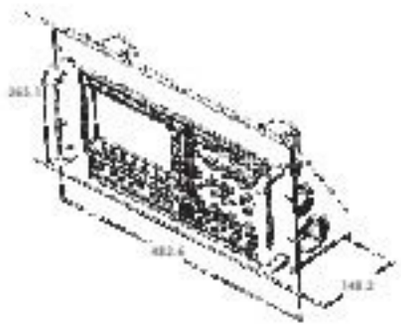




## GRA-426 Rack Mount Kit

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

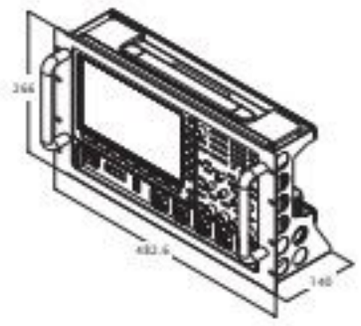




## GRA-443 Rack Mount Kit

For : GDS-3000A Series





# ACCESSORIES

## Current Probe and Differential Probe Selections



GCP-300/500/1000



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



GDP-025



GDP-050/100

## Dual-channel Differential Probe



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, 300kHz/200A, 500kHz/150A, 1MHz/70A), 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.*

### CURRENT PROBE

| | GCP-300 | GCP-500 | GCP-530 | GCP-1000 | GCP-1030 |
|---|---|---|---|---|---|
| Probe Bandwidth | 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 | 200A(10mV/A)<br>20A(100mV/A) | 150A(20mV/A)<br>15A(200mV/A) | 30Apeak | 7A(50mV/A)<br>70A(500mV/A) | 30Apeak |
| Maximum Peak Current Value | DC : 200A<br>AC : 140Arms | DC : 150A<br>AC : 100Arms | 50A | DC : 70A<br>AC : 50Arms | 50A |
| Output Voltage Rate | 100mV/A ;10mV/A | 200mV/A;20mV/A | 0.1V/A | 500mV/A;50mV/A | 0.1V/A |
| DC Amplitude Accuracy | ±3% ±50 mA at 100 mV/A (50 mA – 20A peak range)<br>±4% ±50 mA at 10 mV/A (500 mA ~ 70A peak range)<br>±15% max at 10 mV/A (70A peak – 150A peak range)<br>±25% max at 10mV/A (150A peak ~ 200A peak range) | ±3% ±30 mA at 200 mV/A (30 mA – 15 A peak range)<br>±4% ±300 mA at 20 mV/A (300 mA ~ 80 A peak range)<br>±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)<br>±4% ±200 mA at 50 mV/A (200 mA – 50 A peak range)<br>±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 | 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) ;<br>DC ~ 15MHz(attenuation x20) | DC ~ 50MHz(attenuation x200, x500, x1000) ;<br>DC ~ 25MHz(attenuation x100) | DC ~ 100MHz(attenuation x200, x500 , x1000);<br>DC ~ 50MHz(attenuation 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 ,<br>≤350Vp-p for x 50 ,<br>≤1400Vp-p for x 200 | ≤ 700Vp-p for x 100<br>≤ 1400Vp-p for x 200<br>≤ 3500Vp-p for x 500<br>≤ 7000Vp-p for x 1000 | ≤ 700Vp-p for x 100<br>≤ 1400Vp-p for x 200<br>≤ 3500Vp-p for x 500<br>≤ 7000Vp-p for x 1000 |
| Permitted Max Input Voltage | Maximum differential voltage:<br>Max voltage between input terminal and ground: 600Vrms | Maximum differential voltage:<br>Max voltage between input terminal and ground: 6500Vrms | Maximum differential voltage:<br>Max voltage between input terminal and ground: 6500Vrms |
| Input Impedance | Differential:4MΩ/1.2pF ;<br>Between terminals and ground: 2MΩ/2.3pF | Differential:54MΩ/1.2pF ;<br>Between terminals and ground:27MΩ/2.3pF | Differential: 54MΩ/1.2pF ;<br>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) ;<br>23.4ns (x20 attenuation) | 7ns (x200, x500, x1000 attenuation) ;<br>14ns (x100 attenuation) | 3.5ns (x200, x500, x1000 attenuation) ;<br>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 |
| Maximun Input Voltage to Earth | 600Vpp for x200 |
| Typical CMRR | 80dB@60Hz ;<br>60dB@100Hz ;<br>50dB@1MHz |
| Input Impedance | Differential : 2MΩ//1.2pf,<br>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 & DEDICATED TESTER SERIES

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 and GSP-9300B 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.

## PRODUCTS

- **3.25 GHz Spectrum Analyzer**
- **3 GHz Spectrum Analyzer**
- **1.8 GHz Spectrum Analyzer**
- **RF Training System**

# SPECTRUM ANALYZERS

## 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.

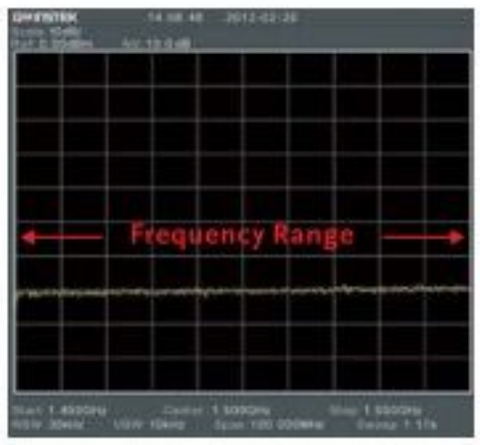



**Figure 1, Frequency Range**

## 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).

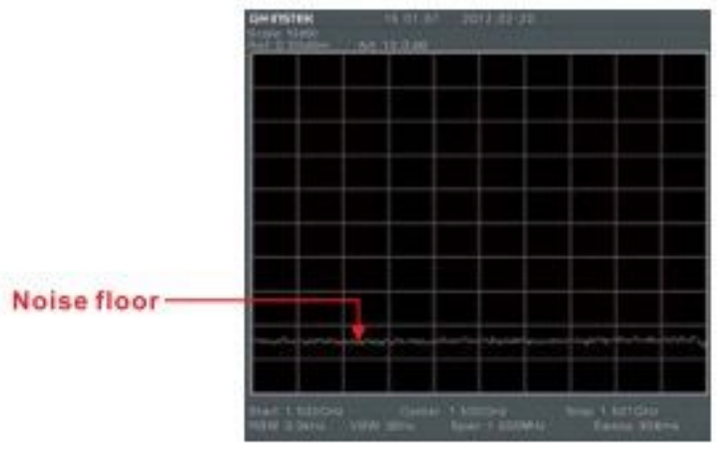



**Figure 2, Noise Floor**

## 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.

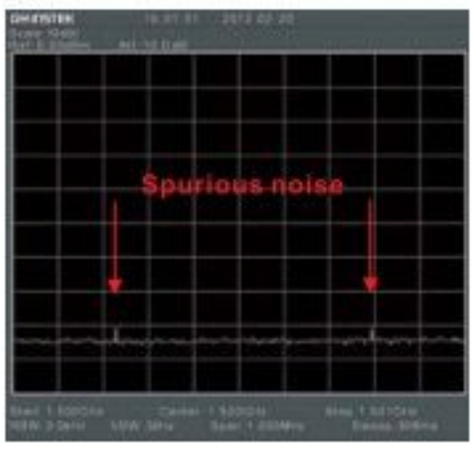



**Figure 3, Spurious Noise**

## 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.

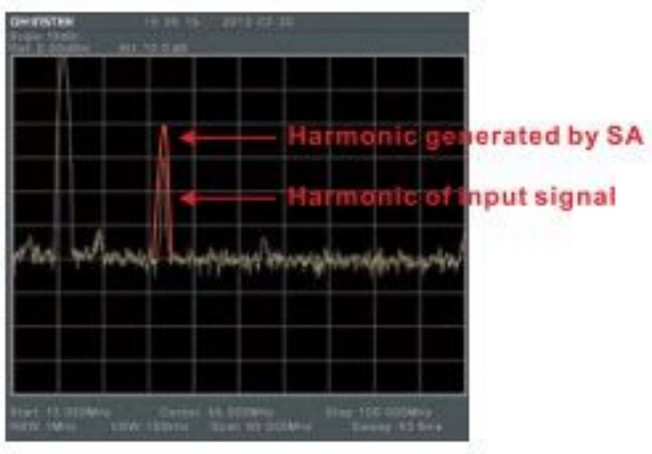



**Figure 4, Harmonics**

## 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

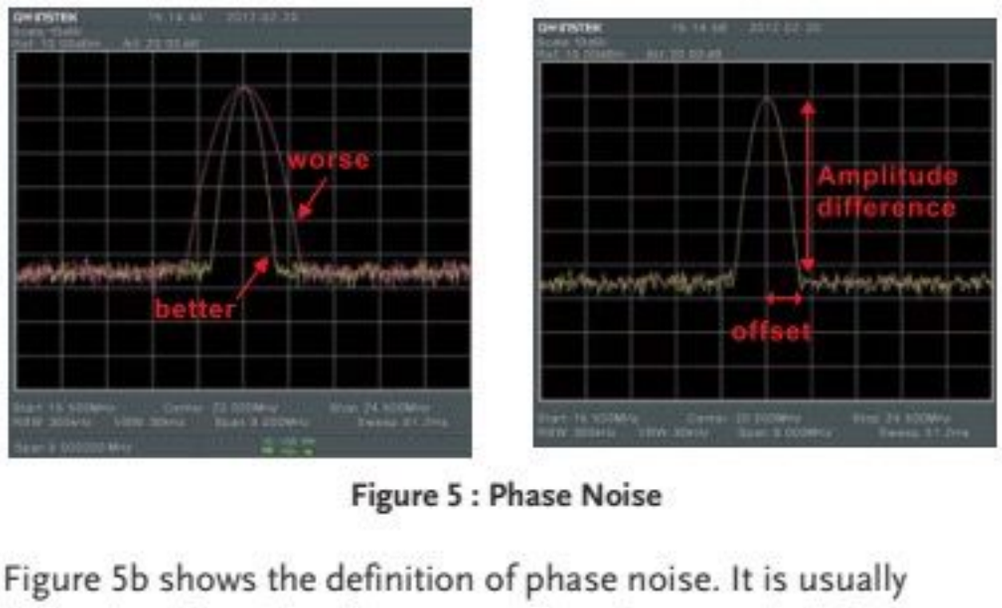



**Figure 5 : Phase Noise**

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 f1 and f2, the harmonics are as follows.

| Input | output | |
|---|---|---|
| f1, f2 | fundamentals | f1,f2 |
| | 2nd order harmonics | 2f1, 2f2, f1±f2, |
| | 3rd order harmonics | 3f1, 3f2, 2f1±f2, 2f2±f1 |
| | .... | .... |

The third order harmonics are the primary concerns in a system. If the frequencies of f1 and f2 are very close, then 2f1-f2 and f1-2f2 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.

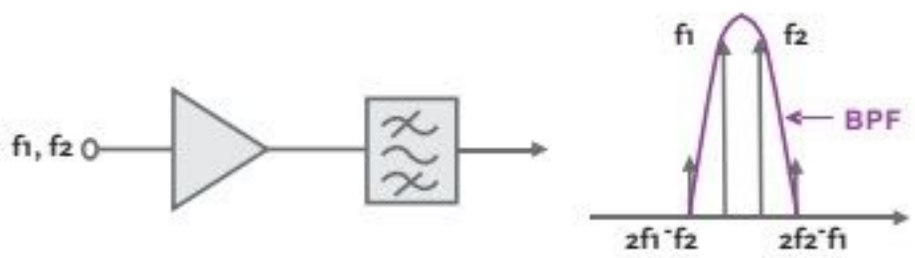



**Figure 6: Third Order Harmonics of 2f1-f2 and 2f2-f1**

An example is expressed in Table 1.

| | Harmonics | 1 | 2 | 3 |
|---|---|---|---|---|
| Input Frequency | 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 (2f1-f2) and 100.2 (2f2-f1). 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.

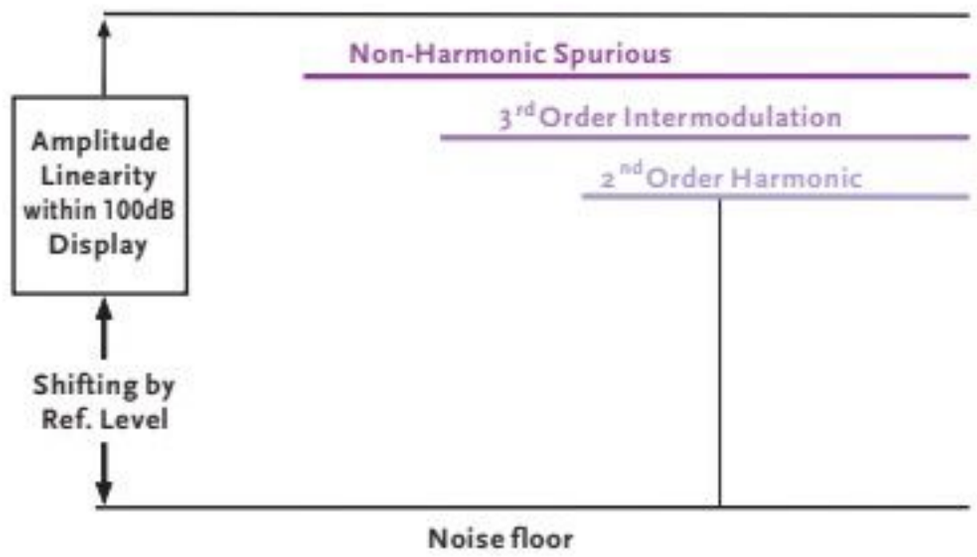



**Figure 7 : Dynamic Range**

## 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-1300A | GRF-1300 |
|---|---|---|
| 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, 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.

## GSP-9330

台灣精品 TAIWAN EXCELLENCE

CE | USB | LXI | DVI Output | RS-232 | GPIB | PC Software



## 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

## 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[1] | RBW : Auto |
| **PHASE NOISE** | | |
| Offset from Carrier | | Fc=1GHz;RBW=1kHz,VBW=10Hz;Average≥40 |
| 10 kHz | < -88 dBc/Hz | Typical[2] |
| 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<br>200 Hz, 9 kHz, 120 kHz, 1MHz | -3dB bandwidth<br>-6dB bandwidth |
| Accuracy | ± 8%, RBW = 1MHz ; ± 5%, RBW < 1MHz | Nominal[3] |
| Shape Factor | <4.5 : 1 | Normal Bandwidth ratio: -60dB:-3dB |
| **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<br>1 MHz – 10 MHz<br>10 MHz – 3.25 GHz | DANL – 18 dBm<br>DANL – 21 dBm<br>DANL – 30 dBm |
| **ATTENUATOR** | | |
| Input Attenuator Range | 0 – 50 dB, in 1 dB steps | Auto or manual setup |
| **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<br>Mixer power level (dBm) = input power (dBm) – attenuation (dB) |

### GSC-009 Soft Carrying Case

For: GSP-9330/9300B






# GSP-9330

## SPECIFICATIONS

| DISPLAYED AVERAGE NOISE LEVEL (DANL)[4] | | |
|---|---|---|
| **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 Uncertainty** | 0 ~ 50 dB in 1 dB step<br>± 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 | 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 | Typical; 10 MHz < fc < 775 MHz |
| | +60 dBm | Typical; 775 MHz ≤ fc < 1.625 GHz |
| **Third-order Intercept** | | Preamp off; signal input -30dBm; 0 dB attenuation |
| | > 1dBm | 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 |

## 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 | 204µs ~ 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** | | |
| 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 | 50Ω | Nominal |
| VSWR | <1.6 :1 | 300 kHz ~ 3.25 GHz ; Input attenuator ≥ 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 | 50Ω | |
| **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 | |
| **ALARM OUTPUT** | | |
| Connector Type | BNC female | Open-collector |
| **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 | |
| Impedance | 50Ω | 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 | |
| **VIDEO OUTPUT** | | |
| Connector Type | DVI-I (integrated analog and digital), Single Link. Compatible with VGA or HDMI standard through adapter | |
| **RS-232C INTERFACE** | | |
| Connector Type | D-sub 9-pin female | Tx , Rx , RTS , CTS |
| **GPIB INTERFACE (OPTIONAL)** | | |
| Connector Type | IEEE-488 bus connector | |
| **AC POWER INPUT** | | |
| Power Source | AC 100 V ~ 240 V, 50/60 Hz | Auto range selection |
| **GENERAL** | | |
| Internal Data Storage | 16 MB nominal | |
| Power Consumption | < 65 W | |
| Warm-up Time | < 45 minutes | |
| Temperature Range | +5 °C ~ + 45 °C | Operating |
| | -20 °C ~ + 70 °C | Storage |
| Dimensions & Weight | 350(W) x 210(H) x 100(D) mm, Approx. 4.5kg | Inc. all options (Basic + TG + GPIB + Battery) |
| | 13.8(W) x 8.3(H) x 3.9(D) inch, Approx. 9.9lb | |
| Calibration Cycle | The recommended calibration cycle is one year; calibration services are available through GW Instek's authorized calibration services. | |
| **TRACKING GENERATOR (OPTIONAL)[5]** | | |
| Frequency Range | 100 kHz ~ 3.25 GHz | |
| Output Power | -50 dBm ~ 0 dBm in 0.5 dB steps | |
| Absolute Accuracy | ± 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 | ± 1.5 dB |
| | 2 GHz ~ 3.25 GHz | ± 2 dB |
| Output Level Switching Uncertainty | ± 0.8 dB | Referenced to -10 dBm |
| Harmonics | < -30 dBc | Typical, output level = -10 dBm |
| Reverse Power | +30 dBm max. | |
| ConnectorType | N-type female | |
| Impedance | 50 Ω | Nominal |
| Output VSWR | < 1.6:1 | 300 kHz ~ 3.25 GHz, source attenuation ≥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 ℃ to 30 ℃, 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

| | |
|---|---|
| **GSP-93T1** | Tracking Generator (Factory installed option) |
| **Option 02** | Battery Pack |
| **GSP-93G1** | GPIB Interface (Factory installed option) |

### 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**

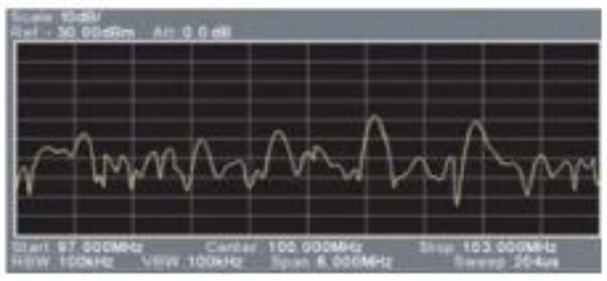
For: GSP-9330



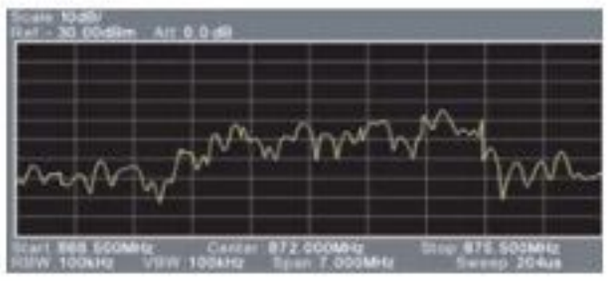
## A. FAST SIGNAL SWEEP

For spectrum analyzer, speed is the most important specification. GSP-9330 provides sweep speed up to 204 µs. 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.

**FM Signal Monitoring**



**Taiwan Telecom Signals**



## B. MODULATED SIGNAL ANALYSIS

**2FSK Signal Analysis** **ASK/FSK Signal Demodulation & Analysis** **AM/FM Signal Demodulation & Analysis**



**2FSK** **FSK** **ASK** **FM** **AM**

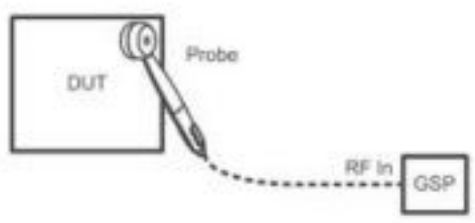
2FSK modulation, for its features of low design cost and low electricity consumption, is widely used by RF communications applications with low power and low data transmission speed characteristics. Nowadays, 2FSK modulation technology has been applied in various products and systems such as consumer 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.

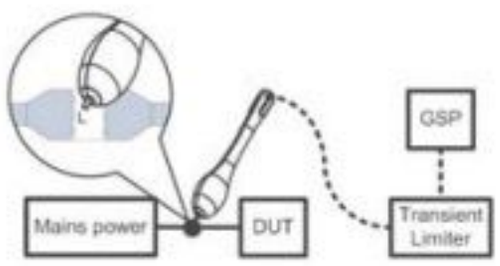
AM/FM Signal Analysis measures parameters including AM depth, frequency deviation, modulation rate, carrier power, carrier frequency offset and SINAD. Users can set the criterion in AM depth, frequency deviation, carrier power and carrier offset for fast test result determination. The GSP-9330 has a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

## C. EMC PRETEST SOLUTION

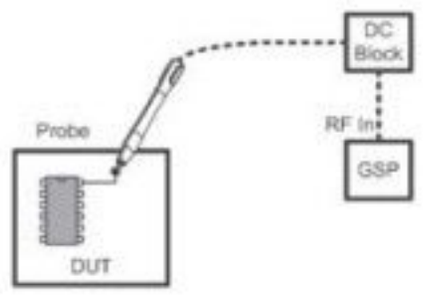



ANT-04/ANT-05




PR-01




PR-02

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.

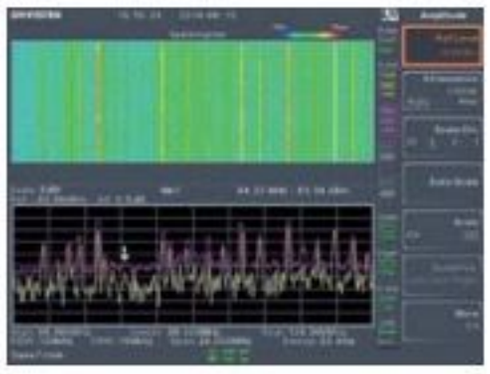
For conduction tests, GSP-9330 can collocate with LISN and Isolation Transformer to conduct electromagnetic conduction tests. If users concern EUT's large voltage variation or complexity, applying a Transient Limiter will make test equipment safer.

| 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<br>ANT-04/ANT-05 field sensor<br>PR-01 AC high voltage probe<br>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.

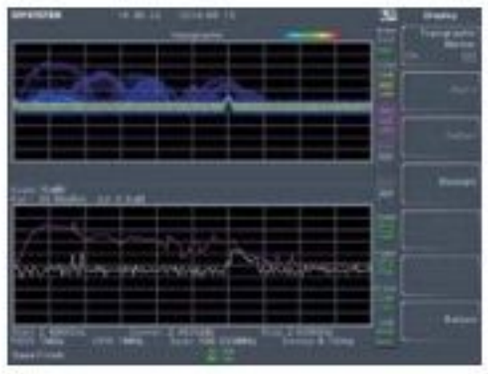
## D. GRAPHIC PROCESSING OF SIGNAL MONITORING

### Observe FM Signals by Spectrogram



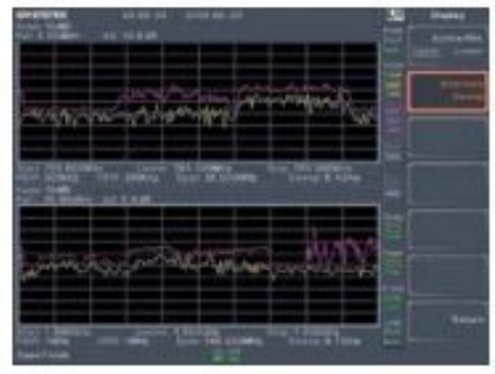
Spectrogram can simultaneously display power, frequency, and time. Frequency and power variation according to time changes can also be tracked. Especially, the intermittently appeared signals can be identified. Users, by using Spectrogram, can analyze the stability of signal versus time or identify the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

### Observe WiFi Signals by Topographic



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

## E. SIGNAL VERIFICATION, TEST AND ANALYSIS

### Channel Power Measurement





**ACPR** **OCBW**

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.

### 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.

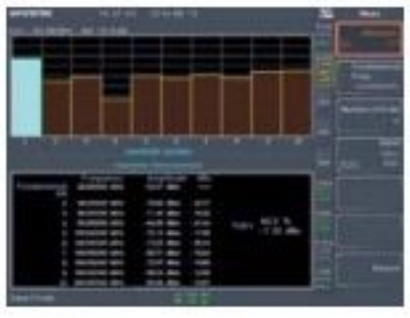
Note: General CATV is 75Ω. For GSP-9330, a 50 ~ 75 ohm adapter is needed.

### TOI (Third Order Intercept)



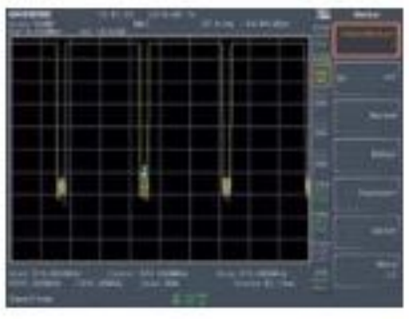
Users can measure the linearity of non-linear systems and components such as receiver, low-noise amplifier and mixer by TOI which automatically tests effective carrier and measures inter-modulation sidebands.

### 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

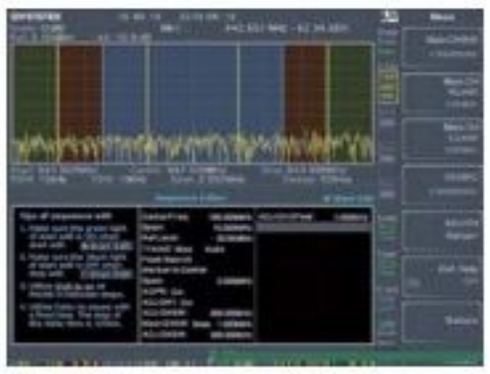
The marker noise function calculates the average noise level over a bandwidth of 1Hz, referenced from the marker position.

### 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.

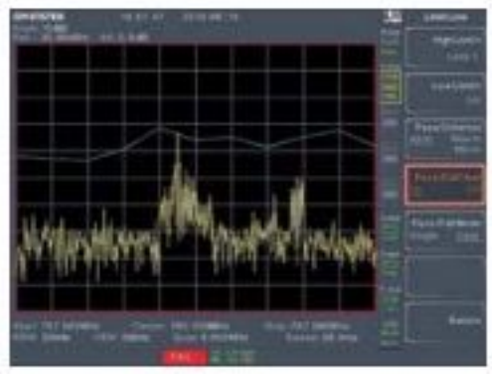
## F. PRODUCTION LINE APPLICATIONS

### 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.

### 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.

### 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.

### 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.

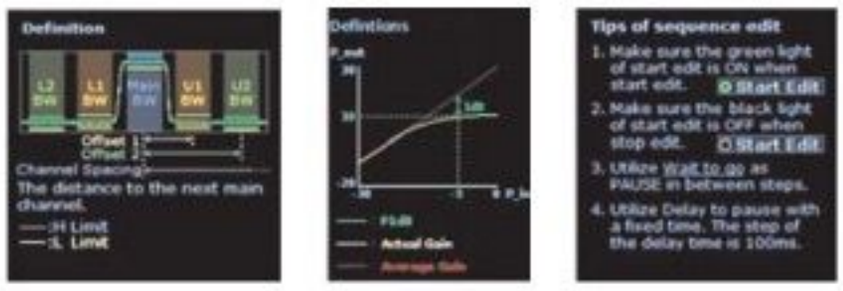
## G. USER FRIENDLY DESIGN

### 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

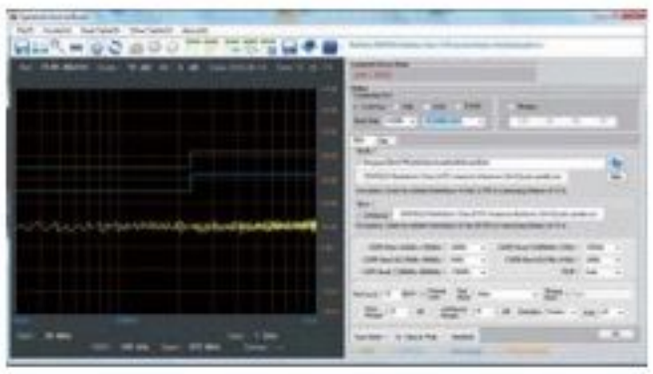



USB Device/MicroSD

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

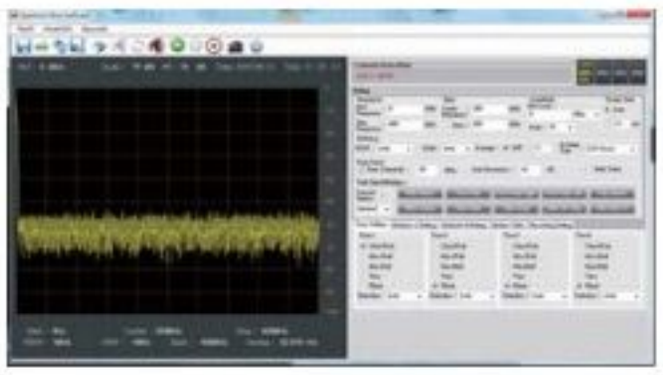
### PC Software - SpectrumShot



**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**



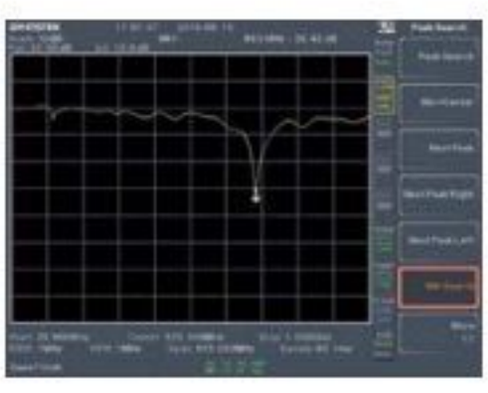

TG option provides 0 to -50 dBm synchronized sweep output, conducts scalar network analysis (S11. S21) function as well as P1dB.

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**



**3dB Frequency Bandwidth**



**Reflection Loss**

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.

**P1dB Point Measurement**



**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)

CE | USB | LXI | DVI Output | RS-232 | PC Software | GPIB | Micro SD/SDHC

## FEATURES

* Frequency Range : 9kHz ~ 3 GHz
* 0.025ppm Frequency Stability and 1ppm Aging Rate
* Built-in Preamplifier, 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-9300 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 | ±(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 GHz | |
| Resolution | 1 Hz | |
| Accuracy | ± frequency resolution[1] | RBW : Auto |
| **PHASE NOISE** | | |
| Offset from Carrier | | Fc=1GHz;RBW=1kHz,VBW=10Hz Average≥40 |
| 10 kHz | < -88 dBc/Hz | Typical[2] |
| 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<br>200 Hz, 9 kHz, 120 kHz, 1MHz | -3dB bandwidth<br>-6dB bandwidth |
| Accuracy | ± 8%, RBW = 1MHz ; ± 5%, RBW<1MHz | Nominal[3] |
| Shape Factor | <4.5 : 1 | Normal Bandwidth ratio: -60dB:-3dB |
| **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<br>1 MHz – 10 MHz<br>10 MHz – 3 GHz | DANL<br>18 dBm<br>DANL to 21 dBm<br>DANL to 30 dBm |
| **ATTENUATOR** | | |
| Input Attenuator Range | 0 – 50 dB, in 1 dB steps | Auto or manual setup |
| **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<br>Mixer power level (dBm) = input power (dBm) - attenuation (dB) |



## GSP-9300B

### SPECIFICATIONS

| | | |
|---|---|---|
| **DISPLAYED AVERAGE NOISE LEVEL (DANL)[4]** | | |
| **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 | |
| **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: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 | |
| **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 | 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 = 10µ s |
| **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 | |
| **Gain** | 18 dB | Nominal (installed as standard) |

### 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**<br>**Impedance**<br>**VSWR** | N-type female<br>50Ω<br><1.6 :1 | <br><br>Nominal<br>300 kHz ~ 3 GHz ; Input attenuator ≥10 dB |
| **POWER FOR OPTION** | | |
| **Connector Type**<br>**Voltage/Current** | SMB male<br>DC +7V/500 mA max | <br><br>With short-circuit protection |
| **USB HOST** | | |
| **Connector Type**<br>**Protocol** | A plug<br>Version 2.0 | <br><br>Support Full/High/Low speed |
| **MICRO SD SOCKET** | | |
| **Protocol**<br>**Support Cards** | SD 1.1<br>Micro SD, Micro SDHC | <br><br>Up to 32GB capacity |
| **REAR PANEL INPUT/OUTPUT** | | |
| **REFERENCE OUTPUT** | | |
| **Connector Type**<br>**Output Frequency**<br>**Output Amplitude**<br>**Output Impedance** | BNC female<br>10 MHz<br>3.3V CMOS<br>50Ω | <br><br>Nominal<br><br> |
| **REFERENCE INPUT** | | |
| **Connector Type**<br>**Input Reference Frequency**<br>**Input Amplitude**<br>**Frequency Lock Range** | BNC female<br>10 MHz<br>-5 dBm ~ +10 dBm<br>Within ± 5 ppm of the input reference frequency | <br><br><br> |
| **ALARM OUTPUT** | | |
| **Connector Type** | BNC female | Open-collector |
| **TRIGGER INPUT/GATED SWEEP INPUT** | | |
| **Connector Type**<br>**Input Amplitude**<br>**Switch** | BNC female<br>3.3V CMOS<br>Auto selection by function | <br><br> |
| **LAN TCP/IP INTERFACE** | | |
| **Connector Type**<br>**Base** | RJ-45<br>10Base-T; 100Base-Tx; Auto-MDIX | <br> |
| **USB DEVICE** | | |
| **Connector Type**<br>**Protocol** | B plug<br>Version 2.0 | For remote control only; supports USB TMC<br>Supports Full/High/Low speed |
| **IF OUTPUT** | | |
| **Connector Type**<br>**Impedance**<br>**IF Frequency**<br>**Output Level** | SMA female<br>50Ω<br>886 MHz<br>-25 dBm | <br><br>Nominal<br>Nominal<br>10 dB attenuation; RF input : 0 dBm @ 1 GHz |
| **EARPHONE OUTPUT** | | |
| **Connector Type** | 3.5mm stereo jack, wired for mono operation | |
| **VIDEO OUTPUT** | | |
| **Connector Type** | DVI-I (integrated analog and digital), Single Link. Compatible with VGA or HDMI standard through adapter | |
| **RS-232C INTERFACE** | | |
| **Connector Type** | D-sub 9-pin female | Tx , Rx , RTS , CTS |
| **GPIB INTERFACE (OPTIONAL)** | | |
| **Connector Type** | IEEE-488 bus connector | |
| **AC POWER INPUT** | | |
| **Power Source** | AC 100 V ~ 240 V, 50/60 Hz | Auto range selection |
| **GENERAL** | | |
| **Internal Data Storage**<br>**Power Consumption**<br>**Warm-up Time**<br>**Temperature Range**<br><br>**Dimensions & Weight**<br><br>**Calibration Cycle** | 16 MB nominal<br>< 65 W<br>< 30 minutes<br>+5 °C ~ + 45 °C<br>-20 °C ~ + 70 °C<br>350(W) x 210(H) x 100(D) mm, Approx. 4.5kg<br>13.8(W) x 8.3(H) x 3.9(D) inch, Approx. 9.9lb<br>The recommended calibration cycle is one year; calibration services are available through GW Instek's authorized calibration services. | <br><br><br>Operating<br>Storage<br>Inc. all options (Basic + TG + GPIB + Battery)<br> |
| **TRACKING GENERATOR (OPTIONAL)[5]** | | |
| **Frequency Range**<br>**Output Power**<br>**Absolute Accuracy**<br>**Output Flatness**<br><br><br>**Output Level Switching Uncertainty**<br>**Harmonics**<br>**Reverse Power**<br>**ConnectorType**<br>**Impedance**<br>**Output VSWR** | 100 kHz ~ 3 GHz<br>-50 dBm ~ 0 dBm in 0.5 dB steps<br>± 0.5 dB<br>Referenced ~ 160 MHz, -10 dBm<br>100 kHz ~ 2 GHz<br>2 GHz ~ 3 GHz<br>± 0.8 dB<br>< -30 dBc<br>+30 dBm max.<br>N-type female<br>50 Ω<br>< 1.6:1 | <br><br>@160 MHz, -10 dBm, Source attenuation 10 dB, 20 ~ 30°C<br><br>± 1.5 dB<br>± 2 dB<br>Referenced to -10 dBm<br>Typical, output level = -10 dBm<br><br><br>Nominal<br>300 kHz ~ 3 GHz, source attenuation ≥ 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 ℃ to 30 ℃, 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

**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)

# 1.8GHz Spectrum Analyzer



## GSP-818

### 1.8GHz Spectrum Analyzer

CE | USB | LAN | SVGA

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.

## 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)

## 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 Accuracy | ±[(days from last calibrate × freq aging rate) + temperature stability + initial accuracy ] | |
| Temperature Stability | <2.5ppm | 15°C ~ 35°C |
| Aging Rate | <1ppm/year | |
| **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 | Typical |
| 100 kHz | < -98 dBc/Hz | Typical |
| 1 MHz | < -110 dBc/Hz | Typical |
| **BANDWIDTH** | | |
| Resolution Bandwidth | 10Hz ~ 500kHz (1-10 steps by sequence), 1MHz, 3MHz<br>200 Hz, 9 kHz, 120 kHz, 1 MHz | EMI Filter(6dB), Optional<br>RBW≤1 MHz<br>RBW is 3 MHz |
| RBW Uncertainty | < 5%<br>< 18% | |
| Resolution Filter Shape Factor(60dB:3dB) | < 5 : 1 | Typical, digital and close to gaussian shape |
| Video Bandwidth(VBW) | 10 Hz ~ 3 MHz | |
| **AMPLITUDE** | | |
| **AMPLITUDE AND LEVEL** | | |
| Amplitude Measurement Range | DANL ~ + 10 dBm<br>DANL ~ + 20 dBm | 100 kHz ~ 1 MHz, Preamp Off<br>1 MHz ~ 1.5 GHz, Preamp Off |
| Reference Level | -80 dBm ~ +30 dBm | 0.01dB by step |
| Preamp | 20 dB | 100 kHz ~ 1.8 GHz |
| Input Attenuation | 0 ~ 40 dB, in 1 dB step | |
| Max Input DC Current | 50 VDC | |
| Max Continuous Power | +30dBm | 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 | ±0.4 dB, Typical |
| Preamp On, fc≥100 MHz | ±0.9 dB | ±0.5 dB, Typical |
| **UNCERTAINTY AND ACCURACY** | | |
| RBW Switch Uncertainty | Reference: 10 kHz RBW at 50 MHz<br>±0.2 dB | Log resolution |
| Input Attenuation Uncertainty | 20°C~30°C, fc=50 MHz, Preamplifier Off, 10 dB RF attenuation<br>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 | Input signal level -20 dBm |
| Preamp On | ±0.5 dB | Input signal level -40 dBm |
| Uncertainty | ±1.5 dB | Input signal range 0 dBm ~ -50 dBm |
| VSWR | <1.5, Nominal | 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 | fc≥50 MHz, Preamp off, signal input -20 dBm, 0 dB RF attenuation, 20°C ~ 30°C |
| **Third-order Intermodulation** | +10 dBm | fc≥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, fc≥50 MHz, 0 dB RF attenuation, Preamp off , 20°C ~ 30°C |
| **Residual Response** | Connect 50 Ω load at input port, 0 dB input attenuation, 20°C ~ 30°C | |
| | <-85 dBm | from 100 kHz ~ 1.5 GHz |
| | <-80 dBm | from 1.5 GHz ~ 1.8 GHz |
| **Input Related Spurious** | <-60 dBc | -30 dBm signal at input mixer, 20°C ~ 30°C |
| **SWEEP** | | |
| **SWEEP TIME** | | |
| **Range** | 10 ms to 3000 s | None-zero Span |
| | 1 ms to 3000 s | Zero Span |
| **Span Mode** | Continue, Single | |
| **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** | ± 3 dB | |
| **Maximum Safe Reverse Level** | Average total power: 30 dBm, DC : ±50 VDC | |
| **Impedance** | 50 Ω | Nominal |
| **Connector** | N Type Female | |
| **FREQUENCY COUNTER** | | |
| **FREQUENCY COUNTER** | | |
| **Resolution** | 1Hz, 10Hz, 100Hz, 1kHz | |
| **Accuracy** | ±(frequency indication × frequency reference accuracy)+ counter resolution | |
| **INPUTS AND OUTPUTS** | | |
| **RF INPUT** | | |
| **Impedance** | 50 Ω | Nominal |
| **Connector** | N Type Female | |
| **REFERENCE INPUT** | | |
| **Connector** | BNC Female | |
| **10MHz Reference Amplitude** | 0 dBm to +10 dBm | |
| **USB** | | |
| **USB Host** | Connector | A Plug |
| | Protocol | USB 2.0 (Host End) |
| **USB Device** | Connector | B Plug |
| | Protocol | 2.0 Version |
| **VGA** | | |
| **VGA** | Connector | 15-pins, D-SUB(female) |
| | Resolution | 800*600, 60 Hz |
| **GENERAL** | | |
| **Display** | Type | TFT LCD |
| | Resolution | 800*600 (SVGA) |
| | Size | 10.4 inches |
| | Color | 65536 colors |
| **Remote Control** | USB Device | B Plug, supports USB TMC |
| | LAN TCP/IP Interface | RJ-45, supports 10Base-T/100Base-Tx |
| **Mass Memory** | Internal Memory | 256M Bytes |
| **Temperature** | Operating Temperature | 0 °C ~ 40°C |
| | Storage Temperature | -20°C ~ 70°C |
| **Dimensions & Weight** | 421(W) × 221(H) × 115(D) mm ; Approx. 5.0 kg (without package) | |
| **AC Power Socket** | 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)

### OPTIONAL ACCESSORIES

**GSP-81T1** Tracking Generator (via software keycode)
**GSP-81E1** EMI Filter and EMI Detector (via software keycode)

### FREE DOWNLOAD

**PC Software** Dedicated Remote Control PC Software

## A. TRACE AND MARKER FUNCTIONS



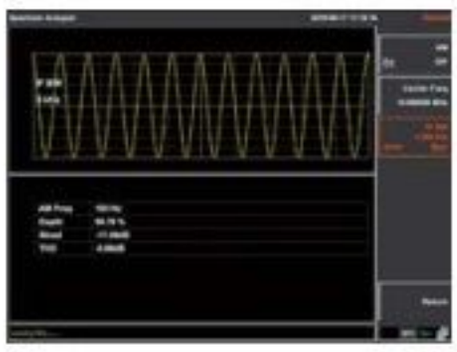
Five traces are provided, and the Marker function can be assigned to different traces.

## 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.

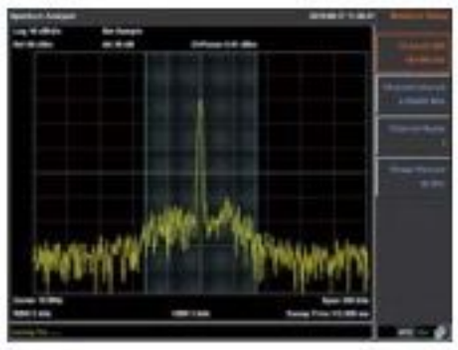
## D. ACPR, OCBW, CHPW



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

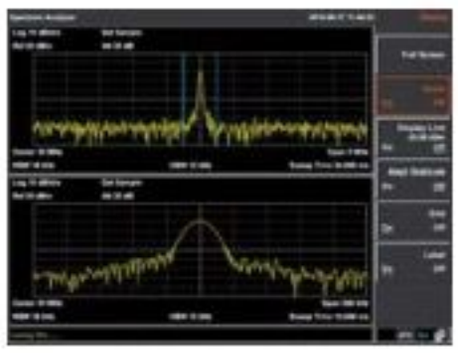


The power density of the signal can be measured through the OCBW function.



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

## E. BANDWIDTH ZOOM



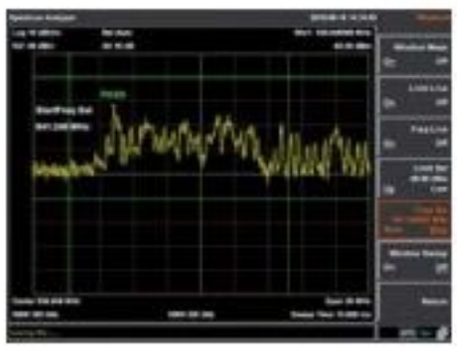
The Bandwidth Zoom function is used to view the spectral performance of the signal under different Span.

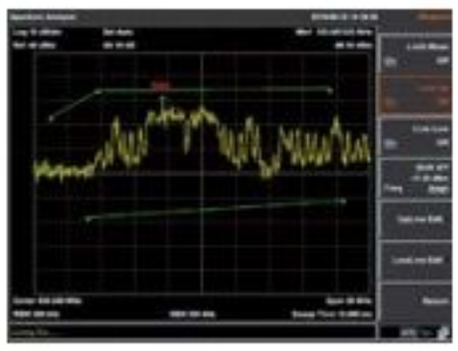
## F. TIME SPEC



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



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
### 3GHz Spectrum Analyzer

CE | USB | RS-232 | VGA Output | PC Software



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

CE | USB | PC Software

## GSP-730 FEATURES

- ✲ Frequency Range : 150kHz ~ 3GHz
- ✲ Autoset Function
- ✲ Noise level : ≤-100dBm
- ✲ 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)

| GSP-730 SPECIFICATIONS | | |
|---|---|---|
| **FREQUENCY** | | |
| **Frequency Range** | | |
| Range | 150kHz ~ 3GHz | |
| **Center Frequency** | | |
| Setting Resolution<br>Accuracy | 0.1MHz<br>±50kHz | Frequency span : 0.3GHz ~ 2.6GHz, 20 ±5°C |
| **Frequency Span** | | |
| Range<br>Accuracy | 0 Hz (Zero Span), 1MHz – 3GHz<br>±3% | Frequency span : 0.3GHz – 2.6GHz, 20 ±5°C |
| **Resolution Bandwidth (RBW)** | | |
| Offset from Carrier | 30kHz, 100kHz, 300kHz, 1MHz | Nominal, -3dB bandwidth |
| **SSB Phase Noise** | | |
| Offset from Carrier | < -85 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<br>Accuracy<br>Unit | +20 – -40dBm<br>Within ±2dB<br>dBm, dBV, dBμV | Reference at 1GHz, SPAN:5MHz |
| **Average Noise Level** | | |
| | ≤-100dBm | Typical, center frequency:1GHz RBW:30kHz |
| **Frequency Characteristics** | | |
| | @300MHz–2.6GHz<br>@80–300MHz, 2.6–3GHz | ±3.0dB<br>±6.0dB |
| **SWEEP** | | |
| **Sweep Time** | | |
| Range<br>Accuracy | 300ms – 8.4s, auto<br>±2% | Not adjustable<br>Frequency span : full span |
| **RF INPUT** | | |
| Impedance<br>VSWR<br>Max Damage Level<br>Connector | 50 ohm<br>less than 2.0@input att ≧ 10dB<br>+30dBm(CW average power), 25VDC<br>N-type female | Nominal |
| **INTERFACE** | | |
| RS-232C<br>USB Connector<br>VGA Output<br>Display | Sub-D female-D 9 pins<br>USB Host/Device full speed supported<br>Sub-D female 15 pins<br>640 x 480 RGB color LCD | |
| **GENERAL** | | |
| Temperature Range<br><br><br>Operating Humidity<br>Dimensions & Weight<br><br>Power Source | Operating: 5 – 45°C<br><br>Storage: -20 ~ 60°C<br>less than 45°C / 90%RH<br>296 (W) × 153 (H) × 105 (D) mm,<br>Approx. 2.2kg<br>AC 100–240V, 50/60Hz | Guaranteed at 25 ±5°C, without soft carrying case<br>Less than 60°C / 70%RH |




## Rear Panel



# GSP-730

| GRF-1300/1300A SPECIFICATIONS | | |
|---|---|---|
| | **GRF-1300A** | **GRF-1300** |
| **BASE BAND** | | |
| **Waveforms** | Sine, Square, Triangle | Sine, Square, Triangle |
| **Frequency Range** | 0.1~3MHz , Step : 10kHz | 0.1~3MHz , Step : 10kHz |
| **Amplitude** | ≧1.5Vpp<br>≧0.75Vpp into 50 Ohm | ≧1.5Vpp |
| **Harmonic Distortion** | ≦-30dBc | ≦-30dBc |
| **RF/FM ANALYSIS** | | |
| **Frequency Accuracy** | ±0.15MHz | ±0.15MHz |
| **Adjustable Range** | ≧45MHz (870M ~ 920MHz), Step : 1MHz | ≧45MHz (870M ~ 920MHz), Step : 1MHz |
| **Power Range** | ≧-15dBm | ≧-15dBm |
| **FM** | | |
| **Max Frequency Deviation** | >3MHz | >3MHz |
| **AM** | | |
| **Peak Difference** | ≧-18dBm | ≧-18dBm |
| **MIXER** | | |
| **LO + IF**<br>**LO - IF** | ≧-35dBm<br>≧-35dBm | - |
| **MIXER + MODULATION** | | |
| | ≧-60dBm | - |
| **BANDPASS FILTER** | | |
| **Frequency Centre: 2.4GHz** | Bandwidth: ±20MHz | - |
| **INTERFACE** | | |
| **USB Device** | USB Type B | USB Type B |
| **DIMENSIONS & WEIGHT** | | |
| 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 | | |

## GRF-1300 Front Panel




## GRF-1300A Front Panel




## 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
**ADP-002** SMA to N-TYPE Adaptor
**ATA-001** Antenna, General FM Antenna, BNC(M)
**GTL-303** RF Cable, RG316 Assembly, 600mm, SMA(P/M)
**GTL-246** USB Cable, USB 2.0, A-B Type, 1200mm

### FREE DOWNLOAD

**PC Software** Training syetem 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.

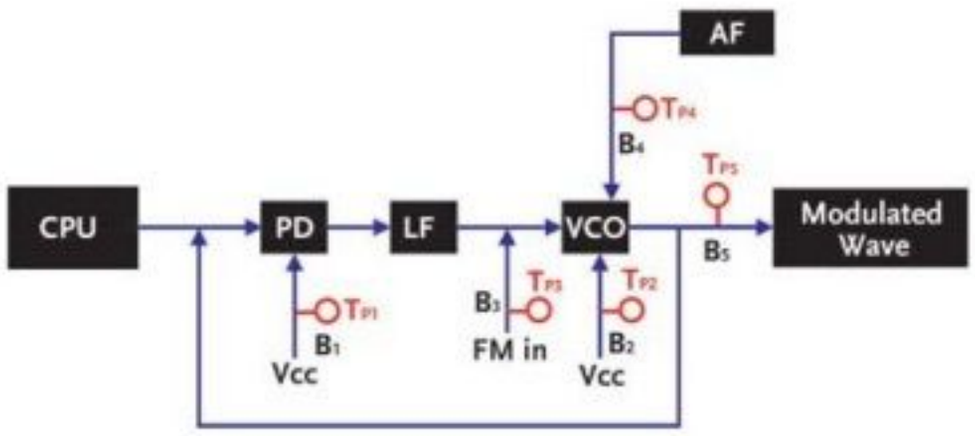
GRF-1300/1300A RF communications trainer, as the counterpart of GSP-730 for the basic RF communications experiment system, is capable of generating a baseband signal and a RF carrier signal for the built-in AM and FM communications operations. The baseband signal output contains the selections of Sine, 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.




Test Points on GRF-1300 for Fault Diagnosis

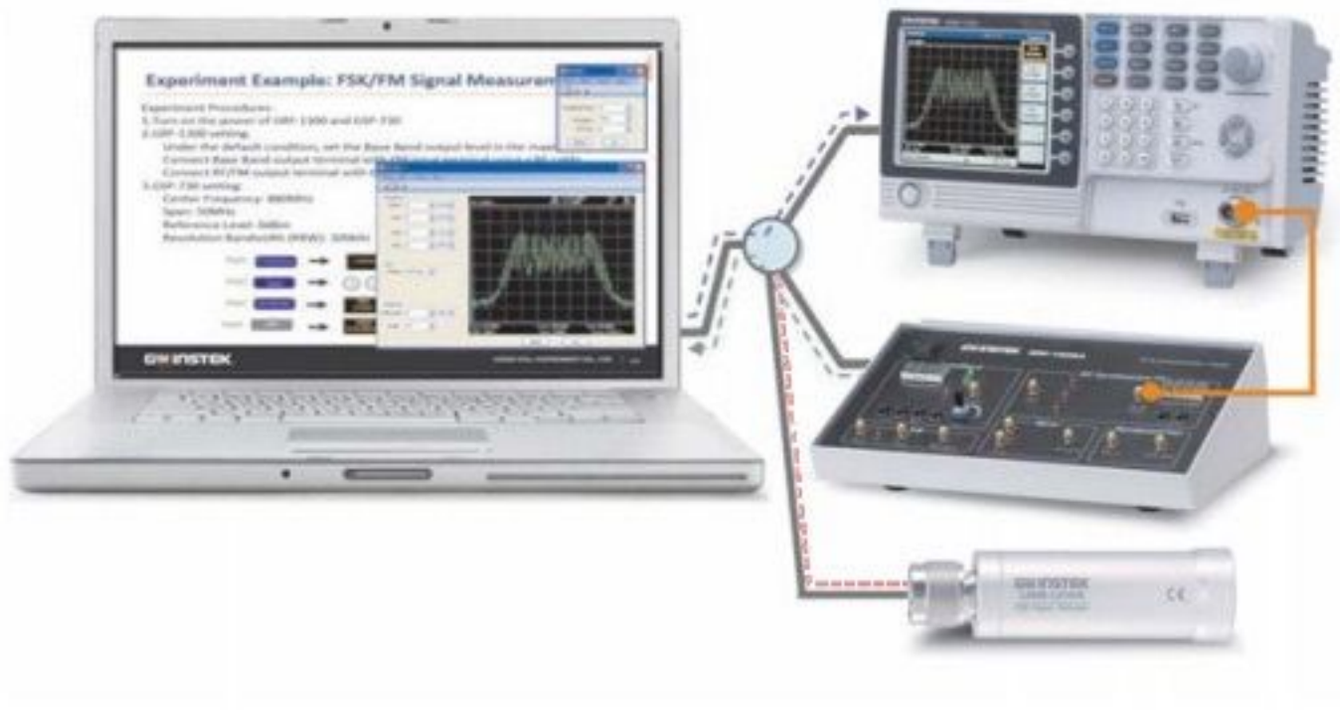
- **Introductions of Frequency Domain , Time Domain , and Spectrum Analyzer Basics.**
- **9 Experiments Include**
  Operations of Spectrum Analyzer
  Base band and RF signal measurements
  AM and FM signal measurements
  Communication system and product measurements
- **Learning Outcome Tests**
- **Auxiliary 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)

## CURRICULUM CONTENTS

**GSP-730+GRF-1300 Solution**




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




## Fully-electronic RF Training System

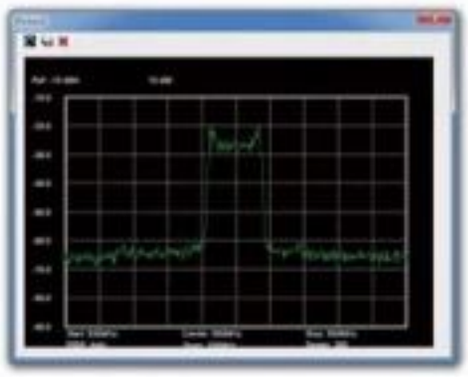
In class, teachers can connect GSP-730 and GRF-1300 with a PC via USB or RS-232 interface. First of all, all the contents of experiment has been converted into power-point slides and provided as the in-class materials. During lecturing the power-point slides, both GSP-730 and GRF-1300 can be remotely 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.

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

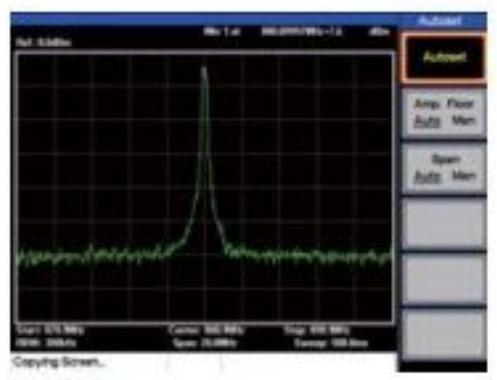




The dedicated PC software, Primary RF, is provided to support the remote control of GSP-730 and GRF-1300 simultaneously. The control includes base band signal waveform, frequency and RF signal frequency for GRF-1300 and Frequency, Span, Amplitude, RBW and spectrum transferring of GSP-730.

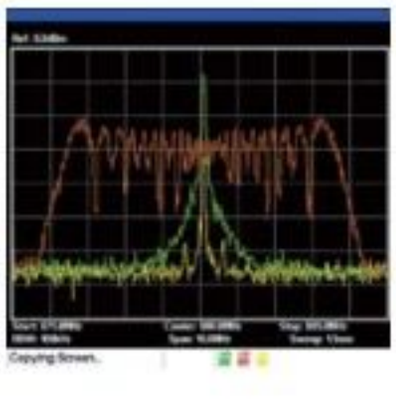
## C. AUTOSET FUNCTION




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



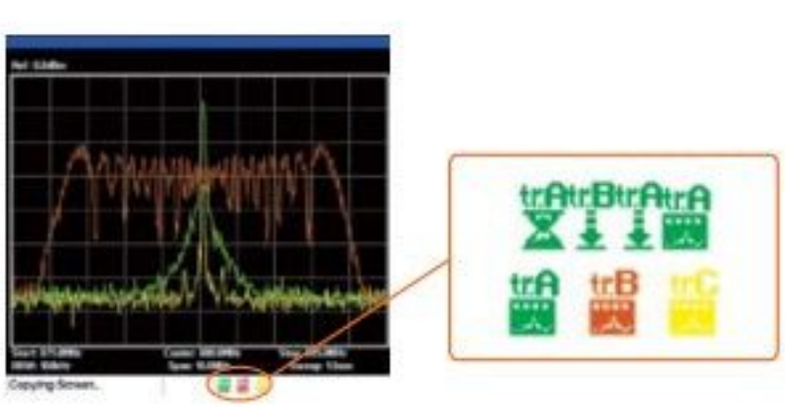
GSP-730 can illustrate a signal with three colors simultaneously under various display modes, including Clear/Write, Max-Peak Hold, Min-Peak Hold, View, Blank and Average. Other useful trace functions such as trace math operations are also accomplishable.

## E. MARKER FUNCTION



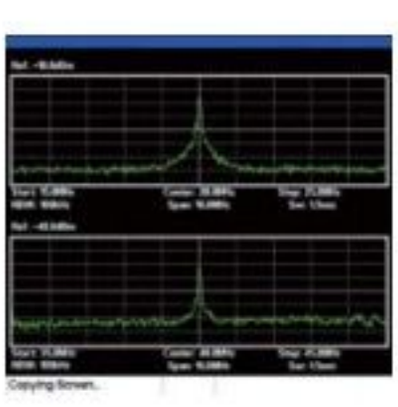
Five Markers can be used to obtain the measurement readings of specified points. Each marker has a counterpart ΔMarker, the amplitude difference can be measured and indicated by setting the frequency of marker and the interval frequency of ΔMarker between two signals. While several pairs of Markers are 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



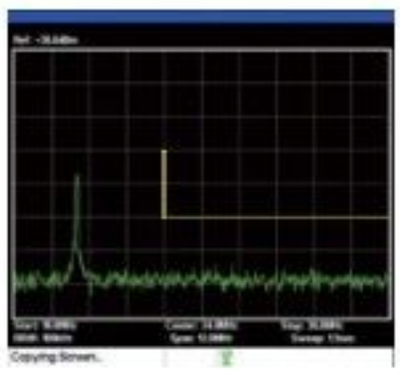

The intuitive icons help users grasp the current setting conditions all the time. As all status icons are clearly shown at the corner of the screen, there is no need to worry about the unknown settings, which may cause confusion and lead to measurement errors.

## G. SPLIT-WINDOW DISPLAY IN LIVE MODE



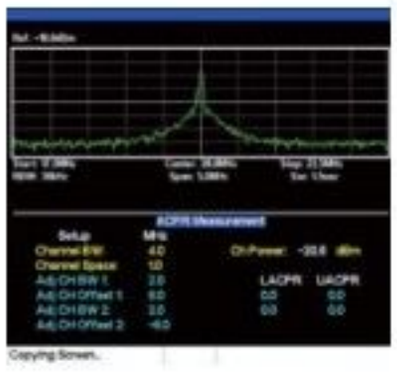
Under Split-Window Display Mode, the monitor will display two independent screens, which can respectively have separated settings. For instance, if processing the test between fundamental and harmonic signals, the separated screens can respectively set at different frequencies at the same time in order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

## H. PASS/FAIL JUDGMENTS

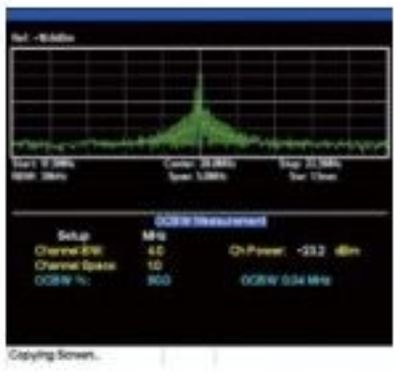


This function may run the “Pass” and “Fail” inspection with efficiency. Firstly, a limit line or upper and lower limit lines should be edited as the judgment criterion, then the LCD will display “Pass” or “Fail” according to whether the input signal meets the condition defined by the limit lines to indicate the examined outcome.

## I. POWER MEASUREMENT FUNCTION



ACPR

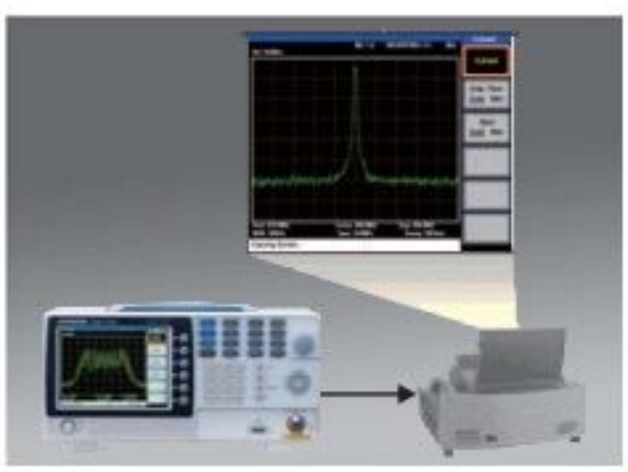


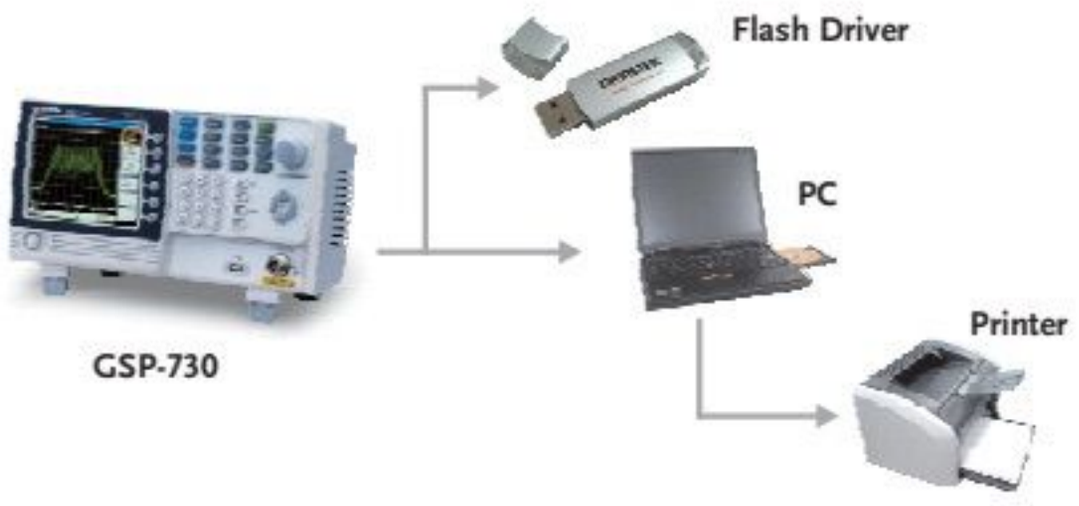
OCBW

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.

# ACCESSORIES

| MODEL | DESCRIPTION | CATEGORY | APPLICABLE DEVICE |
|---|---|---|---|
| ADP-001 | Adaptor, 50Ω, BNC(J/F) - N(P/M) | Adaptor | GSP-Series |
| ADP-002 | Adaptor, 50Ω, SMA(J/F) - N(P/M) | Adaptor | GSP-Series |
| 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 |
| GAK-001 | Adaptor, 50Ω Termination, N(P/M) | Adaptor | GSP-Series |
| GAK-002 | Adaptor, Cap with Chain, N(P/M) | Adaptor | GSP-Series |
| 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 |
| GTL-248 | GPIB Cable, Double Shielded, 2000mm | Communication Cable | GSP-9330, GSP-9300B |
| GTL-250 | GPIB 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 |
| GTL-301 | RF Cable, RG223 Assembly, 1000mm, N(P/M) | General Lead | GSP-Series |
| GTL-302 | RF Cable, RG223 Assembly, 300mm, N(P/M) | General Lead | GSP-Series |
| GTL-303 | RF Cable, RG316 Assembly, 600mm, SMA(P/M) | General Lead | GSP-Series, GRF-1300/1300A |
| GTL-304 | RF Cable, RG223 Assembly, 280mm, N(P/M) - N(J/F) | General Lead | GSP-Series |
| 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

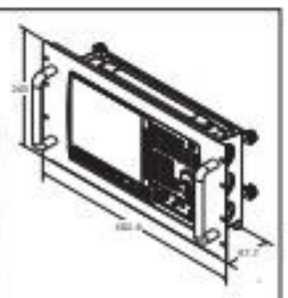


**GTL-246** USB Cable, USB 2.0, A-B Type, 1200mm



**GRA-415 Rack Adapter Kit**





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



**GTL-250** GPIB 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<br>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 and DDS (Direct Digital Synthesized) Function Generators are well provided. The MFG-2000 Series is a mainstay function generator and its special feature is that you can output maximum five channels simultaneously. One of the five channels is RF Generator and its frequency is from 1μHz to 160MHz/320MHz. The isolated channel design is an important feature of GW Instek function generators. 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 long waveform length. The AFG-2000 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**
- **DDS Function Generator**
- **Audio Generator**
- **RF Signal Generator**

# ARBITRARY FUNCTION 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. frequency = sampling rate/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 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 Generatror 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) |
| | 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 | TTL Output/Sync Output | V | V | V | V | V | V |
| SQUARE CHARACTERISTIC | Square Rise/Fall Time | <8ns | <8ns | <8ns | <8ns | <8ns | <8ns |
| | Square Duty Cycle | 20% ~ 80% | 20% ~ 80% | 20% ~ 80% | 20% ~ 80% | 20% ~ 80% | 20% ~ 80% |
| PULSE CHARACTERISTIC | Pulse Width | 20ns–999830s | 20ns–999830s | 20ns–999830s | 20ns–999830s | 8ns–1999.9s | 8ns–1999.9s |
| | 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 |
| MODULATION | AM | V | V | V | V | V | V |
| | 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 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 Generatror 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) |
| | 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 | TTL Output/Sync Output | V | V | V | V | V | V | V | V | V | V | V |
| SQUARE CHARACTERISTIC | Square Rise/Fall Time | <15ns | <15ns | <15ns | <15ns | <15ns | <15ns | <15ns | <15ns | <15ns | <15ns | <15ns |
| | 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 CHARACTERISTIC | 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 |
| | 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 | GPIB(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 Generatror 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)<br>1mVpp ~ 5Vpp (>20MHz) | 1mVpp ~ 10Vpp (≦ 20MHz)<br>1mVpp ~ 5Vpp (>20MHz) | 1mVpp ~ 10Vpp | 1mVpp ~ 10Vpp | 1mVpp ~ 10Vpp (≦ 20MHz)<br>1mVpp ~ 5Vpp (>20MHz) | 1mVpp ~ 10Vpp | 1mVpp ~ 10Vpp |
| | DC Offset (@50Ω) | ±5Vpk (AC+DC) (≦ 20MHz)<br>±2.5Vpk (AC+DC) (>20MHz) | ±5Vpk (AC+DC) (≦ 20MHz)<br>±2.5Vpk (AC+DC) (>20MHz) | ±5Vpk (AC+DC) | ±5Vpk (AC+DC) | ±5Vpk (AC+DC) (≦ 20MHz)<br>±2.5Vpk (AC+DC) (>20MHz) | ±5Vpk (AC+DC) | ±5Vpk (AC+DC) |
| | 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 | 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 | GPIB(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 |
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# 30MHz/20MHz Arbitrary Function Generator



## AFG-303X/302X Series

CE | LAN | GPIB | USB | PC Software

## FEATURES

* 1 μHz ~ 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 ±42V). 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 1μHz to 20MHz or 30MHz; 1μHz 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 ±42 Vpk. (DC + AC Peak) | | | |
| Each of the Signal Ground of CH1/CH2 | – | Isolated | – | Isolated |
| Standard Waveforms | 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, Havercosine, Sinever, Abssin, Haversine, Stair_down, Abssinehalf, 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, Arccsc, 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<br>*Note: It is required to update the ARB data first prior to enabling both Medical (Cardiac, EOC, EEC, 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 | Random, Fixed Pattern | | | |
| Type | 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 | 1μHz – 30MHz | 1μHz – 30MHz | 1μHz – 20MHz | 1μHz – 20MHz |
| Pulse | 1μHz – 25MHz | 1μHz – 25MHz | 1μHz – 20MHz | 1μHz – 20MHz |
| Triangle/Ramp | 1μHz – 1MHz | | | |
| Resolution | 1μHz | | | |
| Accuracy | ±1 ppm 0 – 50℃ ; ±0.3 ppm 18 – 28℃ | | | |
| Stability | ±1 ppm, per 1 year | | | |
| Aging | ≦ 1 μHz | | | |
| Tolerance | | | | |



# AFG-3032/3022



## SPECIFICATIONS

| | | AFG-3031 | AFG-3032 | AFG-3021 | AFG-3022 |
|---|---|---|---|---|---|
| **OUTPUT CHARACTERISTICS (2)** | | | | | |
| Amplitude | Range | 1 mVpp – 10 Vpp (into 50Ω); 2 mVpp – 20 Vpp (into open-circuit) | | | |
| | Accuracy | ± 1% of setting ±1 mVpp (at 1 kHz / into 50Ω without DC offset) | | | |
| | Resolution | 0.1 mV or 4 digits | | | |
| | Flatness | 0.1dB <10 MHz; 0.2 dB 10 MHz – 30 MHz (sinewave relative – 1 kHz/into 50Ω) | | | |
| | Units | Vpp, Vrms, dBm | | | |
| Offset | Range | ±5 Vpk ac + dc (into 50Ω) ; ±10Vpk ac + dc (into open circuit) | | | |
| | Accuracy | 1% of setting + 2 mV + 0.5% of amplitude | | | |
| Waveform Output | Impedance | 50Ω typical (fixed); > 10MΩ (output disabled) | | | |
| SYNC Output | Protection | Short-circuit protected ; Overload relay automatically disables main output | | | |
| | Ground Isolation | 42Vpk max. | | | |
| | Level | TTL-compatible into>1kΩ | | | |
| | Impedance | 50Ω nominal | | | |
| **SINE WAVE CHARACTERISTICS** | | | | | |
| Harmonic Distortion(5) | | -60 dBc DC – 1 MHz, Ampl<3 Vpp; -55 dBc DC – 1 MHz, Ampl>3 Vpp<br>-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 ;<br>-50 dBc + 6 dBc/octave 1MHz – 30MHz(AFG-3031/3032only) | | | |
| Phase Noise | | <-110dBc/Hz typical, 15 kHz offset, fc = 10MHz | | | |
| **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;<br>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*); 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%*) | | | |
| Period | | 40ns – 1,000,000s | | | |
| Rise Time and Fall Time*7 | | 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 | | | |




# AFG-3031/3021

## SPECIFICATIONS

| | AFG-3031 | AFG-3032 | AFG-3021 | AFG-3022 |
|---|---|---|---|---|
| **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 Waveform | 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 | | | |
| **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 (1μs resolution) | | | |

Note : 1. A total of ten waveforms can be stored(Every waveform can composed of 8M points maximum)

2. Add 1/10 th of output amplitude and offset specification per°C for operation outside of 0°C~28°C range(1-year specification)

3. Edge time decreased at higher frequency

4. Sine and square waveforms above 25 MHz are allowed only with an "Infinite" count

5. Harmonic distortion and Spurious noise at low amplitudes is limited by a -70 dBm floor

6. Loss may occur if the pulse width is beyond the setting range of the normal mode. The pulse may vanish at times.

7. 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 |
|---|---|---|---|---|
| **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**

**AFG-3G1** GPIB Interface
**GRA-432** Rack Adapter Kit

**OPTIONAL ASSESSORIES**

**GTL-246** USB Type A to Type B cable

**FREE DOWNLOAD**

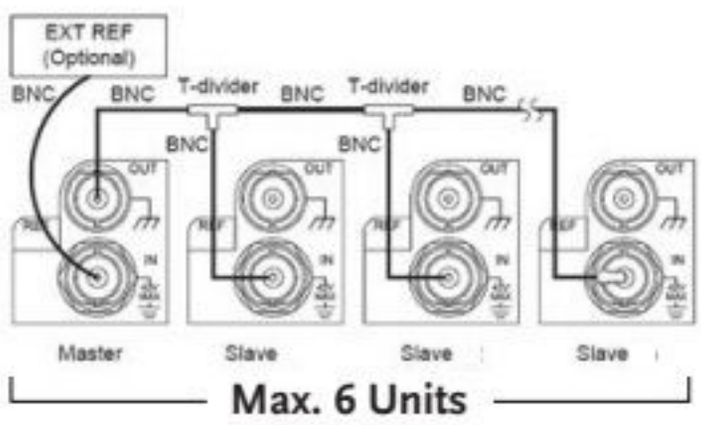
**PC Software** Arbitrary Waveform Editing Software

## A. CIRCUIT DESIGN FOR GROUND ISOLATION AMONG OUTPUT/INPUT TERMINAL, INSTRUMENT CHASSIS, AND DUAL CHANNELS



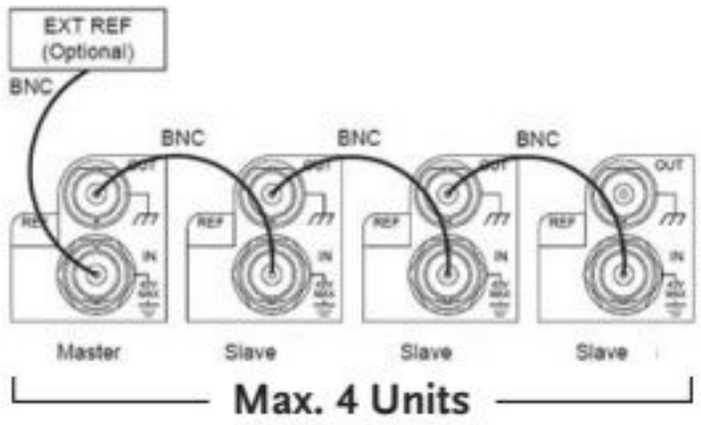

Channel 1, channel 2, reference 10 MHz input, synchronization and modulation input/output connector grounding are isolated from instrument chassis. The output channels of dual channel models are independently isolated. These connectors can sustain maximum isolation voltage up to ±42Vpk (DC+ AC peak value) 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 ±5V under 50Ω 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 ±42Vpk (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.



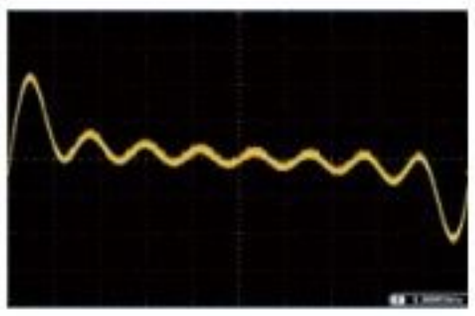

**Method two uses reference frequency output (REF OUT) and reference frequency input (REF IN) ), 50 ohm BNC cable (RG-58A/U) to connect up to 4 units to conduct synchronized phase operation.**

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



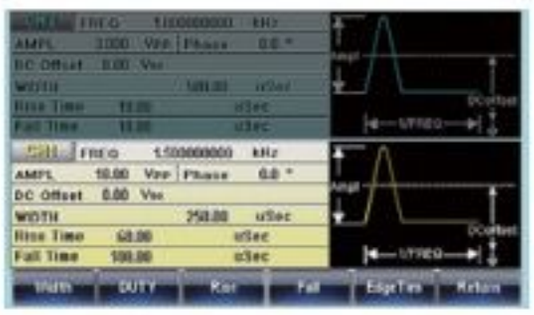

**Harmonic Signal Generator**



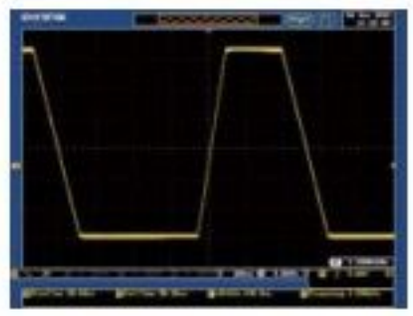
**Harmonic Signal**

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



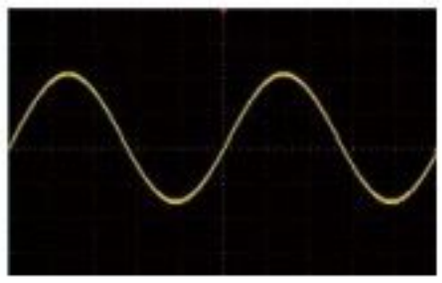

**Pulse Generator**



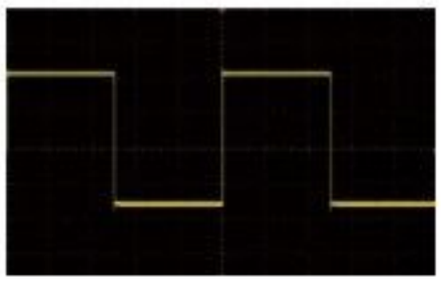
**Pulse Signal**

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.

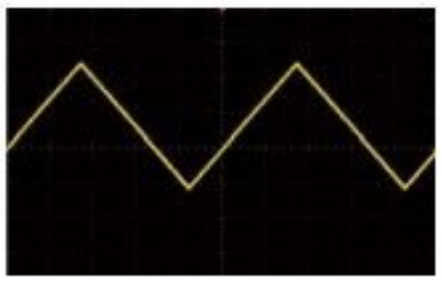
## E. VERSATILE OUTPUT WAVEFORM SELECTIONS



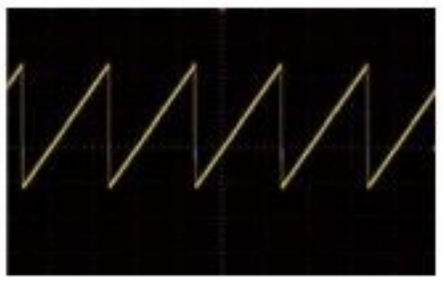
Sine



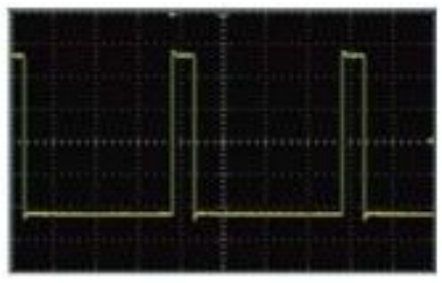
Square



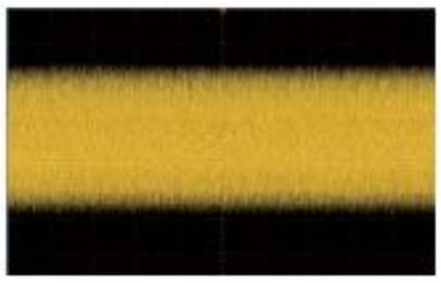
Triangle



Ramp



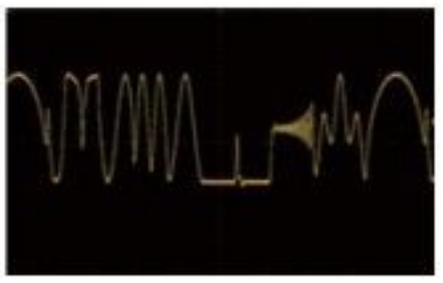
Pulse



Noise

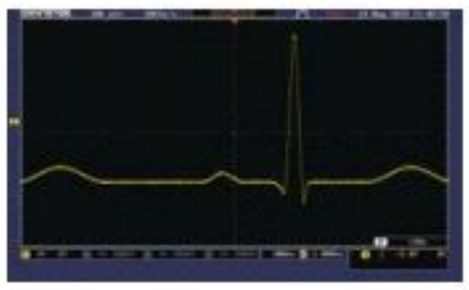


DC Voltage

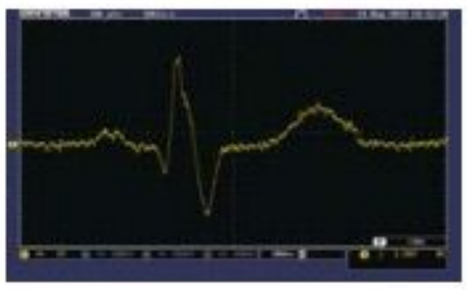


Arbitrary Waveform

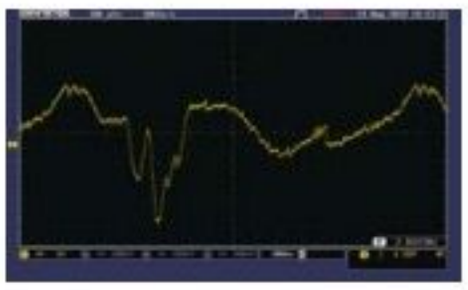
**MEDICAL APPLICATION WAVEFORMS** (MFG-2220HM excluded)



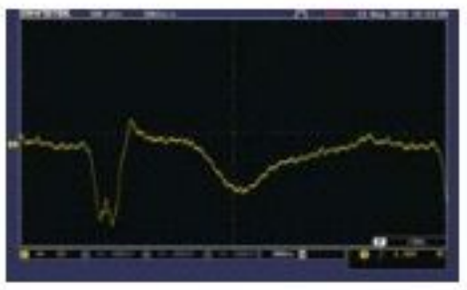
Cardiac



ECG1



ECG2

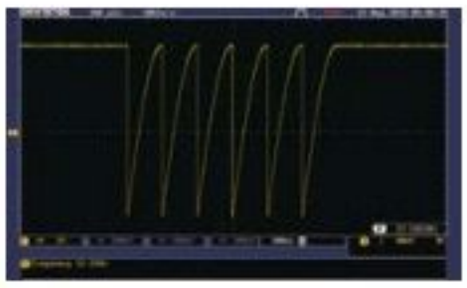


ECG3

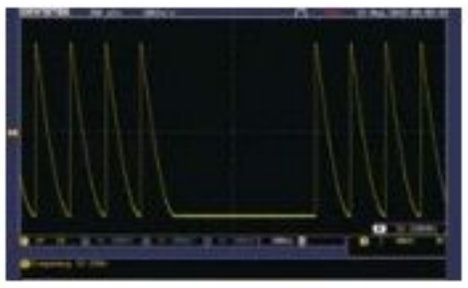
**AUTOMOTIVE ELECTRONIC WAVEFORMS** (MFG-2220HM excluded)



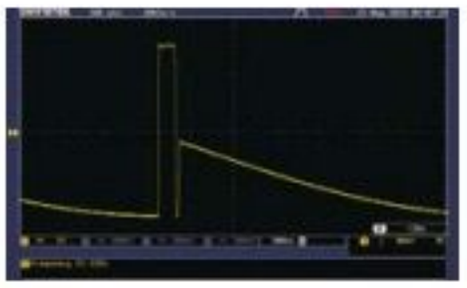
Ignition



ISO7637-2 TP3A



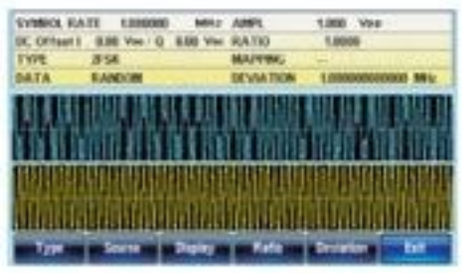
ISO7637-2 TP3B



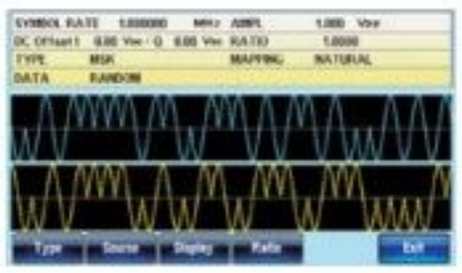
ISO7637-2 TP2B

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.

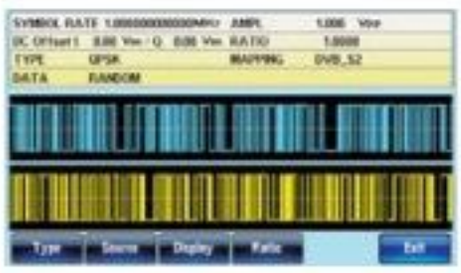
## F. IQ BASEBAND WAVEFORM OUTPUT FUNCTION FOR AFG-3032/3022



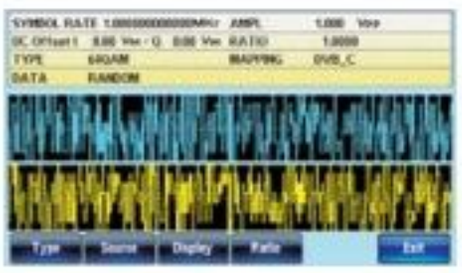
FSK



MSK



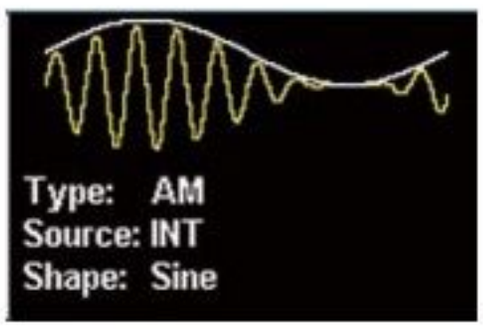
PSK



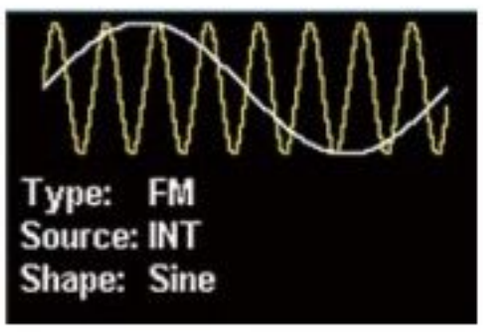
QAM

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,QQPSK,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.

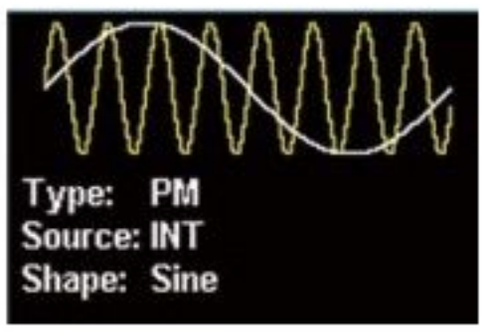
## G. MODULATION FUNCTION



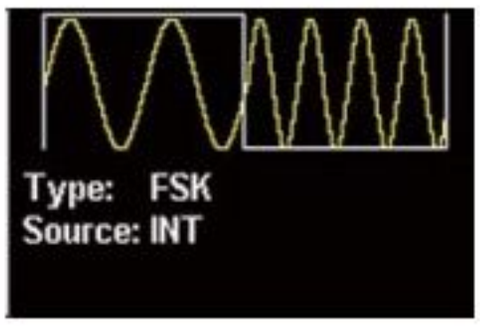

Amplitude Modulation



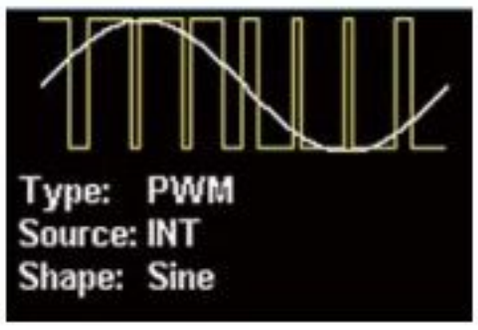

Frequency Modulation



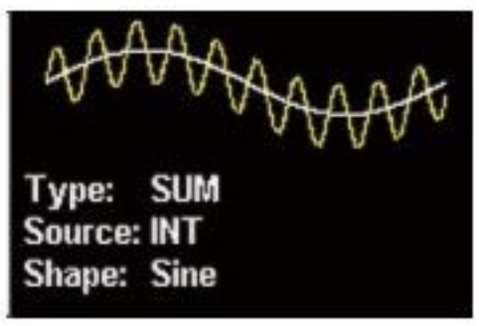

Phase Modulation




Frequency-shift Keying Modulation




Pulse Width Modulation

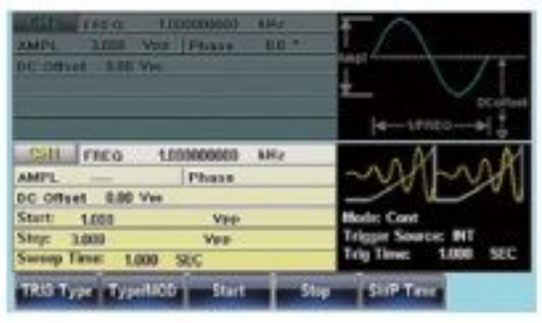



Sum Modulation

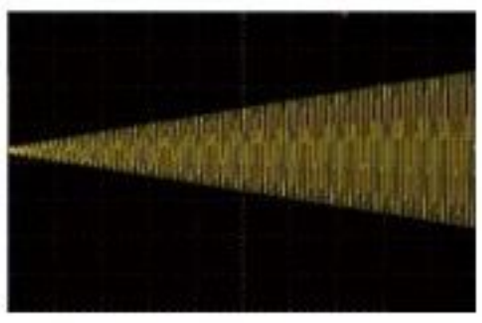
The series supports AM, FM, PM, FSK, PWM and SUM modulation. Modulation source can be from inside or outside.

Applications include the baseband of communications systems, motor control and light adjustment, etc.

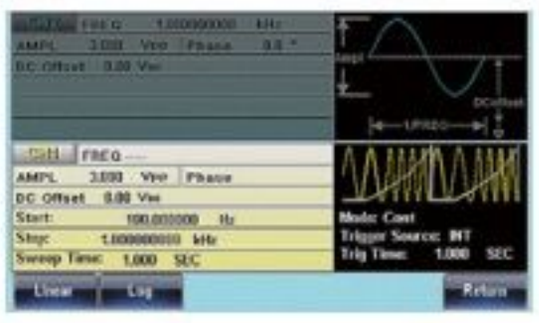
## H. SWEEP FUNCTION



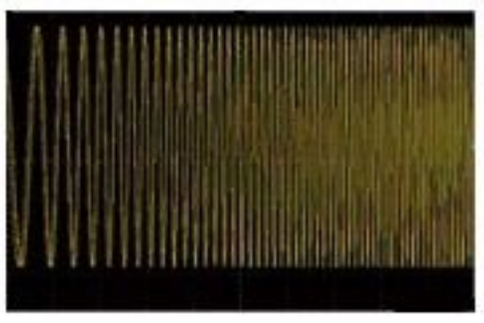
Amplitude Sweep Setting



Amplitude Sweep Signal



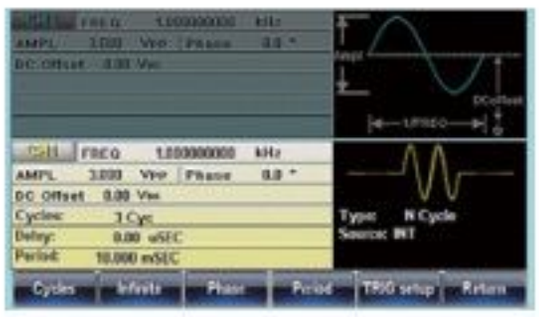
Frequency Sweep Setting



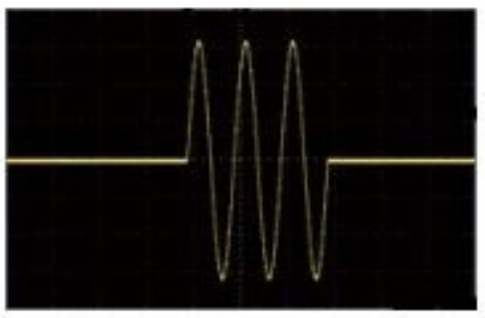
Frequency Sweep Signal

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



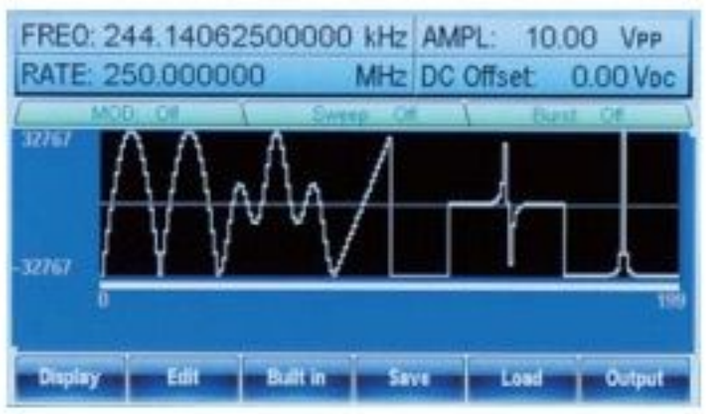
Burst Signal

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

## J. FLEXIBLE ARBITRARY WAVEFORM EDITING

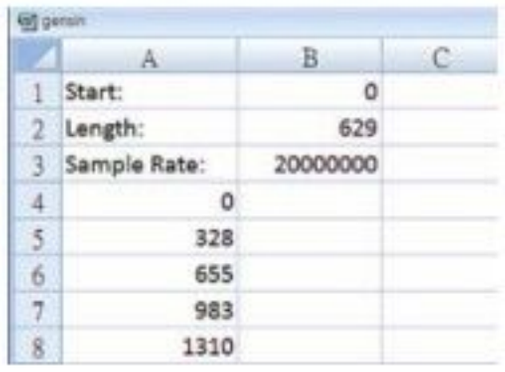
### Four methods to obtain arbitrary waveforms

- **Front Panel Operation**

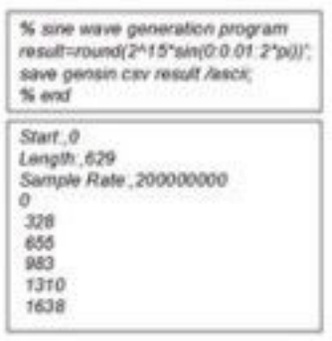



Via single unit's panel, arbitrary waveforms can be selected, edited, stored, recalled, output, triggered from 65 built-in waveforms.

- **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(0:0.01:2*pi));
save gensin csv result /ascii;
% end
```

```
Start ,0
Length ,629
Sample Rate ,20000000
0
328
655
983
1310
1638
```

Supports CSV file

Support CSV file upload produced by MATLAB and Excel.

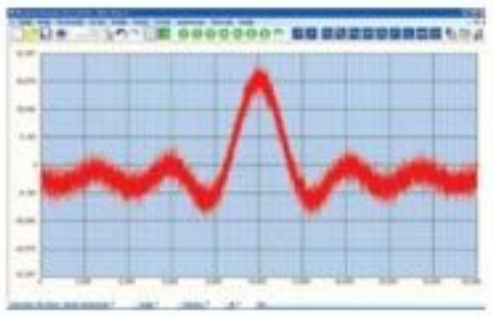
- **Direct Waveform Reconstruction (DWR)**



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**



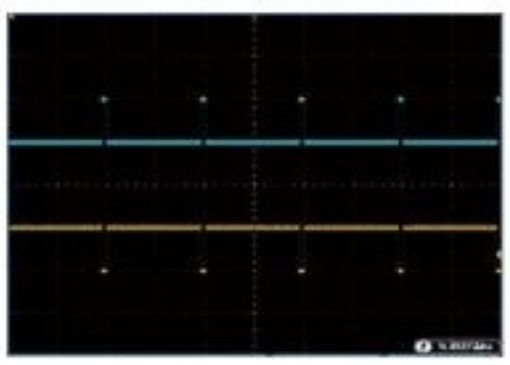
A Sinc Waveform with Gaussian Noise



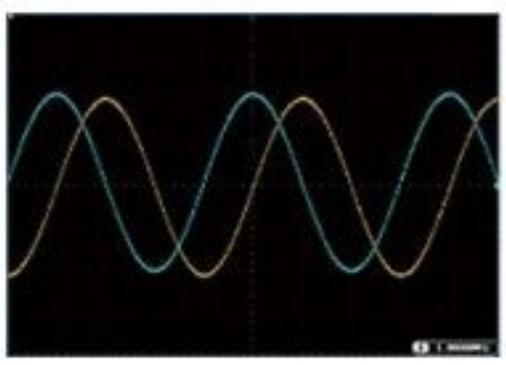

Digital Signal

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.

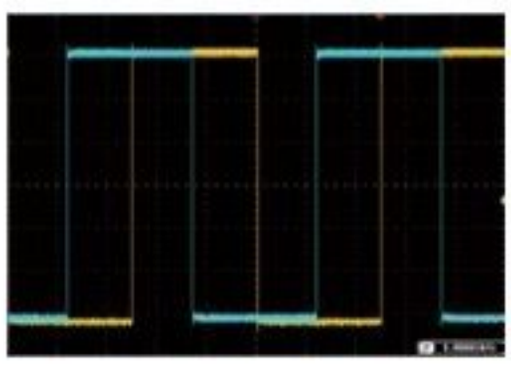
## K. CORRELATED FUNCTIONS OF DUAL CHANNEL OUTPUTS



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

台灣精品 TAIWAN EXCELLENCE 2012

CE | RS-232 | GPIB | USB | PC Software | LabVIEW Driver

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 clip piling 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.

## FEATURES

- ☆ Wide Frequency Range From 1μHz~80/50MHz
- ☆ 1μHz 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

## 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) (into 50Ω) | |
| | 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) | |
| | Units | Vpp, Vrms, dBm | |
| Offset | 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) | |
| | Protection | Short-circuit protected;overload relay auto-matically disables main output | |
| SYNC Output | Level | TTL-compatible into>1kΩ | |
| | Impedance | 50Ω nominal | |
| **SINEWAVE CHARACTERISTICS** | | | |
| Harmonic Distortion *5 | | -60dBc DC~1MHz, Ampl<3Vpp<br>-55dBc DC~1MHz, Ampl>3Vpp<br>-45dBc 1MHz~5MHz, Ampl>3Vpp<br>-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<br>Minimum Pulse Width: 8ns when FREQ≤50MHz; 5% of setting period when FREQ≤6.5MHz<br>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 | |

# 80MHz/50MHz Arbitrary Function Generator



AFG-3081/3051

## Rear Panel





*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 | | ASC II 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 |

## SPECIFICATIONS

| | AFG-3081 | AFG-3051 |
|---|---|---|
| **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 | |
| **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 50Ω | |
| Pulse Width | > 450 ns | |
| Maximum Rate | 1 MHz | |
| Fan-out | ≥4 TTL load | |
| Impedance | 50Ω typical | |
| **MARKER OUTPUT** | | |
| Type | for ARB, Sweep | |
| Level | TTL Compatible into 50Ω | |
| Fan-out | ≥4 TTL load | |
| Impedance | 50Ω 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 | | |

## ORDERING INFORMATION

**AFG-3081** 80MHz Arbitrary Function Generator
**AFG-3051** 50MHz Arbitrary Function Generator

ACCESSORIES :
CD (User manual + Software) × 1 , Quick Start Guide x 1 , Power Cord x 1 , GTL-110 Test Lead x 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



## MFG-2000 Series

CE | LAN | USB | PC Software

### FEATURES

- ☆ **Maximum Five Output Channels**
  - **2 Equivalent Performance Arbitrary Channels Frequency : 1μHz~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 aveform 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 ±42Vpk (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 ±42Vpk 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, medical applications (MFG-2220HM exduled), 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:**

<table>
<tr><td>Channel 1</td><td rowspan="2">1uHz-200MHz<br>max. FG With<br>250MSa/s ARB</td><td rowspan="3">AM,FM,PM,FSK,SUM<br>PWM ,Sweep ,Burst ,<br>Trigger,<br>Frequency Counter</td><td rowspan="2"></td></tr>
<tr><td>Channel 2</td></tr>
<tr><td>RF<br>Channel</td><td>1uHz-320MHz<br>max. FG With<br>200MSa/s ARB</td><td>ASK,PSK</td></tr>
<tr><td>Pulse<br>Generator</td><td colspan="3">25MHz Full Function pulse Generator<br>(Frequency /Width/duty Cycle /Rise and Fall Edge adjustable)</td></tr>
<tr><td>Power<br>Amplifier</td><td colspan="3">20W Power Amplifier<br>(20W (RL=8Ω)/20dB/5Hz~100kHz/<0.1% (Ampl >1Vpp 20Hz~20kHz)</td></tr>
</table>

* 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 | Built-in |
| | Sample Rate | 200 MSa/s ; MFG-2220HM:250MSa/s |
| | Repetition Rate | 100MHz ; MFG-2220HM:125MHz |
| | Waveform Length | 16k points |
| | Amplitude Resolution | 14 bits |
| | Non-volatile Memory | 10sets 16k points(1) |
| | User-defined Output Section | From point 2 – 16384 |
| FREQUENCY CHARACTERISTICS | Range | MFG-2220HM:Sine:200MHz(Max.);Square:60MHz(Max.);Triangle,Ramp:5MHz;Others:Sine:60MHz(Max.) Square:25MHz(Max.);Triangle,Ramp:1MHz |
| | Resolution | 1μHz |
| | Accuracy Stability | ±20 ppm |
| | Aging | ±1 ppm, per 1 year |
| | Tolerance | ≤1μHz |
| OUTPUT CHARACTERISTICS (2) | Amplitude Range | 1mVpp – 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) |
| | Accuracy | ±2% of setting ±1 mVpp (at 1 kHz/into 50Ω without DC offset) |
| | Resolution | 0.1mV or 4 digits |
| | Flatness | ± 1% (0.1dB) ≦1MHz ; ± 3% (0.3dB) ≦50 MHz ; ± 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) |
| | Units | Vpp, Vrms, dBm |
| OFFSET | Range | ±5 Vpk AC + DC (into 50Ω); ±10Vpk AC + DC (open circuit) |
| | Accuracy | ±(1% of setting + 5mV + 0.5% of amplitude) |
| WAVEFORM OUTPUT | Impedance | 50Ω typical (fixed); > 10MΩ (output disabled) |
| | Protection | Short-circuit protected; Overload relay automatically disables main output |
| | Ground Isolation | 42Vpk max (MFG-2220HM excluded) |
| SYNC OUTPUT | Range | TTL-compatible into>1kΩ |
| | Impedance | 50Ω standard |
| | Ground Isolation | 42Vpk max (MFG-2220HM excluded) |
| SINE WAVE CHARACTERISTICS (3) | Harmonic Distortion | –60 dBc DC – 200kHz, Ampl > 0.1 Vpp –55 dBc 200kHz – 1 MHz, Ampl > 0.1 Vpp ; –45 dBc 1MHz – 10 MHz, Ampl > 0.1Vpp ; –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) |
| | Total Harmonic Distortion | < 0.1% (Ampl>1Vpp) DC–100 kHz |
| SQUARE WAVE CHARACTERISTICS | Rise/Fall Time | <15ns ; MFG-2220HM:<6ns |
| | Overshoot | <5% |
| | Asymmetry | 1% of period +5 ns |
| | Variable duty Cycle | 0.01% to 99.99% (limited by the current frequency setting) |
| | Jitter | 20ppm +500ps(4) |
| RAMP CHARACTERISTICS | Linearity | < 0.1% of peak output |
| | Variable Symmetry | 0% – 100% |
| PULSE CHARACTERISTICS | Frequency | 1μHz – 25MHz |
| | Pulse Width | ≧20ns ; MFG-2220HM ≧10ns (limited by the current frequency setting) |
| | Variable duty Cycle | 0.01% – 99.99% (limited by the current frequency setting) |
| | Overshoot | <5% |
| | Jitter | 20ppm + 500ps(4) |

### PULSE GENERATOR

| | | |
|---|---|---|
| PULSE GENERATOR | Amplitude | 1mVpp – 2.5 Vpp (into 50Ω) ; 2mVpp – 5 Vpp (open-circuit) |
| | Offset | ±1 Vpk AC + DC (into 50Ω) ; ±2Vpk AC + DC (Open circuit) |
| | Frequency | 1uHz – 25MHz |
| | Pulse Width | 20ns – 999.7ks (limited by the current frequency setting) |
| | Variable duty Cycle | 0.1% – 99.9% (limited by the current frequency setting) |
| | Leading and Trailing Edge Time(5) | 10ns – 20s(1ns resolution) (limited by the current frequency and pulse width settings) |
| | Overshoot | <5% |
| | Jitter | 100ppm + 500ps(4) |

### RF GENERATOR

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

## SPECIFICATIONS

| | | |
|---|---|---|
| **FREQUENCY CHARACTERISTICS** | **Range** | Sine: 1μHz–160MHz(DDS)/1μHz–60MHz(ARB) for MFG-2XXXMF ; 1μHz–320MHz(DDS)/ 1μHz~60MHz(ARB) for MFG-2XXXMR<br>Square: 25MHz(max); Triangle, Ramp: 1MHz |
| | **Resolution** | 1 μHz |
| | **Accuracy Stability** | ±20 ppm |
| | **Aging** | ±1 ppm, per 1 year |
| | **Tolerance** | ≦ 1 μHz |
| **OUTPUT CHARACTERISTICS(2)** | **Amplitude(into 50Ω)** | 1mVpp to 2 Vpp (MFG-2XXXMF);1mVpp to 1 Vpp (MFG-2XXXMR) |
| | **Accuracy** | ±2% of setting ±1 mVpp(at 1 kHz/into 50Ω without DC offset) |
| | **Resolution** | 1mV or 3 digits |
| | **Flatness** | ±1%(0.1dB)≦1MHz; ±3%(0.3dB)≦50 MHz; ±10%(0.9dB)≦160MHz; ±35%(3.5dB)≦320MHz (sinewave relative to 1 kHz/into 50Ω) |
| **OFFSET** | | ±1 Vpk AC +DC (into 50Ω) ;±2Vpk AC +DC (Open circuit) |
| **WAVEFORM OUTPUT** | **Impedance** | 50Ω typical(fixed) ; >10MΩ (output disabled) |
| **SINE WAVE CHARACTERISTICS(3)** | **Harmonic Distortion** | -60 dBc <200kHz ; -55 dBc 200kHz–1 MHz ; -45 dBc 1MHz–10 MHz; -30 dBc 10MHz–320MHz |
| | **Total Harmonic Distortion** | < 0.1% (Ampl>1Vpp) DC–100 kHz |
| **SQUARE WAVE CHARACTERISTICS** | **Rise/Fall Time** | <15ns |
| | **Overshoot** | <5% |
| | **Asymmetry** | 1% of period +5 ns |
| | **Variable duty Cycle** | 0.01% to 99.99%(limited by the current frequency setting) |
| | **Jitter** | 20ppm+500ps(4) |
| **RAMP CHARACTERISTICS** | **Linearity** | < 0.1% of peak output |
| | **Variable Symmetry** | 0% to 100% |
| **MODULATION/ SWEEP** | **Modulation Type** | AM,FM,PM,FSK,PWM (The detail same as CH1 modulation specification) |
| | **Sweep type** | Frequency |
| | **Source** | INT/EXT (INT only for AM,FM,PM, PWM) |
| | **Modulating Frequency** | Sine-DDS 5μs–327.68ms (Resolution:5μs); Sine-ARB 2mHz–20kHz(Resolution:1mHz) |
| **PSK (MFG-2220HM also provided)** | **Carrier Waveforms** | Sine-DDS |
| | **Modulating Waveforms** | 50% duty cycle square |
| | **Internal Frequency** | 2 mHz to 1 MHz |
| | **Phase Range** | 0° ~ 360.0° |
| | **Source** | Internal / External |
| **ASK (MFG-2220HM also provided)** | **Carrier Waveforms** | Sine-DDS |
| | **Modulating Waveforms** | 50% duty cycle square |
| | **Internal Frequency** | 2 mHz to 1 MHz |
| | **Amplitude Range** | 1mVpp to 10Vpp |
| | **Source** | Internal / External |

## POWER AMPLIFIER

| | | |
|---|---|---|
| **POWER AMPLIFIER** | **Input Impedance** | 10kΩ |
| | **Input Voltage** | 1.25Vpmax |
| | **Working Mode** | Constant Voltage |
| | **Gain** | 20dB |
| | **Output Power (RL=8Ω)** | 20W (Square) |
| | **Output Voltage** | 12.5Vpmax |
| | **Output Current** | 1.6Amax |
| | **Rise/Fall Time** | <2.5μs |
| | **Full Power Bandwidth** | 5Hz – 100kHz |
| | **Overshoot** | 5% |
| | **Total Harmonic Distortion** | < 0.1% (Ampl >1Vpp); 20Hz ~ 20 kHz |
| | **Ground Isolation** | 42Vpk max |

## ADVANCED FUNCTIONS

| | | |
|---|---|---|
| **AM MODULATION** | **Carrier Waveforms** | Sine, Square, Triangle, Ramp, Pulse, Arb |
| | **Modulating Waveforms** | Sine, Square, Triangle, Upramp, Dnramp |
| | **Modulating Frequency** | 2mHz – 20kHz ; MFG-2220HM : 2mHz – 50kHz(Int) ; DC – 20kHz ; MFG-2220HM : DC – 50kHz (Ext) |
| | **Depth** | 0% – 120.0% |
| | **Source** | Internal / External |
| **FM MODULATION** | **Carrier Waveforms** | Sine, Square, Triangle, Ramp |
| | **Modulating Waveforms** | Sine, Square, Triangle, Upramp, Dnramp |
| | **Modulating Frequency** | 2mHz – 20kHz ; MFG-2220HM : 2mHz – 50kHz(Int) ; DC – 20kHz ; MFG-2220HM : DC – 50kHz (Ext) |
| | **Peak Deviation** | DC to max frequency ; MFG-2220HM: DC – 0.5*max frequency |
| | **Source** | Internal / External |
| **PM** | **Carrier Waveforms** | Sine, Square, Triangle, Ramp |
| | **Modulating Waveforms** | Sine, Square, Triangle, Upramp, Dnramp |
| | **Modulation Frequency** | 2mHz – 20kHz ; MFG-2220HM : 2mHz – 50kHz(Int) ; DC – 20kHz ; MFG-2220HM : DC – 50kHz (Ext) |
| | **Phase Deviation** | 0° ~ 360.0° |
| | **Source** | Internal / External |
| **SUM** | **Carrier Waveforms** | Sine, Square, Triangle, Ramp ; MFG-2220HM: Sine, Square, Triangle, Pulse ,Ramp ,Noise |
| | **Modulating Waveforms** | Sine, Square, Triangle, Upramp, Dnramp |
| | **Modulation Frequency** | 2mHz – 20kHz ; MFG-2220HM : 2mHz – 50kHz(Int) ; DC – 20kHz ; MFG-2220HM : DC – 50kHz (Ext) |
| | **SUM Depth** | 0% – 100.0% |
| | **Source** | Internal / External |
| **PWM** | **Carrier Waveforms** | Square |
| | **Modulating Waveforms** | Sine, Square, Triangle,Upramp, Dnramp |
| | **Modulation Frequency** | 2mHz – 20kHz ; MFG-2220HM : 2mHz – 50kHz(Int) ; DC – 20kHz ; MFG-2220HM : DC – 50kHz (Ext) |
| | **Phase Deviation** | 0% – 100.0% pulse width |
| | **Source** | Internal / External |
| **FSK** | **Carrier Waveforms** | Sine, Square, Triangle, Ramp, Pulse |
| | **Modulating Waveforms** | 50% duty cycle square |
| | **Internal Frequency** | 2 mHz to 1 MHz |
| | **Frequency Range** | 1μHz to max frequency |
| | **Source** | Internal / External |
| **SWEEP** | **Waveforms** | Sine, Square, Triangle, Ramp |
| | **Type** | Linear or Logarithmic |
| | **Sweep Direction** | Sweep up or sweep down |
| | **Start/Stop Freq** | 1μHz to max frquency |
| | **Sweep Time** | 1ms to 500s |

# Multi-Channel Function Generator

## SPECIFICATIONS

| | | |
|---|---|---|
| | **Source** | Internal / External |
| | **Trigger** | Single, External, Internal |
| | **Marker** | Marker signal on falling edge (programmable) |
| | **Source** | Internal / External |
| **BURST** | **Waveforms** | Sine, Square, Triangle, Ramp |
| | **Frequency** | Max Frequency 25MHz (sine, square); 1MHz (triangle, ramp) |
| | **Pulse Count** | 1–1000000 Cycles or intfinite |
| | **Start/Stop Phase** | -360.0° – +360.0° |
| | **Internal Frequency** | 1 µs – 500 s |
| | **Gate Source** | External Trigger |
| | **Trigger Source** | Single, External, Internal |
| **TRIGGER DELAY** | **NCycle, Infinite** | 0s – 100 s |
| **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, PWM |
| | **Voltage Range** | ±5V full scale |
| | **Input Impedance** | 10kΩ |
| | **Frequency** | DC – 20kHz(MFG-2220HM : DC – 50kHz) |
| | **Ground Isolation** | 42Vpk max(MFG-2220HM excluded) |
| **TRIGGER OUTPUT** | **Type** | For ARB, Burst, Sweep |
| | **Level** | TTL Compatible into 50Ω |
| | **Pulse Width** | >450ns ; MFG-2220HM : >100ns |
| | **Maximum Rate** | 1MHz |
| | **Fan-out** | ≥4 TTL Load |
| | **Impedance** | 50Ω Typical |
| **REFERENCE INPUT (MFG-2220HM only)** | **Input Voltage** | 0.5Vpp to 5Vpp |
| | **Output Impedance** | 1kΩ, unbalanced , AC coupled |
| | **Input Frequency** | 26.8436MHz±500Hz |
| | **Waveform** | Since or Square (50±5% duty) |
| **REFERENCE OUTPUT (MFG-2220HM only)** | **Output Voltage** | 3.3Vpp square wave |
| | **Output Impedance** | 50Ω, AC coupled |
| | **Output Frequency** | 26.8436MHz |
| **FREQUENCY COUNTER** | **Range** | 5Hz – 150MHz |
| | **Accuracy** | Time Base accuracy±1count |
| | **Time Base** | ±20ppm (23°C ±5°C) |
| | **Resolution** | The maximum resolution is : 100nHz for 1Hz, 0.1Hz for 100MHz |
| | **Input Impedance** | 1kΩ/1pf |
| | **Sensitivity** | 35mVrms – 30Vrms (5Hz – 150MHz) |
| | **Ground Isolation** | 42Vpk max(MFG-2220HM excluded) |
| **Dual Channel Function (CH1/CH2)** | **Phase** | -180° –180° Synchronize phase |
| | **Track** | CH2=CH1 |
| | **Coupling** | Frequency (Ratio or Difference); Amplitude & DC Offset |
| | **Dsolink** | √ |
| **OTHER** | **Store/Recall** | 10 Groups of Setting Memories |
| | **Interface** | LAN (MFG-22XX Series only), USB |
| | **Display** | 4.3 inch TFT LCD, 480 x 3 (RGB) x 272 |
| **GENERAL SPECIFICATIONS** | **Power Source** | AC 100 – 240V, 50 – 60Hz |
| | **Power Amplifier Source** | DIP switch, AC 100–120V/AC 220–240V, 50–60Hz (MFG-2120MA, MFG-2260MFA, MFG-2260MRA only) |
| | **Power Consumption** | 30W or 80W(with power amplifier) |
| | **Operating Environment** | Temperature to satisfy the specification : 18 – 28°C ; Operating temperature : 0 – 40°C ; Relative humidity: ≤ 80%, 0 – 40°C, ≤ 70%, 35 – 40°C ; Installation category : CAT II |
| | **Operating Altitude** | 2000 Meters |
| | **Pollution Degree** | IEC 61010 degree 2, Indoor use |
| | **Storage Temperature** | -10 – 70°C, Humidity : ≤ 70% |
| | **Dimensions & Weight** | 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 Pluse 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) |

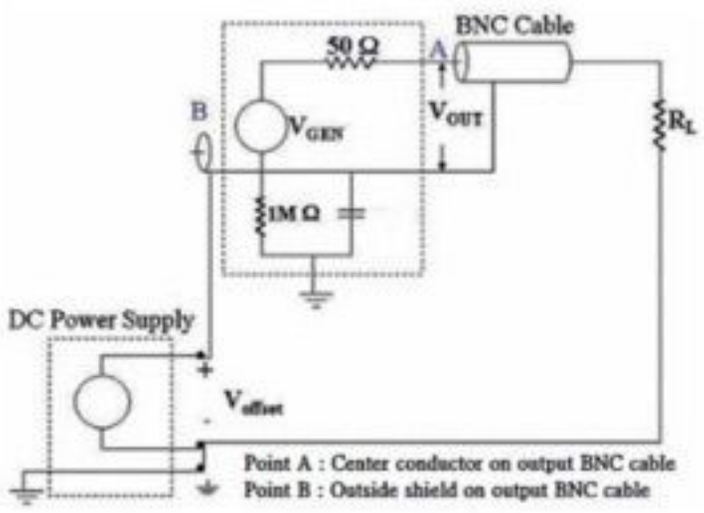
**OPTIONAL ACCESSORIES**

| | |
|---|---|
| **GTL-246** | USB Type A to Type B cable |

**FREE DOWNLOAD**

| | |
|---|---|
| **PC Software** | Arbitrary Waveform Editing Software |

## A. CIRCUIT DESIGN FOR GROUND ISOLATION AMONG OUTPUT/INPUT TERMINALS AND INSTRUMENT CHASSIS



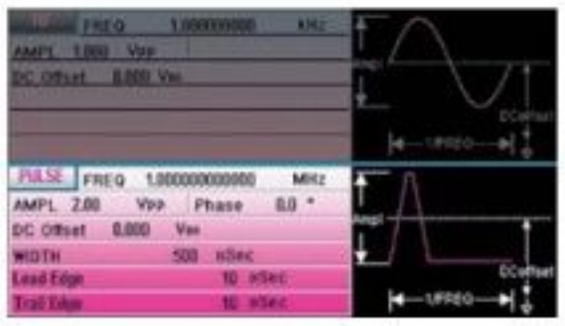

**Connection diagram for MFG connecting with a power supply to increase D.C. bias voltage to ±42Vpk (DC+ AC peak value).**

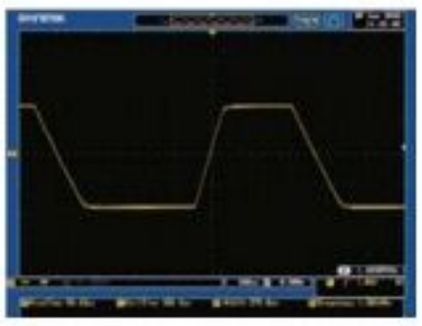
Output channels, synchronization and modulation input/output connector grounding are isolated from instrument chassis. These connectors can sustain maximum isolation voltage up to ±42Vpk (DC+ AC peak value) to earth ground that is ideal for floating circuit tests. Multi-unit outputs can be executed without 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 ±5V under 50 ohm load. An external power supply can be used to bring up the DC bias voltage to ±42Vpk (DC+ AC peak value) for higher DC bias applications.

( * MFG-2220HM excluded )

## B. PULSE GENERATOR



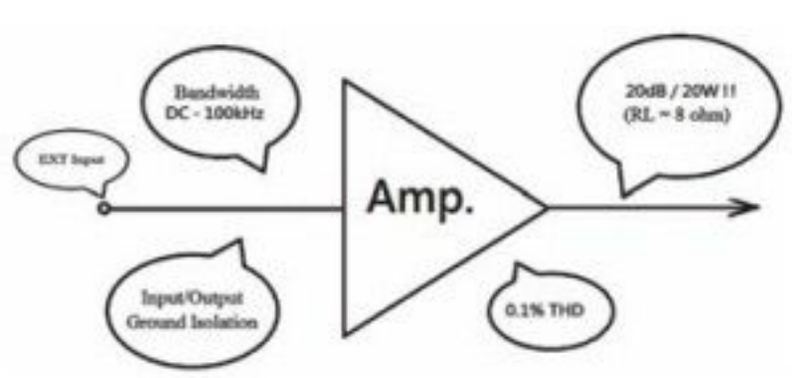
Each model of the series has a built-in pulse generator and its output frequency reaches 25 MHz. Users can set pulse width, duty cycle, rise edge time, and fall edge time to support trigger signal.
The pulse width can be fine-tuned to the minimum of 20ns and the leading/trailing edge times can be set independently to the minimum of 10ns.

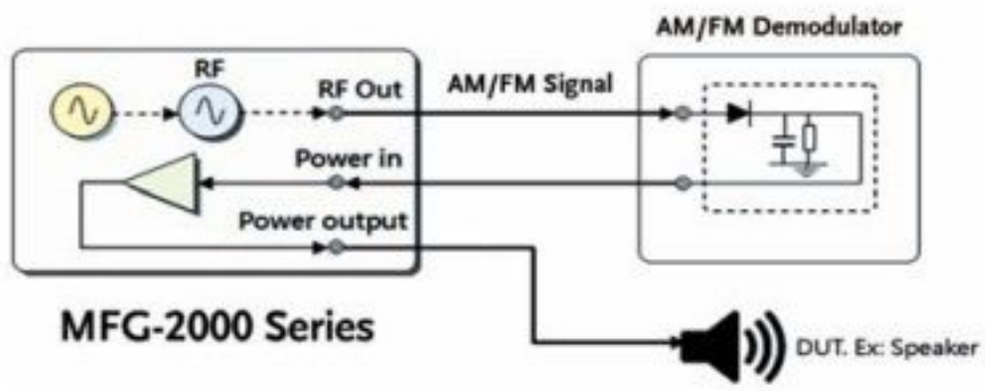
## C. RF SIGNAL GENERATOR




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

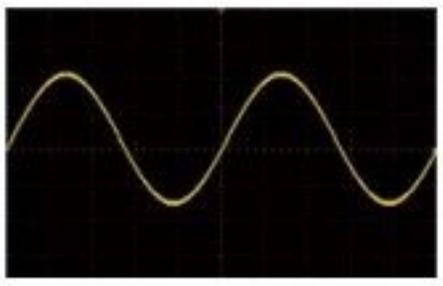


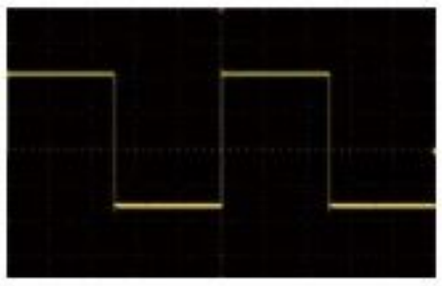

20W/20dB power amplifier, which has a bandwidth of DC~100kHz and less than 0.1% distortion. The low frequency power amplifier can be applied as an audio amplifier or a driver amplifier for piezoelectric components (collocating with an impedance transformer, 20W output) and conducts power component characteristics 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.

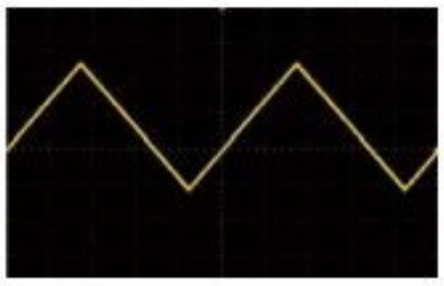
## E. VERSATILE OUTPUT WAVEFORM SELECTIONS



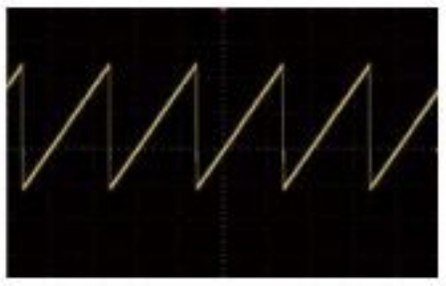
Sine



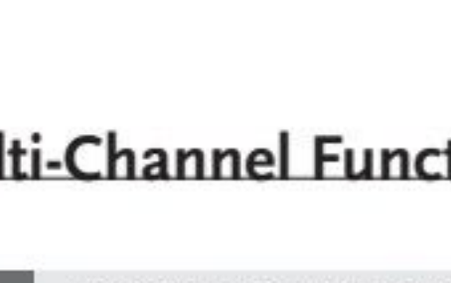
Square



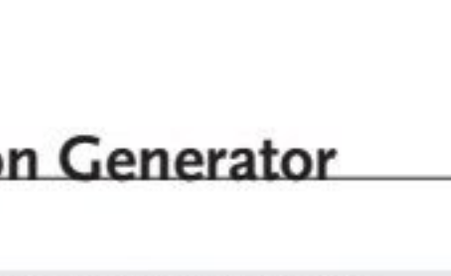
Triangle



Ramp



Pulse



Noise

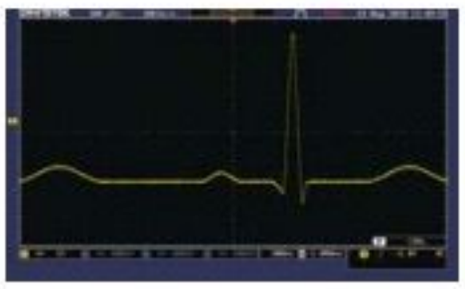


DC Voltage

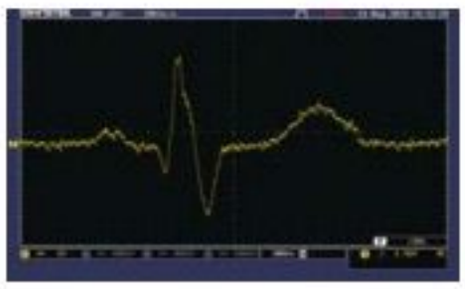


Arbitrary Waveform

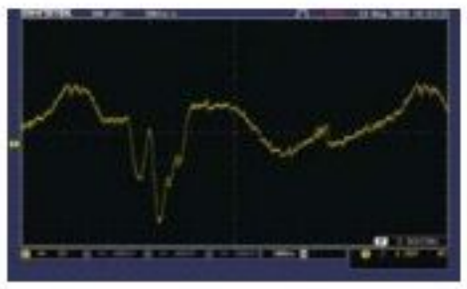
**MEDICAL APPLICATION WAVEFORMS** (MFG-2220HM Excluded)



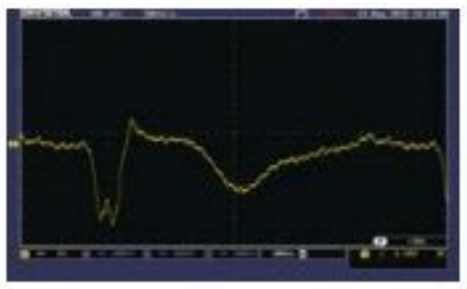
Cardiac



ECG1



ECG2

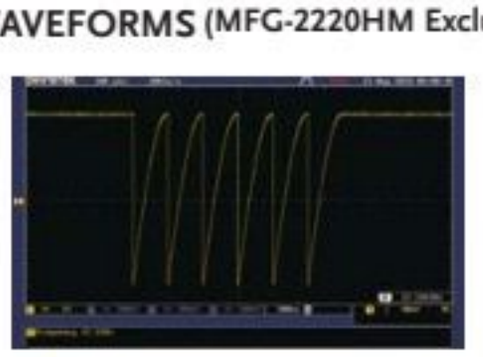


ECG3

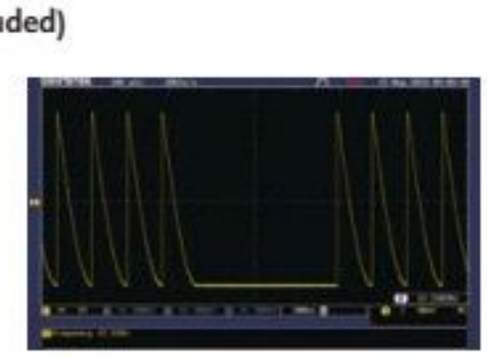
**AUTOMOTIVE ELECTRONIC WAVEFORMS** (MFG-2220HM Excluded)



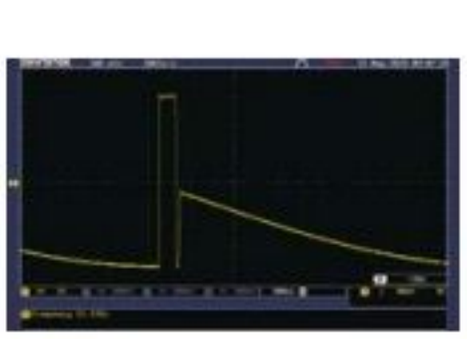
Ignition



ISO7637-2 TP3A



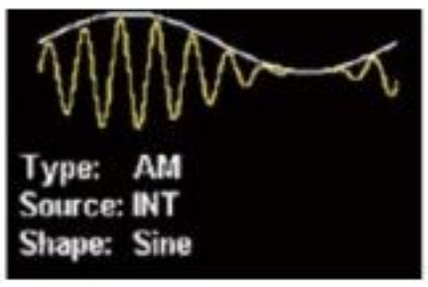
ISO7637-2 TP3B



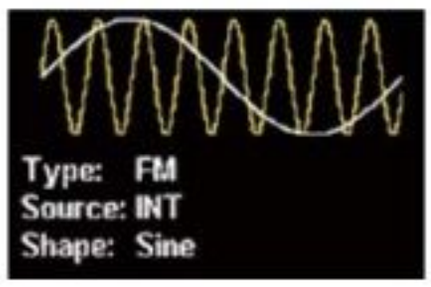
ISO7637-2 TP2B

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.

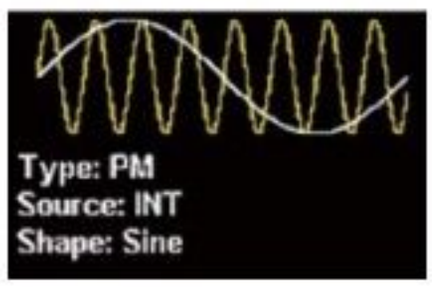
## F. VARIOUS MODULATION FUNCTION



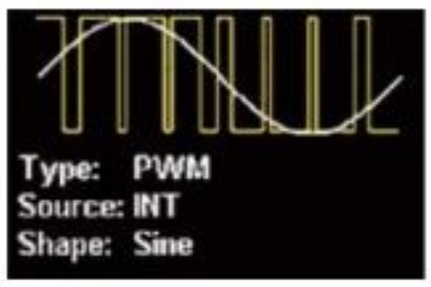

Amplitude Modulation



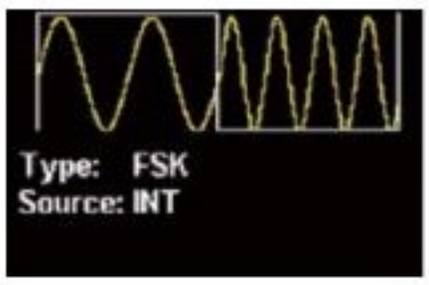

Frequency Modulation



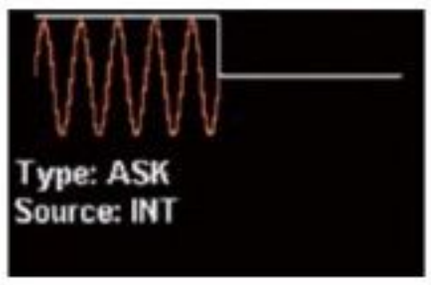

Phase Modulation



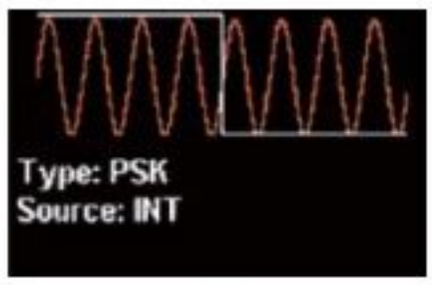

Pulse Width Modulation



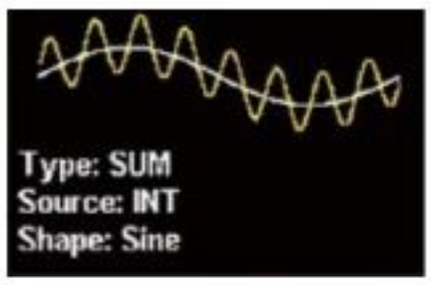

Frequency-shift Keying Modulation




Amplitude-shift Keying Modulation



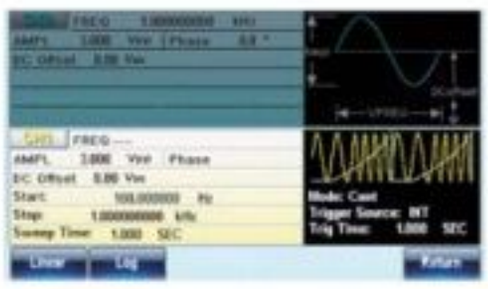

Phase- Shift Keying Modulation




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.

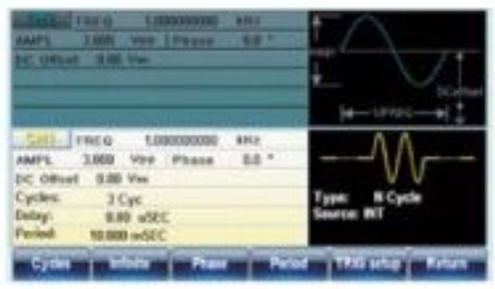
## G. SWEEP FUNCTION

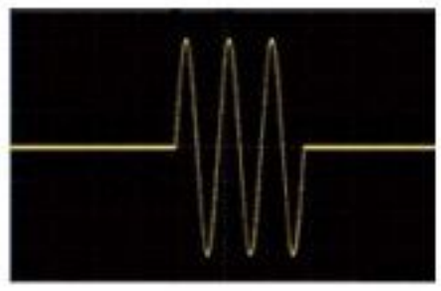




The series supports frequency sweep that can also integrate other functions, including linear/logarithm and INT/EXT/Manual trigger to meet various application requirements. Frequency sweep carries out tests on the frequency response of electronic components such as filter and low frequency amplifier.

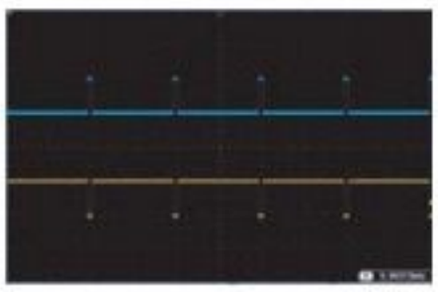
## H. BURST FUNCTION



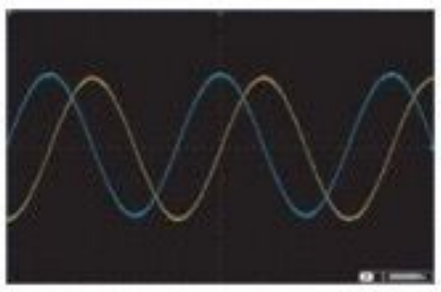


The series supports N-period or gated trigger. Phase angle, duration time, frequency, waveform infinite can be adjusted to meet non-continuous output applications.

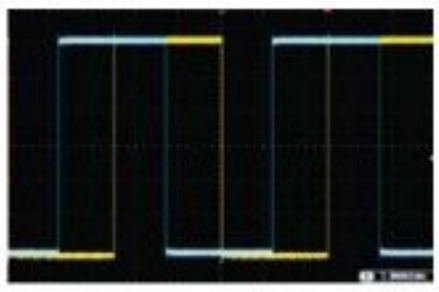
## I. THE OUTPUT CORRELATED FUNCTIONS OF EQUIVALENT PERFORMANCE DUAL CHANNEL



**Differential Signal**



**Sine and Cosine Signal**

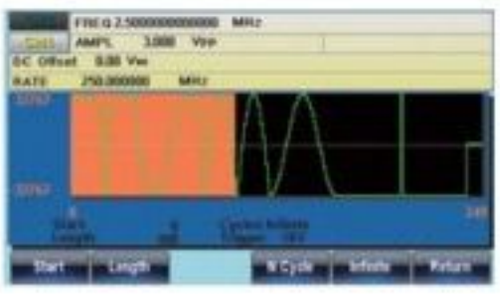


**Square Wave Phase Setting**

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.

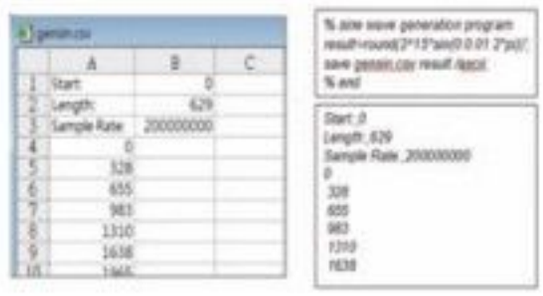
* The coupling function allows users to freely set ratio and offset values for frequency and amplitude of both channels to realize that all parameters are simultaneously effective for both channels. The measurement of the Third-Order Intercept Point for an amplifier and the simulations of two different 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.



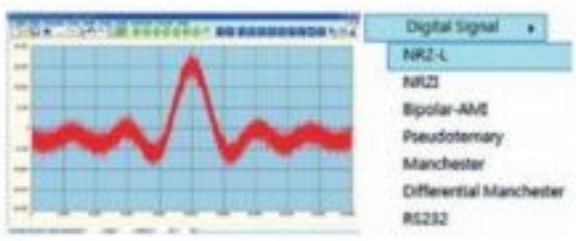
**CSV File Upload**

Support CSV file upload produced by MATLAB and Excel.



**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)




**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

CE | USB Host | USB Device | PC Software | LabVIEW Driver

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.

## 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

## SPECIFICATIONS

| | | CH1 | CH2 |
|---|---|---|---|
| **WAVEFORMS** | | | |
| | | Sine, Square, Ramp, Pulse, Noise, ARB | |
| **ARBITRARY FUNCTION** | | | |
| Sample Rate | | 120MSa/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 | 1MHz | |
| Resolution | | 1μHz | |
| Accuracy | Stability | ±20ppm | |
| | Aging | ±1ppm, per 1 year | |
| | Tolerance | ≤1mHz | |
| **OUTPUT CHARACTERISTICS** | | | |
| Amplitude | Range | 1mVpp–10Vpp(into 50Ω), 2mVpp–20Vpp(open-circuit)<br>1mVpp–5Vpp(into 50Ω)for 20MHz–25MHz<br>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,<br>±10%(0.9dB)≤25MHz (sine wave relative to 1kHz/into 50Ω) | |
| | Units | Vpp, Vrms, dBm | |
| Offset | Range | ±5Vpk ac+dc(into 50Ω); ±10Vpk ac+dc(open circuit)<br>±2.5Vpk ac+dc(into 50Ω) for 20MHz–25MHz<br>±5Vpk ac+dc(open circuit) for 20MHz–25MHz | |
| | Accuracy | 2% of setting+20mV+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 | | –55 dBc DC–200kHz, Ampl > 0.1Vpp; –50 dBc 200kHz–1MHz, Ampl > 0.1Vpp<br>–35 dBc 1MHz–5MHz, Ampl > 0.1Vpp; –30 dBc 5MHz–25MHz, Ampl > 0.1Vpp | |
| **SQUARE WAVE CHARACTERISTICS** | | | |
| 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 | |
| **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 | | <5% | |
| Jitter | | 20ppm + 5ns | |
| **AM MODULATION** | | | |
| Carrier Waveforms | | Sine, Square, Ramp, Pulse, Arb | Sine, Square, Ramp, Pulse, Arb |
| Modulating Waveforms | | Sine, Square, Triangle, Upramp, | Sine, Square, Triangle, Upramp, |
| Modulating Frequency | | Dnramp 2mHz – 20kHz (INT); | Dnramp 2mHz – 20kHz (INT); |
| Depth | | DC – 20kHz (EXT) 0% – 120.0% | DC – 20kHz (EXT) 0% – 120.0% |
| Source | | Internal / External | Internal / External |




# AFG-2225

| SPECIFICATIONS | CH1 | CH2 |
|---|---|---|
| **FM MODULATION** | | |
| 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 |
| **PM** | | |
| Carrier Waveforms | Sine, Square, Ramp | Sine, Square, Ramp |
| Modulating Waveforms | Sine, Square, Triangle, Upramp, Dnramp | Sine, Square, Triangle, Upramp, Dnramp |
| Modulation Frequency | 2mHz – 20kHz (INT); DC – 20kHz (EXT) | 2mHz – 20kHz (INT); DC – 20kHz (EXT) |
| Phase Deviation | 0° – 360° | 0° – 360° |
| Source | Internal / External | Internal / External |
| **FSK** | | |
| Carrier Waveforms | Sine, Square, Ramp, Pulse | Sine, Square, Ramp, Pulse |
| Modulating Waveforms | 50% duty cycle square | 50% duty cycle square |
| Modulation 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 |
| **SUM** | | |
| Carrier Waveforms | Sine, Square, Ramp, Pulse, Noise | Sine, Square, Ramp, Pulse, Noise |
| Modulating Waveforms | Sine, Square, Triangle, Upramp, Dnramp | Sine, Square, Triangle, Upramp, Dnramp |
| Modulation 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 |
| **SWEEP** | | |
| 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 |
| **BURST** | | |
| Waveforms | Sine, Square, Ramp | Sine, Square, Ramp |
| Frequency | 1μHz – 15MHz(sine, square); 1μHz – 1MHz(ramp) | 1μHz – 15MHz(sine, square); 1μHz – 1MHz(ramp) |
| 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 |
| **FREQUENCY COUNTER** | | |
| 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) | |
| **DUAL CHANNEL FUNCTION** | | |
| 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

CE | USB | PC Software | LabVIEW Driver

## 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 0.1Hz 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** | 0.1Hz | | | | | |
| **Accuracy** | **Stability** | ±20ppm | | | | | |
| | **Aging** | ±1ppm, per 1 year | | | | | |
| | **Tolerance** | ≤10mHz | | | | | |
| **OUTPUT CHARACTERISTICS** | | | | | | | |
| **Amplitude** | | | | | | | |
| **Range** | | ≤ 20MHz : 1mVpp–10Vpp(50Ω); 2mVpp–20Vpp(open-circuit)<br>≤ 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<br>–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<br>(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**<br>**Type**<br>**Start/Stop Frequency**<br>**Sweep Time**<br>**Source** | Sine, Square, Triangle<br>Linear or Logarithmic<br>0.1Hz to Max Frequency<br>1ms–500s<br>Internal/External | | | – | | |
| **FSK** | | | | | | |
| **Carrier Waveforms**<br>**Modulating Waveforms**<br>**Modulation Rate**<br>**Frequency Range**<br>**Source** | Sine, Square, Triangle<br>50% duty cycle square<br>2mHz–100kHz(Int); DC–100kHz(Ext)<br>0.1Hz–Max Frequency<br>Internal/External | | | – | | |
| **FREQUENCY COUNTER** | | | | | | |
| **Range**<br>**Accuracy**<br>**Time base**<br>**Resolution**<br>**Input Impedance**<br>**Sensitivity** | 5Hz–150MHz<br>Time Base accuracy ± 1count<br>±20ppm(23°C±5°C)after 30minutes warm up<br>100nHz for 1Hz, 0.1Hz for 100MHz<br>1kΩ/1pf<br>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<br>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 | | | | | | |

## 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) × 1, Quick Start Guide x 1, Power cord × 1
AFG-2100 Series - GTL-101 Test Lead × 2, Instruction Manual × 1, Power cord × 1
AFG-2000 Series - GTL-101 Test Lead × 1, Instruction Manual × 1, Power cord × 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 | | ✓ | | ✓ | | ✓ |

## 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.

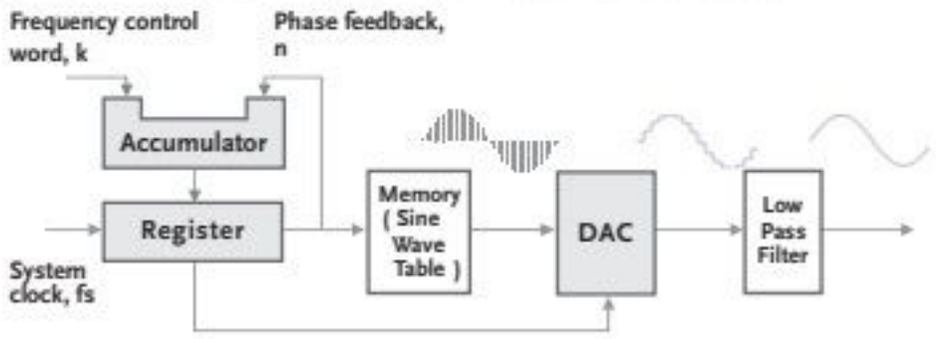



**Figure 1 Block Diagram of DDS**

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 resister, an address $n$ in the memory selects the $K_{Th}$ data. Meanwhile the address $n$ is fed back as part of the phase feedback to be added with $K$. Repeat the above steps, the $2K_{Th}$, $3K_{Th}$, 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 | **C29** | **C29** |

# 3 MHz DDS Function Generator



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.

## SFG-1003/1013 (3MHz)

CE

## 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

| MODEL / MAIN FUNCTION | SFG-1003 | SFG-1013 |
|---|---|---|
| Frequency | 3 MHz | 3 MHz |
| Offset | ✓ | ✓ |
| TTL Output | ✓ | ✓ |
| -40dB Attenuation | ✓ | ✓ |
| Voltage display | — | ✓ |

## 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<br>≥ -55dBc, 0.1Hz – 200kHz<br>≥ -40dBc, 0.2MHz – 2MHz<br>≥ -35dBc, 2MHz – 3MHz |
| Flatness (at maximum amplitude relative to 1kHz) | ＜±0.3dB, 0.1Hz – 1MHz<br>＜±0.5dB, 1MHz – 2MHz<br>＜± 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<br>Ambient Temperature : 0℃ – 40℃<br>Relative Humidity: ＜ 80% at 0℃ – 40℃<br>Up to 70% at 35℃ – 40℃<br>Installation category II<br>Pollution Degree 2 |
| **POWER SOURCE** | |
| | AC 100V/120V/220V/240V± 10%, 50/60Hz |
| **STORAGE CONDITION** | |
| Temperature | -10℃ – 70℃ |
| 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

# SPECIFIC APPLICATION SIGNAL SOURCES

## SPECIFIC APPLICATION SIGNAL SOURCE OVERVIEW

GAG-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 | C31 |

### RF SIGNAL GENERATOR

| MODEL | USG-LF44 |
|---|---|
| Application | RF signal generator |
| Analog Channel | 1 |
| Frequency Range | 34.5MHz ~ 4400MHz |
| Output Range | -30dBm ~ 0dBm |
| Impedance | 50Ω |
| Modulation | Sine Wave |
| Display | - |
| Interface | USB |
| Power Source | DC 5V |
| Power Consumption | – |
| Page | C32-33 |

# 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)

CE

### FEATURES

* Frequency from 10Hz ~ 1MHz
* 0.02% Low Sine wave Distortion
* 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)<br>Reference Frequency (1kHz) |
| Distortion Factor | 500Hz – 20kHz : ≤0.02%<br>100Hz – 100kHz : ≤0.05%<br>(x 10 range for 100Hz, x 1k range for 100kHz)<br>50Hz – 200kHz : ≤0.3%<br>20Hz – 500kHz : ≤0.5%<br>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<br>6 ranges (accuracy ±1dB at 600Ω load) |
| **POWER SOURCE** | |
| AC 100/120/220/230V±10% , 50/60Hz | |
| **DIMENSIONS & WEIGHT** | |
| 130(W) x 210(H)x292(D)mm , Approx 3 kg | |

## ORDERING INFORMATION

**GAG-810** 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-LF44

CE USB PC Software

The USG-LF44 RF signal generator is a pocket-sized and USB interface compatible RF signal generator. It covers the frequency range from 35MHz ~ 4400MHz. The USG-LF44 provides continuous wave (CW) signal outputs without any signal modulation function.

The built-in electronic attenuator of the USG-LF44 allows an adjustable power range between -30dBm to 0dBm. The USG-LF44 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.

## 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**

## SPECIFICATIONS

| |
|---|
| **FREQUENCY RANGE** |
| 34.5 MHz – 4.4 GHz |
| **OUTPUT POWER** |
| -30 dBm – 0 dBm, in 1 dB steps |
| **INTERNAL REFERENCE FREQUENCY** |
| 25 MHz, aging ±1 ppm at first year |
| **FREQUENCY ACCURACY (0 dBm Output Level)** |
| ± 100 Hz at 100MHz |
| **FREQUENCY RESOLUTION** |
| 10 kHz |
| **OUTPUT ISOLATION** |
| ≦ -75 dBc , Output Control On/Off |
| **MODE CONTROL** |
| Fixed Frequency / Single Sweep / CW Sweep / Hopping / Power Sweep |
| **STEP DWELL** |
| ≦1000 ms in 1 ms steps |
| **FREQUENCY OFFSET** |
| -50 kHz – 50 kHz in 10 kHz steps |
| **OUTPUT FLATNESS (0 dBm Output Level)** |
| -1 dBm – 3.5 dBm, typical |
| **PHASE NOISE** |
| **Carrier Frequency** |
| fc = 1.0 GHz |
| **at 10kHz Offset Frequency** |
| < -97 dBc/Hz, typical -100 dBc/Hz |
| **at 100kHz Offset Frequency** |
| < -107 dBc/Hz, typical -110 dBc/Hz |
| **2ND HARMONICS (0 dB Attenuation)** |
| ≦ -15 dBc, typical<br>34.5 MHz – 2.0 GHz<br>≦ -10 dBc, typical<br>2.0 GHz – 3.0 GHz<br>≦ -25 dBc, typical<br>3.0 GHz – 4.4 GHz |
| **3rd HARMONICS (0 dB Attenuation)** |
| ≦ -5 dBc, typical<br>34.5 MHz – 2 GHz<br>≦ -20 dBc, typical<br>2.0 GHz – 3.0 GHz<br>≦ -40 dBc, typical<br>3.0 GHz – 4.4 GHz |
| **SPURIOUS RELATED TO RESOLUTION SETTINGS** |
| ≦ -30 dBc, typical, Resolution < 1MHz<br>≦ -65 dBc, typical, Resolution ≧ 1MHz |
| **SPURIOUS RELATED TO THE FUNDAMENTAL OUTPUT** |
| ≦ -60 dBc, typical |

## ORDERING INFORMATION

| | |
|---|---|
| **USG-LF44** | RF Signal Generator |

## ADP-003

50Ω N type (female) to SMA (female) Adapter
For: USG-Series



## GTL-303

50Ω SMA RF cable (600mm)
For: USG-Series



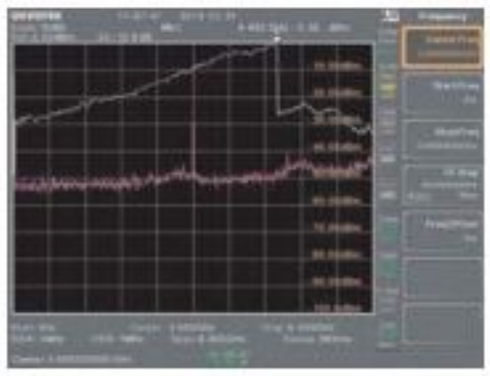
| SPECIFICATIONS |
|---|
| **SUPPORTED OS** |
| Windows/Linux/Mac/Android |
| **INTERFACE** |
| USB 2.0 |
| **USB CONNECTOR TYPE** |
| Mini B |
| **SUPPLY VOLTAGE** |
| 5V nominal |
| **CURRENT CONSUMPTION** |
| 200 mA |
| **RF CONNECTOR TYPE** |
| N-type male |
| **IMPEDANCE** |
| 50 Ω nominal |
| **OUTPUT VSWR** |
| < 1.5 : 1 , Output Level @ -30 dBm |
| **MAXIMUM PERMISSIBLE DC VOLTAGE** |
| ±25V |
| **MAXIMUM REVERSE POWER** |
| +30dBm (1W) |
| **ELECTROMAGNETIC COMPATIBILITY** |
| 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 |
| **DIMENSIONS & WEIGHT** |
| 30(W) x 103(H) x 30(D)mm; Approx. 100g |

**USG-LF44** 35MHz ~ 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** 50Ω N type (female) to SMA (female) Adapter
**GTL-303** 50Ω SMA RF cable (600mm)



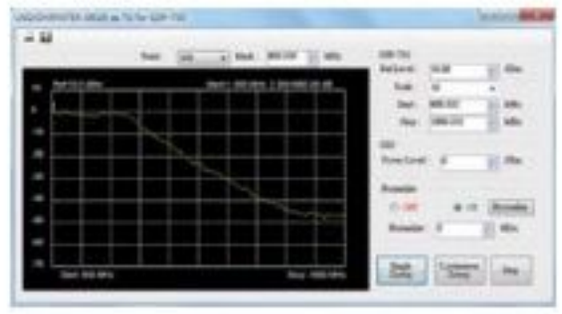
**Test Result of Simultaneous Power Sweep and Frequency Sweep**



**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 |
|---|---|---|
| ADP-003 | Adaptor, 50Ω, N(J/F) - SMA(J/F) | USG-Series |
| GRA-432 | Rack Adapter Kit | AFG-3000 Series |
| GTL-101 | Test Lead, BNC(P/M) to Alligator Test Lead, 1100mm | AFG-Series, SFG-Series, GFC-Series |
| GTL-110 | BNC Cable, BNC(P/M)-BNC(P/M), 1000mm | AFG-Series, SFG-Series, GFC-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 |

ADP-003



GTL-303



GTL-232



GTL-101



GTL-110



GTL-246



GTL-248



GTL-250



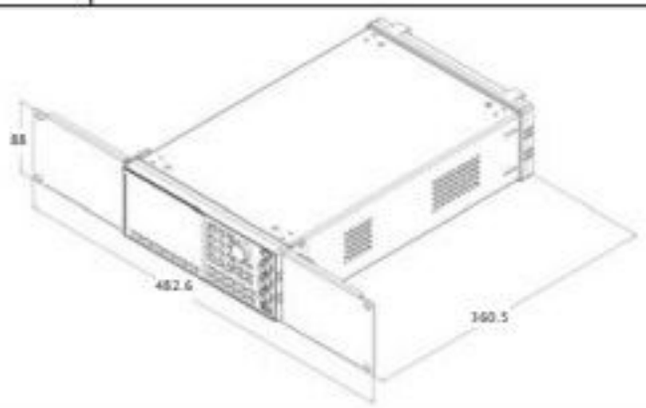
GTL-253



**GRA-432 Rack Mount Kit**

For : AFG-3000 Series

















# 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, DC Electronic Load and Source Measure Unit.

For DC Power Supply, the products can be briefly categorized by the following types, Technic, 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.

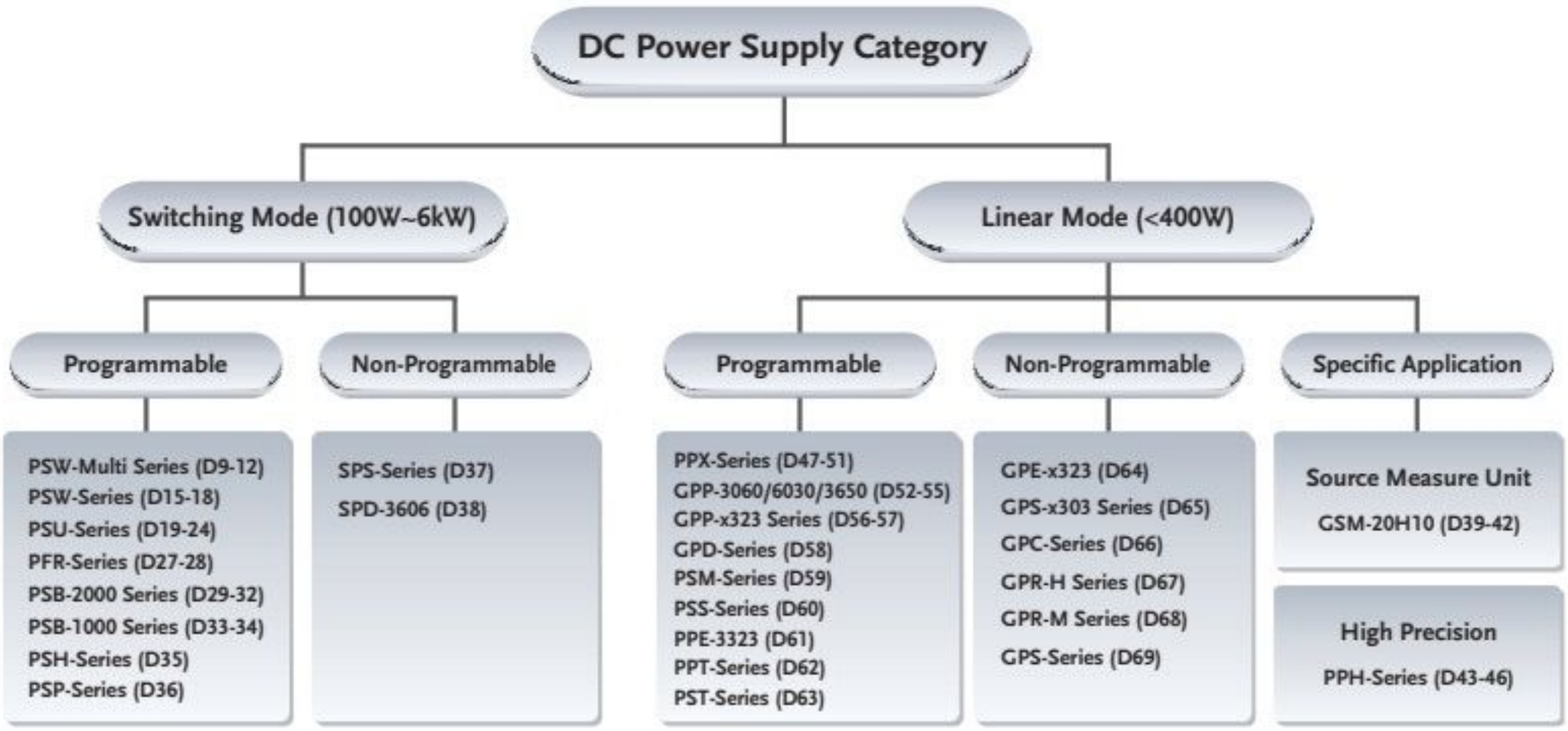
Precision source meter is the latest product offering a four-quadrant power supply, which can accurately utilize voltage or current and measure voltage and/or current at the same time.

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**
- **Source Measure Unit**

## GENERAL SELECTION GUIDE OF POWER SUPPLY BY APPLICATION




| Series | Education | R&D/ Research Lab | Production Testing | ATE for Production | Burn-IN | Page |
|---|---|---|---|---|---|---|
| PSW-Multi Series | | V | V | V | V | D9-12 |
| PSW-Series | | V | V | V | V | D15-18 |
| PSU-Series | | V | V | V | V | D19-24 |
| PFR-Series | | V | | V | | D27-28 |
| PSB-2000 Series | | V | V | V | V | D29-32 |
| PSB-1000 Series | | V | V | V | V | D33-34 |
| PSH-Series | | V | V | V | V | D35 |
| PSP-Series | V | V | | V | | D36 |
| SPS-Series | | | V | V | V | D37 |
| SPD-3606 | V | V | V | | V | D38 |
| GSM-20H10 | V | V | V | V | | D39-42 |
| PPH-Series | | V | V | | V | D43-46 |
| PPX-Series | | V | V | | V | D47-51 |
| GPP-3060/6030/3650 | | V | V | V | V | D52-55 |
| GPP-x323 Series | V | V | V | | V | D56-57 |
| GPD-Series | V | V | V | | | D58 |
| PSM-Series | | V | V | | V | D59 |
| PSS-Series | | V | V | V | | D60 |
| PPE-3323 | V | V | V | V | | D61 |
| PPT-Series | V | V | V | V | | D62 |
| PST-Series | V | V | V | V | | D63 |
| GPE-x323 | V | V | V | | | D64 |
| GPS-x303 Series | V | V | V | | | D65 |
| GPC-Series | V | V | V | | | D66 |
| GPR-H Series | | V | V | | V | D67 |
| GPR-M Series | | V | V | | V | D68 |
| GPS-Series | V | V | V | | | D69 |

# DC POWER SUPPLIES

## GENERAL SELECTION GUIDE OF DC POWER SUPPLY BY TECHNIC

| Technic | Channel | Programmability | Display | Model Series | Page |
|---|---|---|---|---|---|
| Switching | 2, 3 | Programable | LED | PSW-Multi Series | D9-12 |
| | 1 | | LED | PSW-Series | D15-18 |
| | 1 | | LED | PSU-Series | D19-24 |
| | 1 | | LED | PFR-Series | D25-28 |
| | 1 | | LED | PSB-2400L/PSB-2800L/PSB-2400H/PSB-2800H/PSB-2800LS | D29-32 |
| | 1 | | LCD | PSB-1000 Series | D33-34 |
| | 1 | | LCD | PSH-Series | D35 |
| | 1 | | LCD | PSP-Series | D36 |
| | 1 | Non-Programable | LED | SPS-Series | D37 |
| | 2 | Programable | LED | PSB-2400L2 | D29-32 |
| | 3 | Non-Programable | LED | SPD-3606 | D38 |
| Linear | 1 | Programable | LCD | PPH-1503 | D43-46 |
| | 1 | | LCD | GSM-20H10 | D39-42 |
| | 1 | | LED | GPP-1326 | D56-57 |
| | 1 | | LCD | PPX-Series | D47-51 |
| | 1 | | VFD | PSM-Series | D59 |
| | 1 | | LCD | PSS-Series | D60 |
| | 1 | Non-Programable | LED | GPR-H Series | D67 |
| | 1 | | LED | GPR-M Series | D68 |
| | 1 | | LED | GPS-1830D/GPS-1850D/GPS-3030D/GPS-3030DD | D69 |
| | 1 | | LED | GPE-1326 | D64 |
| | 2 | Programable | LCD | PPH-1503D/PPH-1506D/PPH-1510D | D43-46 |
| | 3 | | LCD | GPP-3060/GPP-6030 | D52-55 |
| | 2 | | LCD | GPP-2323 | D56-57 |
| | 3 | | | GPP-3323 | |
| | 4 | | | GPP-4323 | |
| | 2 | | LED | GPD-2303S | D58 |
| | 3 | | | GPD-3303S | |
| | 4 | | | GPD-4303S | |
| | 3 | | LED | PPE-3323 | D64 |
| | 3 | | LED | PPT-Series | D62 |
| | 3 | | LED | PST-3201 | D63 |
| | 3 | | LED | PST-3202 | |
| | 2 | Non-Programable | LED | GPE-2323 | D64 |
| | 3 | | | GPE-3323 | |
| | 4 | | | GPE-4323 | |
| | 2 | | LED | GPS-2303 | D65 |
| | 3 | | | GPS-3303 | |
| | 4 | | | GPS-4303 | |
| | 3 | | LED | GPC-Series | D66 |

## GENERAL SELECTION GUIDE OF DC POWER SUPPLY BY CHANNEL

| Channel | Programmability | Technic | Display | Model Series | Page |
|---|---|---|---|---|---|
| Single Channel | Programable | Switching | LED | PSW-Series | D15-18 |
| | | | LED | PSU-Series | D19-24 |
| | | | LED | PFR-Series | D25-28 |
| | | | LED | PSB-2400L/PSB-2800L/PSB-2400H/PSB-2800H/PSB-2800LS | D29-32 |
| | | | LCD | PSB-1000 Series | D33-34 |
| | | | LCD | PSH-Series | D35 |
| | | | LCD | PSP-Series | D36 |
| | | Linear | LCD | PPH-1503 | D43-46 |
| | | | LCD | GSM-20H10 | D39-42 |
| | | | LED | GPP-1326 | D56-57 |
| | | | LCD | PPX-Series | D47-51 |
| | | | VFD | PSM-Series | D59 |
| | | | LCD | PSS-Series | D60 |
| | Non-Programable | Switching | LED | SPS-Series | D37 |
| | | Linear | LED | GPE-1326 | D64 |
| | | | LED | GPR-H Series | D67 |
| | | | LED | GPR-M Series | D68 |
| | | | LED | GPS-1830D/GPS-1850D/GPS-3030D/GPS-3030DD | D69 |
| Multiple Channel | Programable | Switching | LED | PSB-2400L2 | D29-32 |
| | | | LED | PSW-Multi Series | D9-12 |
| | | Linear | LCD | PPH-1503D/PPH-1506D/PPH-1510D | D43-46 |
| | | | LCD | GPP-3060/GPP-6030 | D52-55 |
| | | | LCD | GPP-2323/GPP-3323/GPP-4323 | D56-57 |
| | | | LED | GPD-Series | D58 |
| | | | LED | PPE-3323 | D61 |
| | | | LED | PPT-Series | D62 |
| | | | LED | PST-3201 | D63 |
| | | | LED | PST-3202 | D63 |
| | Non-Programable | Switching | LED | SPD-3606 | D38 |
| | | Linear | LED | GPE-2323/GPE-3323/GPE-4323 | D64 |
| | | | LED | GPS-x303 Series | D65 |
| | | | LED | GPC-Series | D66 |

# DC POWER SUPPLIES

## PROGRAMMABLE & SINGLE CHANNEL DC POWER SUPPLY

| Voltage(V) | Current(A) | Total Power(W) | Model Name | Display | Technic | Interface | Page |
|---|---|---|---|---|---|---|---|
| 6 | 200 | 1200 | PSU 6-200 | LED | Switching | RS-232, RS-485, USB, LAN, Analog Control, (Opt)GPIB | D19-24 |
| 8 | 180 | 1440 | PSU 8-180 | LED | Switching | RS-232, RS-485, USB, LAN, Analog Control, (Opt)GPIB | |
| 15 | 100 | 1500 | PSU 15-100 | LED | Switching | RS-232, RS-485, USB, LAN, Analog Control, (Opt)GPIB | |
| 30 | 50 | 1500 | PSU 30-50 | LED | Switching | RS-232, RS-485, USB, LAN, Analog Control, (Opt)GPIB | |
| 50 | 30 | 1500 | PSU 50-30 | LED | Switching | RS-232, RS-485, USB, LAN, Analog Control, (Opt)GPIB | |
| 80 | 19 | 1520 | PSU 80-19 | LED | Switching | RS-232, RS-485, USB, LAN, Analog Control, (Opt)GPIB | |
| 8 | 20 | 200 | PSM-2010 | VFD | Linear | RS-232, (Opt)GPIB | D59 |
| 9 | 5 | 45 | PPH-1503 | LCD | Linear | USBCDC, LAN, GPIB | D43-46 |
| 10 | 5 | 50 | PPX-1005 | LCD | Linear | USBCDC, LAN, RS-232, RS-485, (Opt)GPIB | D47-51 |
| 12.5 | 120 | 1500 | PSU 12.5-120 | LED | Switching | RS-232, RS-485, USB, LAN, Analog Control, (Opt)GPIB | D19-24 |
| 15 | 3 | 45 | PPH-1503 | LCD | Linear | USBCDC, LAN, GPIB | D43-46 |
| 15 | 7 | 120 | PSM-3004 | VFD | Linear | RS-232, (Opt)GPIB | D59 |
| 20 | 1 | 20 | GSM-20H10 | LCD | Linear | RS-232, USBTMC, LAN, GPIB | D39-42 |
| 20 | 2 | 40 | PPX-2002 | LCD | Linear | USBCDC, LAN, RS-232, RS-485, (Opt)GPIB | D47-51 |
| 20 | 5 | 100 | PPX-2005 | LCD | Linear | USBCDC, LAN, RS-232, RS-485, (Opt)GPIB | |
| 20 | 5 | 100 | PSS-2005 | LCD | Linear | RS-232, (Opt)GPIB | D60 |
| 20 | 10 | 200 | PSP-2010 | LCD | Switching | RS-232 | D36 |
| 20 | 10 | 200 | PSM-2010 | VFD | Linear | RS-232, (Opt)GPIB | D59 |
| 20 | 18 | 360 | PSH-2018A | LCD | Switching | RS-232, (Opt)GPIB | D35 |
| 20 | 76 | 1520 | PSU 20-76 | LED | Switching | RS-232, RS-485, USB, LAN, Analog Control, (Opt)GPIB | D19-24 |
| 30 | 4 | 120 | PSM-3004 | VFD | Linear | RS-232, (Opt)GPIB | D59 |
| 30 | 6 | 200 | PSM-6003 | VFD | Linear | RS-232, (Opt)GPIB | |
| 30 | 36 | 360 | PSW 30-36 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | D15-18 |
| 30 | 72 | 720 | PSW 30-72 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| 30 | 108 | 1080 | PSW 30-108 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| 32 | 3 | 96 | PSS-3203 | LCD | Linear | RS-232, (Opt)GPIB | D60 |
| 32 | 6 | 192 | GPP-1326 | LCD | Linear | USBCDC, RS-232, (Opt)LAN, GPIB | D56-57 |
| 36 | 1 | 36 | PPX-3601 | LCD | Linear | USBCDC, LAN, RS-232, RS-485, (Opt)GPIB | D47-51 |
| 36 | 3 | 108 | PPX-3603 | LCD | Linear | USBCDC, LAN, RS-232, RS-485, (Opt)GPIB | |
| 36 | 10 | 360 | PSH-3610A | LCD | Switching | RS-232, (Opt)GPIB | D35 |
| 36 | 20 | 720 | PSH-3620A | LCD | Switching | RS-232, (Opt)GPIB | |
| 36 | 30 | 1080 | PSH-3630A | LCD | Switching | RS-232, (Opt)GPIB | |
| 40 | 27 | 360 | PSW 40-27 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | D15-18 |
| 40 | 54 | 720 | PSW 40-54 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| 40 | 81 | 1080 | PSW 40-81 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| 40 | 5 | 200 | PSP-405 | LCD | Switching | RS-232 | D36 |
| 40 | 38 | 1520 | PSU 40-38 | LED | Switching | RS-232, RS-485, USB, LAN, Analog Control, (Opt)GPIB | D19-24 |
| 40 | 40 | 400 | PSB-1400L | LCD | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB | D33-34 |
| 40 | 80 | 800 | PSB-1800L | LCD | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB | |
| 50 | 10 | 100 | PFR-100L | LED | Switching | RS-232, RS-485, USB, LAN, (Opt)GPIB | D25-28 |
| 60 | 3.3 | 200 | PSM-6003 | VFD | Linear | RS-232, (Opt)GPIB | D59 |
| 60 | 3.5 | 200 | PSP-603 | LCD | Switching | RS-232 | D36 |
| 60 | 25 | 1500 | PSU 60-25 | LED | Switching | RS-232, RS-485, USBCDC, LAN, Analog Control, (Opt)GPIB | D19-24 |
| 80 | 13.5 | 360 | PSW 80-13.5 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | D15-18 |
| 80 | 27 | 720 | PSW 80-27 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | |
| 80 | 40 | 400 | PSB-2400L | LED | Switching | USBCDC, Analog Control, (Opt)GPIB, RS-232 | D29-32 |
| 80 | 40.5 | 1080 | PSW 80-40.5 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB | D15-18 |
| 80 | 80 | 800 | PSB-2800L | LED | Switching | RS-232, USBCDC, Analog Control, (Opt)GPIB | D29-32 |
| 80 | 80 | 800 | PSB-2800LS | LED | Switching | RS-232, USBCDC, Analog Control, (Opt)GPIB | |
| 100 | 1 | 100 | PPX-10H01 | LCD | Linear | USBCDC, LAN, RS-232, RS-485, (Opt)GPIB | D47-51 |
| 100 | 15 | 1500 | PSU 100-15 | LED | Switching | RS-232, RS-485, USBCDC, LAN, Analog Control, (Opt)GPIB | D19-24 |
| 150 | 10 | 1500 | PSU 150-10 | LED | Switching | RS-232, RS-485, USBCDC, LAN, Analog Control, (Opt)GPIB | |
| 160 | 7.2 | 360 | PSW 160-7.2 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | D15-18 |

# DC POWER SUPPLIES

| Voltage(V) | Current(A) | Total Power(W) | Model Name | Display | Technic | Interface | Page |
|---|---|---|---|---|---|---|---|
| 160 | 10 | 400 | PSB-1400M | LCD | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | D33-34 |
| 160 | 14.4 | 720 | PSW 160-14.4 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | D15-18 |
| 160 | 20 | 800 | PSB-1800M | LCD | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB | D33-34 |
| 160 | 21.6 | 1080 | PSW 160-21.6 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB | D15-18 |
| 200 | 0.1 | 20 | GSM-20H10 | LCD | Linear | RS-232, USBTMC, LAN, GPIB | D39-42 |
| 250 | 2 | 100 | PFR-100M | LED | Switching | RS-232, RS-485, USBCDC, LAN,(Opt) GPIB, RS-232 | D25-28 |
| 250 | 4.5 | 360 | PSW 250-4.5 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | D15-18 |
| 250 | 9 | 720 | PSW 250-9 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | |
| 250 | 13.5 | 1080 | PSW 250-13.5 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | |
| 300 | 5 | 1500 | PSU 300-5 | LED | Switching | RS-232, RS-485, USBCDC, LAN, Analog Control, (Opt)GPIB | D19-24 |
| 400 | 3.8 | 1520 | PSU 400-3.8 | LED | Switching | RS-232, RS-485, USBCDC, LAN, Analog Control, (Opt)GPIB | |
| 600 | 2.6 | 1560 | PSU 600-2.6 | LED | Switching | RS-232, RS-485, USBCDC, LAN, Analog Control, (Opt)GPIB | |
| 800 | 1.44 | 360 | PSW 800-1.44 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | D15-18 |
| 800 | 2.88 | 720 | PSW 800-2.88 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | |
| 800 | 3 | 400 | PSB-2400H | LED | Switching | RS-232, USBCDC, Analog Control, (Opt)GPIB | D29-32 |
| 800 | 4.32 | 1080 | PSW 800-4.32 | LED | Switching | LAN, USBCDC, Analog Control, (Opt)GPIB, RS-232 | D15-18 |
| 800 | 6 | 800 | PSB-2800H | LED | Switching | RS-232, USBCDC, Analog Control, (Opt)GPIB | D29-32 |

## NON-PROGRAMMABLE & SINGLE CHANNEL DC POWER SUPPLY

| Voltage(V) | Current(A) | Total Power(W) | Model Name | Display | Technic | Remark | Page |
|---|---|---|---|---|---|---|---|
| 8 | 30 | 240 | GPR-0830HD | LED | Linear | Rear-Panel Output | D67 |
| 12 | 30 | 360 | SPS-1230 | LED | Switching | Rear-Panel Output | D37 |
| 18 | 3 | 54 | GPS-1830D | LED | Linear | Rear-Panel Output | D69 |
| 18 | 5 | 90 | GPS-1850D | LED | Linear | | |
| 18 | 10 | 180 | GPR-1810HD | LED | Linear | Rear-Panel Output | D68 |
| 18 | 20 | 360 | SPS-1820 | LED | Switching | Rear-Panel Output | D37 |
| 18 | 20 | 360 | GPR-1820HD | LED | Linear | Rear-Panel Output | D67 |
| 24 | 15 | 360 | SPS-2415 | LED | Switching | | D37 |
| 30 | 3 | 90 | GPS-3030D | LED | Linear | Rear-Panel Output | D69 |
| 30 | 3 | 90 | GPS-3030DD | LED | Linear | | |
| 30 | 6 | 180 | GPR-3060D | LED | Linear | Rear-Panel Output | D68 |
| 32 | 6 | 192 | GPE-1326 | LED | Linear | Rear-Panel Output | D64 |
| 35 | 10 | 350 | GPR-3510HD | LED | Linear | Rear-Panel Output | D67 |
| 36 | 10 | 360 | SPS-3610 | LED | Switching | Rear-Panel Output | D37 |
| 60 | 3 | 180 | GPR-6030D | LED | Linear | Rear-Panel Output | D68 |
| 60 | 6 | 360 | SPS-606 | LED | Switching | Rear-Panel Output | D37 |
| 60 | 6 | 360 | GPR-6060D | LED | Linear | Rear-Panel Output | D67 |
| 75 | 5 | 375 | GPR-7550D | LED | Linear | Rear-Panel Output | |
| 110 | 3 | 330 | GPR-11H30D | LED | Linear | Rear-Panel Output | |
| 300 | 1 | 300 | GPR-30H10D | LED | Linear | Rear-Panel Output | |

# DC POWER SUPPLIES

## PROGRAMMABLE & MULTIPLE CHANNEL DC POWER SUPPLY

| Voltage(V) | | Current(A) | Power per. CH | Total Power(W) | Model Name | Channel | Display | Technic | Interface | Page |
|---|---|---|---|---|---|---|---|---|---|---|
| CH1 | 15 | 3 | 45 | 63 | PPH-1503D | 2 | LCD | Linear | USBTMC, LAN, GPIB | D43-46 |
| | 9 | 5 | 45 | | | | | | | |
| CH2 | 12 | 1.5 | 18 | | | | | | | |
| CH1 | 15 | 3 | 45 | 81 | PPH-1506D | 2 | LCD | Linear | USBTMC, LAN, GPIB | |
| | 9 | 5 | 45 | | | | | | | |
| CH2 | 12 | 3 | 36 | | | | | | | |
| CH1 | 15 | 3 | 45 | 81 | PPH-1510D | 2 | LCD | Linear | USBTMC, LAN, GPIB | |
| | 9 | 5 | 45 | | | | | | | |
| | 4.5 | 10 | 45 | | | | | | | |
| CH2 | 12 | 3 | 36 | | | | | | | |
| CH1 | 18 | 3 | 54 | 138 | PPT-1830 | 3 | LED | Linear | GPIB | D62 |
| CH2 | 18 | 3 | 54 | | | | | | | |
| CH3 | 6 | 5 | 30 | | | | | | | |
| CH1 | 30 | 6 | 180 | 385 | GPP-3060 | 3 | LCD | Linear | USBCDC, RS-232, (Opt)LAN, GPIB | D52-55 |
| CH2 | 30 | 6 | 180 | | | | | | | |
| CH3 | 1.8/2.5/3.3/5.0 | 5 | 25 | | | | | | | |
| CH1 | 30 | 3 | 90 | 180 | GPD-2303S | 2 | LED | Linear | USBCDC | D58 |
| CH2 | 30 | 3 | 90 | | | | | | | |
| CH1 | 30 | 3 | 90 | 195 | GPD-3303S | 3 | LED | Linear | USBCDC | |
| CH2 | 30 | 3 | 90 | | | | | | | |
| CH3 | 2.5/3.3/5.0 | 3 | 15 | | | | | | | |
| CH1 | 30 | 3 | 90 | 195 | GPD-4303S | 4 | LED | Linear | USBCDC | |
| CH2 | 30 | 3 | 90 | | | | | | | |
| CH3 | 5 | 3 | 15 | | | | | | | |
| CH4 | 5 | 1 | 5 | | | | | | | |
| CH1 | 30 | 3 | 90 | 195 | GPD-3303D | 3 | LED | Linear | USBCDC | |
| CH2 | 30 | 3 | 90 | | | | | | | |
| CH3 | 2.5/3.3/5.0 | 3 | 15 | | | | | | | |
| CH1 | 32 | 3 | 96 | 192 | GPP-2323 | 2 | LCD | Linear | USBCDC, RS-232, (Opt)LAN, GPIB | D56-57 |
| CH2 | 32 | 3 | 96 | | | | | | | |
| CH1 | 32 | 3 | 96 | 217 | GPP-3323 | 3 | LCD | Linear | USBCDC, RS-232, (Opt)LAN, GPIB | |
| CH2 | 32 | 3 | 96 | | | | | | | |
| CH3 | 1.8/2.5/3.3/5.0 | 5 | 25 | | | | | | | |
| CH1 | 32 | 3 | 96 | 212 | GPP-4323 | 4 | LCD | Linear | USBCDC, RS-232, (Opt)LAN, GPIB | |
| CH2 | 32 | 3 | 96 | | | | | | | |
| CH3 | 5 | 1 | 5 | | | | | | | |
| CH4 | 15 | 1 | 15 | | | | | | | |
| CH1 | 32 | 3 | 96 | 207 | PPE-3323 | 3 | LED | Linear | RS-232 | D61 |
| CH2 | -32 | 3 | 96 | | | | | | | |
| CH3 | 3.3 / 5 | 3 | 15 | | | | | | | |
| CH1 | 36 | 1.5 | 54 | 126 | PPT-3615 | 3 | LED | Linear | GPIB | D62 |
| CH2 | 36 | 1.5 | 54 | | | | | | | |
| CH3 | 6 | 3 | 18 | | | | | | | |
| CH1 | 32 | 2 | 64 | 158 | PST-3202 | 3 | LED | Linear | RS-232(O), GPIB | D63 |
| CH2 | 32 | 2 | 64 | | | | | | | |
| CH3 | 6 | 5 | 30 | | | | | | | |
| CH1 | 32 | 1 | 32 | 96 | PST-3201 | 3 | LED | Linear | RS-232(O), GPIB | |
| CH2 | 32 | 1 | 32 | | | | | | | |
| CH3 | 32 | 1 | 32 | | | | | | | |
| CH1 | 60 | 3 | 180 | 385 | GPP-6030 | 3 | LCD | Linear | USBCDC, RS-232, (Opt)LAN, GPIB | D52-55 |
| CH2 | 60 | 3 | 180 | | | | | | | |
| CH3 | 1.8/2.5/3.3/5.0 | 5 | 25 | | | | | | | |
| CH1 | 80 | 40 | 400 | 800 | PSB-2400L2 | 2 | LED | Switching | RS-232, USB, Analog Control, | D29-32 |
| CH2 | 80 | 40 | 400 | | | | | | | |
| CH1 | 30 | 36 | 360 | 720 | PSW-720L11 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | D9 |
| CH2 | 30 | 36 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 720 | PSW-720L12 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 40 | 27 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 720 | PSW-720L14 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 80 | 13.5 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 720 | PSW-720L15 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 40 | 27 | 360 | 720 | PSW-720L22 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 40 | 27 | 360 | | | | | | | |
| CH1 | 40 | 27 | 360 | 720 | PSW-720L24 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 80 | 13.5 | 360 | | | | | | | |
| CH1 | 40 | 27 | 360 | 720 | PSW-720L25 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 80 | 13.5 | 360 | 720 | PSW-720L44 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 80 | 13.5 | 360 | | | | | | | |
| CH1 | 80 | 13.5 | 360 | 720 | PSW-720L45 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 160 | 7.2 | 360 | 720 | PSW-720L55 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 250 | 4.5 | 360 | 720 | PSW-720H66 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 250 | 4.5 | 360 | | | | | | | |
| CH1 | 250 | 4.5 | 360 | 720 | PSW-720H68 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 800 | 1.44 | 360 | | | | | | | |
| CH1 | 800 | 1.44 | 360 | 720 | PSW-720H88 | 2 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 800 | 1.44 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 1080 | PSW-1080L111 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 30 | 36 | 360 | | | | | | | |
| CH3 | 30 | 36 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 1080 | PSW-1080L112 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 30 | 36 | 360 | | | | | | | |
| CH3 | 40 | 27 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 1080 | PSW-1080L114 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 30 | 36 | 360 | | | | | | | |
| CH3 | 80 | 13.5 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 1080 | PSW-1080L115 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 30 | 36 | 360 | | | | | | | |
| CH3 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 1080 | PSW-1080L122 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 40 | 27 | 360 | | | | | | | |
| CH3 | 40 | 27 | 360 | | | | | | | |

| Voltage(V) | | Current(A) | Power per. CH | Total Power(W) | Model Name | Channel | Display | Technic | Interface | Page |
|---|---|---|---|---|---|---|---|---|---|---|
| CH1 | 30 | 36 | 360 | 1080 | PSW-1080L124 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | D9 |
| CH2 | 40 | 27 | 360 | | | | | | | |
| CH3 | 80 | 13.5 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 1080 | PSW-1080L125 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 40 | 27 | 360 | | | | | | | |
| CH3 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 1080 | PSW-1080L144 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 80 | 13.5 | 360 | | | | | | | |
| CH3 | 80 | 13.5 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 1080 | PSW-1080L145 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 80 | 13.5 | 360 | | | | | | | |
| CH3 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 30 | 36 | 360 | 1080 | PSW-1080L155 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 160 | 7.2 | 360 | | | | | | | |
| CH3 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 40 | 27 | 360 | 1080 | PSW-1080L222 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 40 | 27 | 360 | | | | | | | |
| CH3 | 40 | 27 | 360 | | | | | | | |
| CH1 | 40 | 27 | 360 | 1080 | PSW-1080L224 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 40 | 27 | 360 | | | | | | | |
| CH3 | 80 | 13.5 | 360 | | | | | | | |
| CH1 | 40 | 27 | 360 | 1080 | PSW-1080L225 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 40 | 27 | 360 | | | | | | | |
| CH3 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 40 | 27 | 360 | 1080 | PSW-1080L244 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 80 | 13.5 | 360 | | | | | | | |
| CH3 | 80 | 13.5 | 360 | | | | | | | |
| CH1 | 40 | 27 | 360 | 1080 | PSW-1080L245 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 80 | 13.5 | 360 | | | | | | | |
| CH3 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 40 | 27 | 360 | 1080 | PSW-1080L255 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 160 | 7.2 | 360 | | | | | | | |
| CH3 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 80 | 13.5 | 360 | 1080 | PSW-1080L444 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 80 | 13.5 | 360 | | | | | | | |
| CH3 | 80 | 13.5 | 360 | | | | | | | |
| CH1 | 80 | 13.5 | 360 | 1080 | PSW-1080L445 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 80 | 13.5 | 360 | | | | | | | |
| CH3 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 80 | 13.5 | 360 | 1080 | PSW-1080L455 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 160 | 7.2 | 360 | | | | | | | |
| CH3 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 160 | 7.2 | 360 | 1080 | PSW-1080L555 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 160 | 7.2 | 360 | | | | | | | |
| CH3 | 160 | 7.2 | 360 | | | | | | | |
| CH1 | 250 | 4.5 | 360 | 1080 | PSW-1080H666 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 250 | 4.5 | 360 | | | | | | | |
| CH3 | 250 | 4.5 | 360 | | | | | | | |
| CH1 | 250 | 4.5 | 360 | 1080 | PSW-1080H668 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 250 | 4.5 | 360 | | | | | | | |
| CH3 | 800 | 1.44 | 360 | | | | | | | |
| CH1 | 250 | 4.5 | 360 | 1080 | PSW-1080H688 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 800 | 1.44 | 360 | | | | | | | |
| CH3 | 800 | 1.44 | 360 | | | | | | | |
| CH1 | 800 | 1.44 | 360 | 1080 | PSW-1080H888 | 3 | LED | Switching | LAN, USB, Analog Control, (Opt)GPIB, RS-232 | |
| CH2 | 800 | 1.44 | 360 | | | | | | | |
| CH3 | 800 | 1.44 | 360 | | | | | | | |

## NON-PROGRAMMABLE & MULTIPLE CHANNEL DC POWER SUPPLY

| Voltage(V) | | Current(A) | Power per. CH | Total Power(W) | Model Name | Channel | Display | Technic | Page |
|---|---|---|---|---|---|---|---|---|---|
| CH1 | 30 | 6 | 180 | 375 | SPD-3606 | 3 | LED | Switching | D38 |
| CH2 | 30 | 6 | 180 | | | | | | |
| CH3 | 5 | 3 | 15 | | | | | | |
| CH1 | 32 | 3 | 96 | 192 | GPE-2323 | 2 | LED | Linear | D64 |
| CH2 | 32 | 3 | 96 | | | | | | |
| CH1 | 32 | 3 | 96 | 217 | GPE-3323 | 3 | LED | Linear | |
| CH2 | 32 | 3 | 96 | | | | | | |
| CH3 | 1.8/2.5/3.3/5.0 | 5 | 25 | | | | | | |
| CH1 | 32 | 3 | 96 | 212 | GPE-4323 | 4 | LED | Linear | |
| CH2 | 32 | 3 | 96 | | | | | | |
| CH3 | 5 | 1 | 5 | | | | | | |
| CH4 | 15 | 1 | 15 | | | | | | |
| CH1 | 30 | 3 | 90 | 180 | GPS-2303 | 2 | LED | Linear | D65 |
| CH2 | 30 | 3 | 90 | | | | | | |
| CH1 | 30 | 3 | 90 | 195 | GPS-3303 | 3 | LED | Linear | |
| CH2 | 30 | 3 | 90 | | | | | | |
| CH3 | 5 | 3 | 15 | | | | | | |
| CH1 | 30 | 3 | 90 | 200 | GPS-4303 | 4 | LED | Linear | |
| CH2 | 30 | 3 | 90 | | | | | | |
| CH3 | 2.2 ~ 5.2 | 1 | 5.2 | | | | | | |
| CH4 | 8 ~ 15 | 1 | 15 | | | | | | |
| CH1 | 30 | 6 | 180 | 375 | GPC-3060D | 3 | LED | Linear | D66 |
| CH2 | 30 | 6 | 180 | | | | | | |
| CH3 | 5 | 3 | 15 | | | | | | |
| CH1 | 60 | 3 | 180 | 375 | GPC-6030D | 3 | LED | Linear | |
| CH2 | 60 | 3 | 180 | | | | | | |
| CH3 | 5 | 3 | 15 | | | | | | |

# Dual-channel/Triple-channel Programmable Switching D.C. Power Supply



## PSW-Multi Series

NEW

CE | GPIB | USB | LabVIEW Driver | Analog Control | LAN

PSW-Multi Series is a dual-channel or triple-channel wide range output programmable switching DC power supply. The maximum output power can reach 1080W. There are 13 dual-channel models with a rated power of 720W, and 24 triple-channel models with a rated power of 1080W. The rated voltages of low voltage modules are 30V, 40V, 80V, 160V. The rated voltages of high voltage modules are 250V and 800V.

The CV/CC priority selection of the PSW-Multi Series is a very useful feature for DUT protection. The conventional power supply normally operates under CV 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 CV 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 CV mode to CC mode. Though the current becomes stable after the CC mode being activated, the current spike occurred at the CV and CC crossover point may possibly damage the DUT. At the power output-on stage, the PSW-Multi Series is able to operate under CC 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-Multi 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 pike current and protect the device from high current damage.

The OVP and OCP  are provided with the PSW-Multi 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-Multi 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.

## FEATURES

- **Multi-channel: Maximum 720W for Dual-channel Module and Maximum 1080W for Triple-channel Models; The PSW-Multi Series Aslo Features a New Built-in Function That Allows Individualor Synchronizd Output Control of Eachvoltage Module Output Latency Between Channels with the Same Voltage Module is Less Than 0.1ms**
- **Multiple Voltage Combinations: Low Voltage Combinations Can be Selected From 30V/ 40V/80V/160V; High Voltage Combinations Can be Selected From 250V/800V**
- **Advanced Web Server: Executes SCPI Commands; Web Controls Through Server; Data Log; Edit Sequence**
- **CC/CV Priority Mode Selection is Ideal for Battery and LED Industries**
- **Adjustable Rising and Falling Slew Rate**
- **720W/1080W Adopt 1/3, 1/2 Rack Mount Frame Designs (Standard EIA/JIS)**
- **Standard Communications Interfaces: LAN, USB, External Analog Remote Control Terminal**
- **Optional Communications Interfaces: GPIB-USB Adapter, RS232-USB Cable**
- **Support LabVIEW Driver**



### DUAL-CHANNEL MODELS ARE AS FOLLOWS

| MODEL | CH1 | CH2 | SIZE |
|---|---|---|---|
| PSW-720L11 | 30.00V | 30.00V | 1/3 Rack 3U |
| PSW-720L12 | 30.00V | 40.00V | 1/3 Rack 3U |
| PSW-720L14 | 30.00V | 80.00V | 1/3 Rack 3U |
| PSW-720L15 | 30.00V | 160.0V | 1/3 Rack 3U |
| PSW-720L22 | 40.00V | 40.00V | 1/3 Rack 3U |
| PSW-720L24 | 40.00V | 80.00V | 1/3 Rack 3U |
| PSW-720L25 | 40.00V | 160.0V | 1/3 Rack 3U |
| PSW-720L44 | 80.00V | 80.00V | 1/3 Rack 3U |
| PSW-720L45 | 80.00V | 160.0V | 1/3 Rack 3U |
| PSW-720L55 | 160.0V | 160.0V | 1/3 Rack 3U |
| PSW-720H66 | 250.0V | 250.0V | 1/3 Rack 3U |
| PSW-720H68 | 250.0V | 800.0V | 1/3 Rack 3U |
| PSW-720H88 | 800.0V | 800.0V | 1/3 Rack 3U |

### TRIPLE-CHANNEL MODELS ARE AS FOLLOWS

| MODEL | CH1 | CH2 | CH3 | SIZE |
|---|---|---|---|---|
| PSW-1080L111 | 30.00V | 30.00V | 30.00V | 1/2 Rack 3U |
| PSW-1080L112 | 30.00V | 30.00V | 40.00V | 1/2 Rack 3U |
| PSW-1080L114 | 30.00V | 30.00V | 80.00V | 1/2 Rack 3U |
| PSW-1080L115 | 30.00V | 30.00V | 160.0V | 1/2 Rack 3U |
| PSW-1080L122 | 30.00V | 40.00V | 40.00V | 1/2 Rack 3U |
| PSW-1080L124 | 30.00V | 40.00V | 80.00V | 1/2 Rack 3U |
| PSW-1080L125 | 30.00V | 40.00V | 160.0V | 1/2 Rack 3U |
| PSW-1080L144 | 30.00V | 80.00V | 80.00V | 1/2 Rack 3U |
| PSW-1080L145 | 30.00V | 80.00V | 160.0V | 1/2 Rack 3U |
| PSW-1080L155 | 30.00V | 160.0V | 160.0V | 1/2 Rack 3U |
| PSW-1080L222 | 40.00V | 40.00V | 40.00V | 1/2 Rack 3U |
| PSW-1080L224 | 40.00V | 40.00V | 80.00V | 1/2 Rack 3U |
| PSW-1080L225 | 40.00V | 40.00V | 160.0V | 1/2 Rack 3U |
| PSW-1080L244 | 40.00V | 80.00V | 80.00V | 1/2 Rack 3U |
| PSW-1080L245 | 40.00V | 80.00V | 160.0V | 1/2 Rack 3U |
| PSW-1080L255 | 40.00V | 160.0V | 160.0V | 1/2 Rack 3U |
| PSW-1080L444 | 80.00V | 80.00V | 80.0V | 1/2 Rack 3U |
| PSW-1080L445 | 80.00V | 80.00V | 160.0V | 1/2 Rack 3U |
| PSW-1080L455 | 80.00V | 160.0V | 160.0V | 1/2 Rack 3U |
| PSW-1080L555 | 160.0V | 160.0V | 160.0V | 1/2 Rack 3U |
| PSW-1080H666 | 250.0V | 250.0V | 250.0V | 1/2 Rack 3U |
| PSW-1080H668 | 250.0V | 250.0V | 800.0V | 1/2 Rack 3U |
| PSW-1080H688 | 250.0V | 800.0V | 800.0V | 1/2 Rack 3U |
| PSW-1080H888 | 800.0V | 800.0V | 800.0V | 1/2 Rack 3U |

**GRA-410-J/E  Rack Mount Kit (JIS/EIA)**

For : PSW-Series



Notes :
*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% to 90% of rated output voltage, with rated resistive load.
*7: From 90% to 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.

## SPECIFICATIONS

| Module Type | | | 1 | 2 | 4 | 5 | 6 | 8 |
|---|---|---|---|---|---|---|---|---|
| H/L Voltage Classicfication | | — | L | L | L | L | H | H |
| Rated output voltage | | V | 30 | 40 | 80 | 160 | 250 | 800 |
| Rated output current | | A | 36 | 27 | 13.5 | 7.2 | 4.5 | 1.44 |
| Rated output power | | W | 360 | 360 | 360 | 360 | 360 | 360 |
| Power ratio | | — | 3 | 3 | 3 | 3.2 | 3.125 | 3.2 |
| **Constant Voltage Mode** | | | **30-36** | **40-27** | **80-13.5** | **160-7.2** | **250-4.5** | **800-1.44** |
| Line regulation (*1) | | mV | 18 | 23 | 43 | 83 | 128 | 403 |
| Load regulation (*2) | | mV | 20 | 25 | 45 | 85 | 130 | 405 |
| Ripple and noise (*3) | p-p (*4) | mV | 60 | 60 | 60 | 60 | 80 | 150 |
| | r.m.s. (*5) | mV | 7 | 7 | 7 | 12 | 15 | 30 |
| Temperature coefficient | | ppm/℃ | 100ppm/°C of rated output voltage, after a 30 minute warm-up | | | | | |
| Remote snese compensation voltage (single wire) | | V | 0.6 | 0.6 | 0.6 | 0.6 | 1 | 1 |
| Rise time (*6) | Rated load | ms | 50 | 50 | 50 | 100 | 100 | 150 |
| | No load | ms | 50 | 50 | 50 | 100 | 100 | 150 |
| Fall time (*7) | Rated load | ms | 50 | 50 | 50 | 100 | 150 | 300 |
| | No load | ms | 500 | 500 | 500 | 1000 | 1200 | 2000 |
| Transient response time (*8) | | ms | 1 | 1 | 1 | 2 | 2 | 2 |
| **Constant Current Mode** | | | **30-36** | **40-27** | **80-13.5** | **160-7.2** | **250-4.5** | **800-1.44** |
| Line regulation (*1) | | mA | 41 | 32 | 18.5 | 12.2 | 9.5 | 6.44 |
| Load regulation (*9) | | mA | 41 | 32 | 18.5 | 12.2 | 9.5 | 6.44 |
| Ripple and noise | r.m.s. | mA | 72 | 54 | 27 | 15 | 10 | 5 |
| Temperature coefficient | | ppm/℃ | 200ppm/°C of rated output current, after a 30 minute warm-up | | | | | |
| **Protection Function** | | | **30-36** | **40-27** | **80-13.5** | **160-7.2** | **250-4.5** | **800-1.44** |
| Over voltage protection (OVP) | Setting range | V | 3-33 | 4-44 | 8-88 | 16-176 | 20-275 | 20-880 |
| | Setting accuracy | | ± (2% of rated output voltage) | | | | | |
| Over current protection (OCP) | Setting range | A | 3.6-39.6 | 2.7-29.7 | 1.35-14.85 | 0.72-7.92 | 0.45-4.95 | 0.144-1.584 |
| | Setting accuracy | | ± (2% of rated output current) | | | | | |
| Over temperature protection (OTP) | Operation | | Turn the output off | | | | | |
| Low AC input protection (AC-FAIL) | Operation | | Turn the output off | | | | | |
| Power limit (POWER LIMIT) | Operation | | Over power limit. | | | | | |
| | Value (fixed) | | Approx. 105% of rated output power | | | | | |
| **Analog Programming and Monitoring** | | | **30-36** | **40-27** | **80-13.5** | **160-7.2** | **250-4.5** | **800-1.44** |
| External voltage control output voltage | at 23 °C ± 5 °C | | Accuracy and linearity: ±0.5% of rated output voltage. | | | | | |
| External voltage control output current | at 23 °C ± 5 °C | | Accuracy and linearity: ±1% of rated output current. | | | | | |
| External resistor control output voltage | at 23 °C ± 5 °C | | Accuracy and linearity: ±1.5% of rated output voltage. | | | | | |
| External resistor control output current | at 23 °C ± 5 °C | | Accuracy and linearity: ±1.5% of rated output current. | | | | | |
| Output voltage monitor | at 23 °C ± 5 °C | | Accuracy: ±1% | | | | Accuracy: ±2% | |
| Output current monitor | at 23 °C ± 5 °C | | Accuracy: ±1% | | | | Accuracy: ±2% | |
| 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. | | | | | |
| CV/CC/ALM/PWR ON/OUT ON indicator | | | Photocoupler open collector output; Maximum voltage 30V, maximum sink current 8mA. | | | | | |
| **Front Panel** | | | **30-36** | **40-27** | **80-13.5** | **160-7.2** | **250-4.5** | **800-1.44** |
| Display, 4 digits Voltage accuracy | at 23 °C ± 5 °C; ± (0.1% + | mV | 20 | 20 | 20 | 100 | 200 | 400 |
| Current accuracy | at 23 °C ± 5 °C; ± (0.1% + | mA | 40 | 30 | 20 | 5 | 5 | 2 |
| Indications | | | GREEN LED's: CV, CC, VSR, ISR, DLY, RMT, 20, 40, 60, 80, 100, %W, W, V, A | | | | | |
| | | | RED LED's: ALM | | | | | |
| Buttons | | | Function, OVP/OCP, Set, Test, Lock/Local, PWR DSPL, Output | | | | | |
| Knobs | | | Voltage, Current | | | | | |
| USB port | | | Type A USB connector | | | | | |
| **Programming and Measurement (USB, LAN, GPIB)** | | | **30-36** | **40-27** | **80-13.5** | **160-7.2** | **250-4.5** | **800-1.44** |
| Output voltage programming accuracy | at 23 °C ± 5 °C; ± (0.1% + | mV | 10 | 10 | 10 | 100 | 200 | 400 |
| Output current programming accuracy | at 23 °C ± 5 °C; ± (0.1% + | mA | 30 | 20 | 10 | 5 | 5 | 2 |
| Output voltage programming resolution | | mV | 1 | 1 | 2 | 3 | 5 | 14 |
| Output current programming resolution | | mA | 1 | 1 | 1 | 1 | 1 | 1 |
| Output voltage measurement accuracy | at 23 °C ± 5 °C; ± (0.1% + | mV | 10 | 10 | 10 | 100 | 200 | 400 |
| Output current measurement accuracy | at 23 °C ± 5 °C; ± (0.1% + | mA | 30 | 20 | 10 | 5 | 5 | 2 |
| Output voltage measurement resolution | | mV | 1 | 1 | 2 | 3 | 5 | 14 |
| Output current measurement resolution | | mA | 1 | 1 | 1 | 1 | 1 | 1 |
| **Input Characteristics** | | | **30-36** | **40-27** | **80-13.5** | **160-7.2** | **250-4.5** | **800-1.44** |
| Efficiency | 100Vac | % | 77 | 78 | 78 | 79 | 79 | 80 |
| | 200Vac | % | 79 | 80 | 80 | 81 | 81 | 82 |
| **Input Characteristics** | | | **Dual Channel** | | | **Triple Channel** | | |
| Norminal input rating | | | 100Vac to 240Vac, 50Hz to 60Hz, single phase | | | | | |
| Input voltage range | | | 85Vac ~ 265Vac | | | | | |
| Input frequency range | | | 47Hz ~ 63Hz | | | | | |
| Maximum input current | 100Vac | A | 10 | | | 15 | | |
| | 200Vac | A | 5 | | | 7.5 | | |
| Inrush current | | | Less than 50A | | | Less than 75A | | |
| Maximum input power | | VA | 1000 | | | 1500 | | |
| Power factor | 100Vac | | 0.99 | | | | | |
| | 200Vac | | 0.97 | | | | | |
| Hold-up time | | | 20ms or greater | | | | | |
| **Interface Capabilities** | | | **Dual Channel** | | | **Triple Channel** | | |
| 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 | | | | | |
| GPIB | | | Optional: GUG-001 (GPIB to USB Adapter) | | | | | |
| **Environmental Conditions** | | | **Dual Channel** | | | **Triple Channel** | | |
| Operaing temperature | | | 0˚C to 50˚C | | | | | |
| Storage temperature | | | -25˚C to 70˚C | | | | | |
| Operating humidity | | | 20% to 85% RH; No condensation | | | | | |
| Storage humidity | | | 90% RH or less; No condensation | | | | | |
| Altitude | | | Maximum 2000m | | | | | |
| **General Specifications** | | | **Dual Channel** | | | **Triple Channel** | | |
| Weight | main unit only | kg | Approx. 5.4kg | | | Approx. 7.7kg | | |
| Dimensions | (WxHxD) | mm | 142 x 124 x 350 | | | 214 x 124 x 350 | | |
| Cooling | | | Forced air cooling by internal fan | | | | | |
| EMC | | | Complies with the European EMC directive for Class A test and measurement products | | | | | |
| Safety | | | Complies with the European Low Voltage Directive and carries the CE-marking | | | | | |
| Withstand voltage | Between input and chassis | | No abnormalities at 1500 Vac for 1 minute | | | | | |
| | Between input and output | | No abnormalities at 3000 Vac for 1 minute | | | | | |
| | Between output and chassis | | No abnormalities at 500 Vdc for 1 minute for 30V, 40V, 80V, 160V models<br>No abnormalities at 1500 Vdc for 1 minute for 250V, 800V models | | | | | |
| Insulation resistance | Between input and chassis | | 500 Vdc, 100 MΩ or more | | | | | |
| | Between input and output | | 500 Vdc, 100 MΩ or more | | | | | |
| | Between output and chassis | | 500 Vdc, 100 MΩ or more for 30V, 40V, 80V, 160V and 250V models<br>1000 Vdc, 100 MΩ or more for 800V models | | | | | |

# Dual-channel/Triple-channel Programmable Switching D.C. Power Supply



PSW-Multi Series(Three-channel)



PSW-Multi Series(Two-channel)



PSW-Multi Series (LV)
Three-channel Models Rear Panel



PSW-Multi Series (HV)
Three-channel Models Rear Panel



PSW-Multi Series (LV)
Two-channel Models Rear Panel



PSW-Multi Series (HV)
Two-channel Models Rear Panel

## ORDERING INFORMATION

### Dual Channel Model

| | |
|---|---|
| **PSW-720L11** | 30V/36A*2 720W Multi-Range D.C. Power Supply |
| **PSW-720L12** | 30V/36A*1 40V/27A*1 720W Multi-Range D.C. Power Supply |
| **PSW-720L14** | 30V/36A*1 80V/13.5A*1 720W Multi-Range D.C. Power Supply |
| **PSW-720L15** | 30V/36A*1 160V/7.2A*1 720W Multi-Range D.C. Power Supply |
| **PSW-720L22** | 40V/27A*2 720W Multi-Range D.C. Power Supply |
| **PSW-720L24** | 40V/27A*1 80V/13.5A*1 720W Multi-Range D.C. Power Supply |
| **PSW-720L25** | 40V/27A*1 160V/7.2A*1 720W Multi-Range D.C. Power Supply |
| **PSW-720L44** | 80V/13.5A*2 720W Multi-Range D.C. Power Supply |
| **PSW-720L45** | 80V/13.5A*1 160V/7.2A*1 720W Multi-Range D.C. Power Supply |
| **PSW-720L55** | 160V/7.2A*2 720W Multi-Range D.C. Power Supply |
| **PSW-720H66** | 250V/4.5A*2 720W Multi-Range D.C. Power Supply |
| **PSW-720H68** | 250V/4.5A*1 800V/1.44A*1 720W Multi-Range D.C. Power Supply |
| **PSW-720H88** | 800V/1.44A*2 720W Multi-Range D.C. Power Supply |

### Triple Channel Model

| | |
|---|---|
| **PSW-1080L111** | 30V/36A*3 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L112** | 30V/36A*2 40V/27A*1 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L114** | 30V/36A*2 80V/13.5A*1 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L115** | 30V/36A*2 160V/7.2A*1 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L122** | 30V/36A*1 40V/27A*2 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L124** | 30V/36A*1 40V/27A*1 80V/13.5A*1 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L125** | 30V/36A*1 40V/27A*1 160V/7.2A 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L144** | 30V/36A*1 80V/13.5A*2 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L145** | 30V/36A*1 80V/13.5A*1 160V/7.2A*1 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L155** | 30V/36A*1 160V/7.2A*2 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L222** | 40V/27A*3 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L224** | 40V/27A*2 80V/13.5A*1 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L225** | 40V/27A*2 160V/7.2A*1 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L244** | 40V/27A*1 80V/13.5A*2 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L245** | 40V/27A*1 80V/13.5A*1 160V/7.2A*1 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L255** | 40V/27A*1 160V/7.2A*2 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L444** | 80V/13.5A*3 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L445** | 80V/13.5A*2 160V/7.2A*1 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L455** | 80V/13.5A*1 160V/7.2A*2 1080W Multi-Range D.C. Power Supply |
| **PSW-1080L555** | 160V/7.2A*3 1080W Multi-Range D.C. Power Supply |
| **PSW-1080H666** | 250V/4.5A*3 1080W Multi-Range D.C. Power Supply |
| **PSW-1080H668** | 250V/4.5A*2 800V/1.44A*1 1080W Multi-Range D.C. Power Supply |
| **PSW-1080H688** | 250V/4.5A*1 800V/1.44A*2 1080W Multi-Range D.C. Power Supply |
| **PSW-1080H888** | 800V/1.44A*3 1080W Multi-Range D.C. Power Supply |

Apart from the differences in output type, each unit differs at output channels and voltage.
The PSW-720 is dual channel output and PSW-1080 is triple channel output.

ACCESSORIES :

Power Cord x1 (Region dependent)

| | |
|---|---|
| **GTL-123** | Test Lead x 1 (30V/40V/80V/160VOne low voltage module for each channel) |
| **GTL-240** | USB Cable"L" Type x1 |
| **PSW-004** | Basic Accessories Kit x1 (30V/40V/80V/160V low voltage module) |
| **PSW-008** | Basic Accessories Kit x1 (250V/800V high voltage module) |
| **PSW-009** | Output terminal cover (30V/40V/80V/160V low voltage module) |
| **PSW-011** | Output terminal cover (250V/800V high voltage module) |
| **PSW-012** | High voltage output terminal( 250V/800V high voltage module) |

### OPTIONAL ACCESSORIES

| | |
|---|---|
| **PSW-001** | Accessory Kit |
| **PSW-002** | Simple IDC Tool |
| **PSW-003** | Contact Removal Tool |
| **GUG-001** | GPIB to USB Adaptor |
| **GRA-410-J** | Rack Mount Kit(JIS) |
| **GRA-410-E** | Rack Mount Kit(KIA) |
| **GET-001** | Extended Terminal with max. 30A (30V/40V/80V/160V low voltage module) |
| **GET-002** | Extended Terminal with max. 10A (250V/800V high voltage module) |
| **GET-005** | Extended European Terminal with max. 20A (30V/40V/80V/160V low voltage module) |
| **GTL-130** | Test Lead: 2x red, 2x black (250V/800V high voltage module) |
| **GTL-248** | GPIB Cable, 2000mm |
| **GTL-250** | GPIB Cable, 600mm |
| **GUR-001A** | USB to RS-232 Cable (M3), 3000mm |
| **GUR-001B** | USB to RS-232 Cable (#4-40 UNC), 3000mm |

PSW-001



PSW-002



PSW-003



PSW-004



GUG-001



GTL-130



GUR-001A



GUR-001B



GET-001



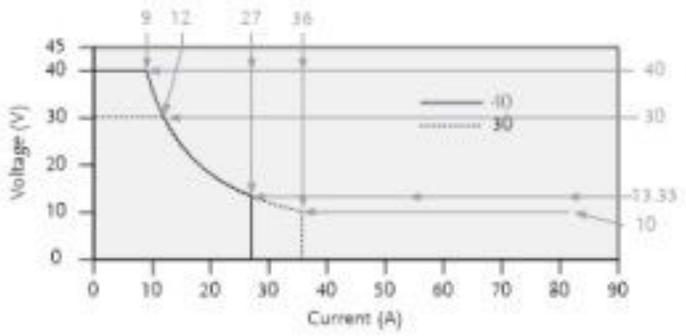
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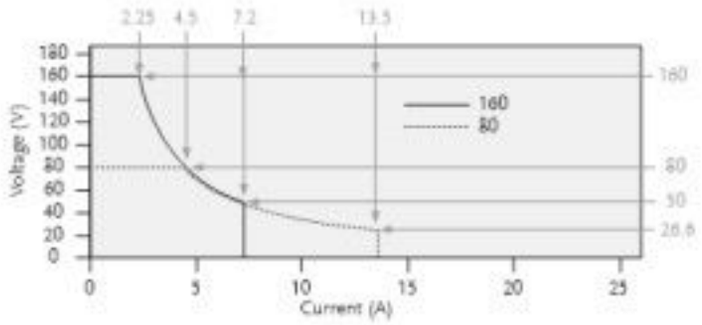
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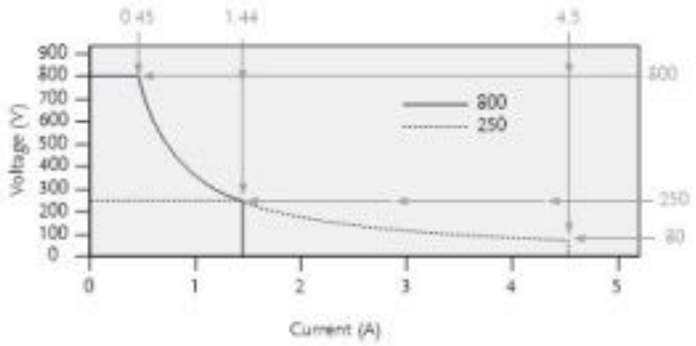
## A. MULTI-RANGE OPERATION




PSW 30V/40V Series Operating Area




PSW 80V/160V Series Operating Area




PSW 250V/800V Series Operating Area

When the power supply is configured that the total output (Current x Voltage output) is less than the rated power output, it functions as a typical Constant Current (CC) and Constant Voltage (CV) power supply.

However, when the power supply is configured such that the total output power (Current x Voltage Output) exceeds the rated power output, the effective output is actually limited to the operation area of the unit.

## B. MULTI-CHANNEL

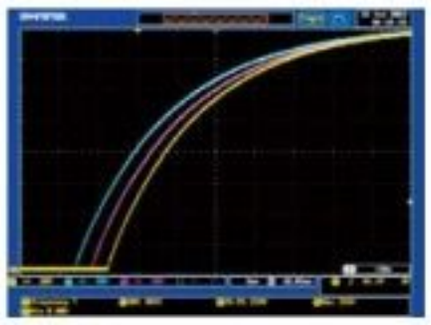


Figure 1

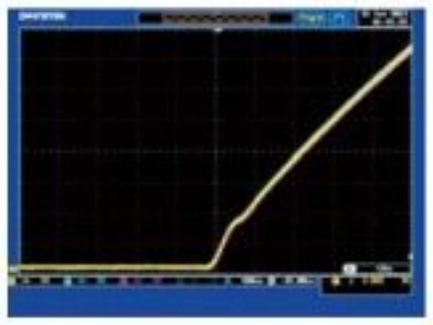


Figure 2

Multi-Channel, Dual-channel or triple-channel; the output latency between channels for same voltage module is less than 0.1ms.

When using a single-channel power supply for parallel multiple voltage output testing, there are different delays and slew rate settings, resulting in longer voltage output delay times and lack of control. The PSW-Multi Series features a built-in synchronous output control function (F130) that allow Dual-channel or triple-channel; the output latency between channels for same voltage module is less than 0.1ms.

It can fulfill diverse testing applications, for example: multi-channel digital device testing, electronic circuit verification, battery charging and discharging testing, and more.

When using a single-channel power supply with three units connected in parallel through the backplane for synchronized output, each unit will experience a voltage output latency of approximately 5 to 10 ms. (Figure 1)

The waveform of PSW-Multi Series in triple-channel synchronized output mode exhibits voltage output latency times less than 0.1 ms for each channel (with the same voltage model) (Figure 2)

## C. ADVANCED WEB SERVER



Figure 1



Figure 2



Figure 3




Figure 4

SCPI commands can be issued directly on the browser, examples are as follows: Direct control of PSW-Multi series power supplies on the browser. (Figure 1)

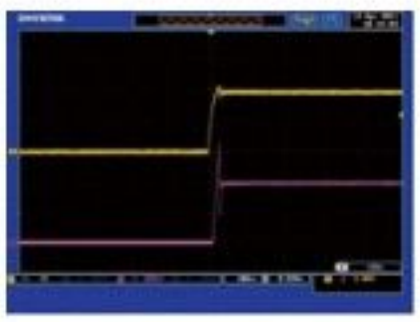
Data Log can be performed on the browser. For standard web server, the fastest data log time interval is 1 second. PSW-Multi series also provide paid version (active by option license key), the fastest data log time interval is 0.1 seconds and the data save to USB drive directly. (Figure 2)

Sequences can be edited on the browser. (Figure 3)

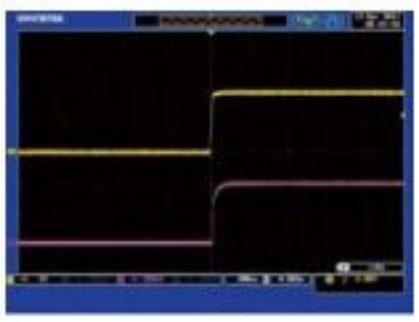
The above advanced web server functions are new functions of PSW-Multi. Currently, there is no plan to update the advanced web server in the existing PSW-Series (Single Channel). (Figure 4)



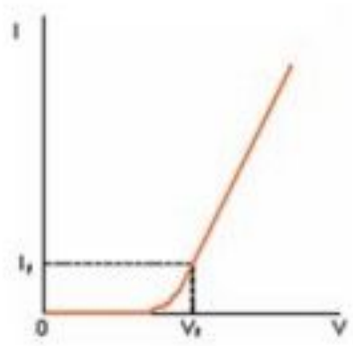
## D. CV / CC PRIORITY SELECTION



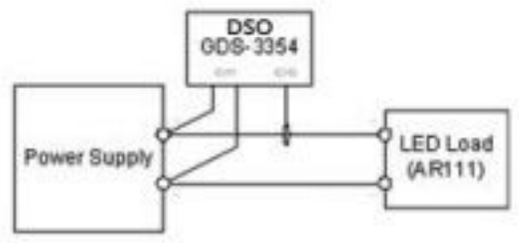
**The Inrush Current and Surge Voltage occur at LED Forward Voltage(Vf)Under C.V Priority**



**The CC Priority Feature Effectively Limits the Occurrence of Inrush Current and Surge Voltage when the Supplied Voltage Rises to the LED Forward Voltage**



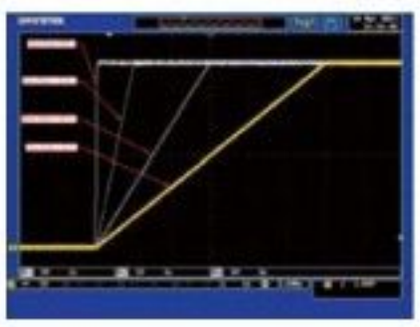

**V-I Characteristic of Diode**



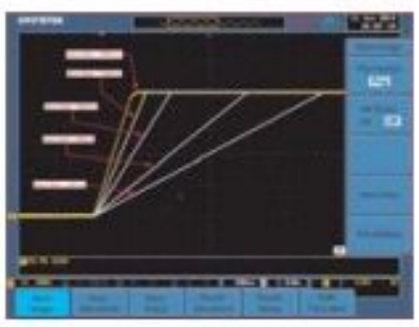

**Using GDS-3354 DSO to Test LED Operation Under CV Priority and CC Priority Respectively**

The PSW-Multi Series provides CC Mode and CV Mode to fit various applications in the general purpose market. To get into critical application niches, however, the power supply needs to provide advanced features to meet the specific requirements. The CC and CV Priority Selection enable the power supply to run under CC priority, rather than normal CV priority, at the output-on stage.

## E. ADJUSTABLE SLEW RATE



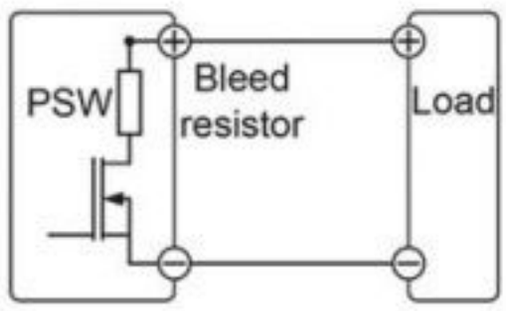
**The Adjustable Rise Time of the PSW 30V Module**



**The Adjustable Rise Time of the PSW 800V Module**

The PSW-Multi Series has adjustable slew rates for the level transition of both Current and Voltage. This gives the PSW-Multi Series power supply the ability to set specific rise time and fall time of the Voltage and Current drawn from the power supply to verify DUT performance during the Voltage/Current level transition. The feature also provides the benefit to slow down the voltage transition at the power output-on to protect DUT from inrush current damage. This is especially useful for the test of heavy-current-drawn devices like capacitors.

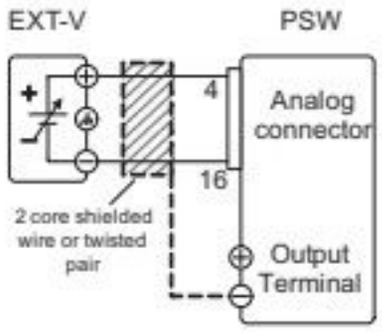
## F. BLEEDER CONTROL



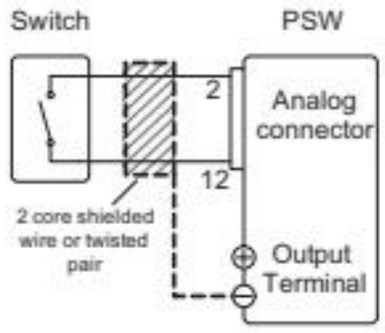

**PSW-Multi Series Built-in Bleed Resistor**

The PSW-Multi Series employs a bleed resistor in parallel with the output terminal. Bleed resistor is designed to dissipatch the power from the power supply filter capacitors when power is turned off and 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.

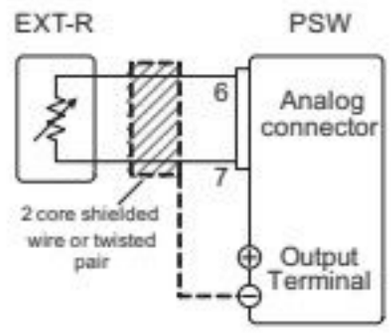
## G. EXTERNAL ANALOG REMOTE CONTROL



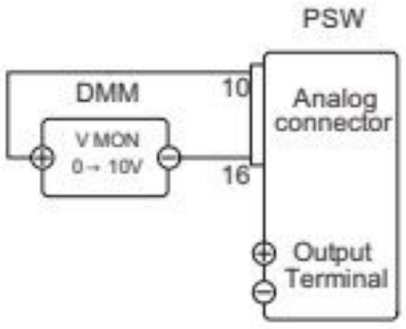

External Voltage Control of the Voltage Output



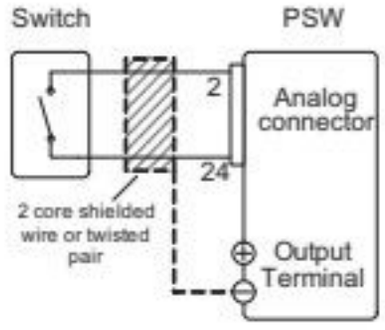

External Switch Control of the Main Power Shut-down



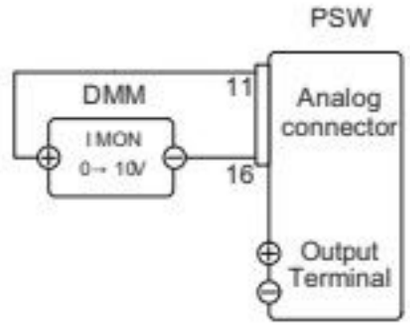

External Resistance control of the Voltage Output




External DMM Monitoring of the Output Voltage




External Switch Control of the Output On/Off




External DMM Monitoring of the Output Current

On the rear panel of the PSW-Multi Series power supply, a 26-pin Analog Control connector is available to perform lots of remote control and monitoring functions. The output voltage and current can be set using external voltage or resistance.

The power supply output on/off and main power shut-down can also be controlled using external switches. This Analog Control Connector is complied with the Mil 26 pin connector(OMRON XG4 IDC plug) standard.

## H. VARIOUS INTERFACES SUPPORT & EXTENDED TERMINAL BOX



Rear Panel for PSW-Multi Series





**GUG-001**

GPIB to USB Adapter



**GET-001**

Extended Terminal (for PSW 30V/40V/80V/160V)



**GET-002**

Extended Terminal (for PSW 250V/800V)



**GET-005**

Extended European Terminal (for PSW 30V/40V/80V/160V)

The PSW-Multi Series provides USB Host port in the front panel for easy access of stored data, such as test script program. In the rear panel, a USB Device port is available for remote control or I & V data logging of power output through a PC controller. The LAN interface, which meets DHCP standard, is provided as a standard feature of the PSW-Multi Series for system communications and ATE applications.

An Extender Terminal box (P/N: GET-001/GET-002/GET-005) is provided as optional accessory to extend the power output form the rear panel to the front side. This extender terminal gives R&D or QC engineers convenience to do the jobs without frequently reaching the output terminal at the rear side of the PSW-Multi Series.

## I. USING THE RACK MOUNT KIT




Rack Mount Kit GRA-410-J (JIS)




Rack Mount Kit GRA-410-E (EIA)

The PSW-Multi Series has an optional Rack Mount Kit (GW Instek part number: [JIS] GRA-410-J, [EIA] GRA-410-E[EIA]) that can be used to hold 6x PSW models, 3x PSW-720 models, 2x PSW-1080 models or a combination of all models (1x PSW, 1x PSW-720 and 1x PSW-1080).

# Programmable Switching D.C. Power Supply (Multi-Range D.C. Power Supply)



## PSW-Series

CE | GPIB | USB | LabVIEW Driver | Analog Control | LAN

### FEATURES

- Voltage Rating : 30V/40V/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/40V /80V/160V), Parallel Operation(3 units in Parallel) for (30V/40V/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 80-27 (0~80V, 0~27A, 720W)



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 eighteen models with the combination of 30V, 40V, 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 40-27 | 40V/27A | 40V/54A | 40V/81A |
| PSW 40-54 | 40V/54A | 40V/108A | 40V/162A |
| PSW 40-81 | 40V/81A | 40V/162A | 40V/243A |
| 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 40-27 | 40V/27A | 80V/27A |
| PSW 40-54 | 40V/54A | 80V/54A |
| PSW 40-81 | 40V/81A | 80V/81A |
| 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 40-27 | PSW 40-54 | PSW 40-81 | PSW 80-13.5 | PSW 80-27 | PSW 80-40.5 |
|---|---|---|---|---|---|---|---|---|---|
| **OUTPUT RATING** | | | | | | | | | |
| Voltage | 0 – 30V | 0 – 30V | 0 – 30V | 0 ~ 40V | 0 ~ 40V | 0 ~ 40V | 0 – 80V | 0 – 80V | 0 – 80V |
| Current | 0 – 36A | 0 – 72A | 0 – 108A | 0 ~ 27A | 0 ~ 54A | 0~ 81A | 0 – 13.5A | 0 – 27A | 0 – 40.5A |
| Power | 360W | 720W | 1080W | 360W | 720W | 1080W | 360W | 720W | 1080W |
| **REGULATION(CV)** | | | | | | | | | |
| Load | 20mV | 20mV | 20mV | 25mV | 25mV | 25mV | 45mV | 45mV | 45mV |
| Line | 18mV | 18mV | 18mV | 23mV | 23mV | 23mV | 43mV | 43mV | 43mV |
| **REGULATION(CC)** | | | | | | | | | |
| Load | 41mA | 77mA | 113mA | 32mA | 59mA | 86mA | 18.5mA | 32mA | 45.5mA |
| Line | 41mA | 77mA | 113mA | 32mA | 59mA | 86mA | 18.5mA | 32mA | 45.5mA |
| **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 | 7mV | 11mV | 14mV |
| CC rms | 72mA | 144mA | 216mA | 54mA | 108mA | 162mA | 27mA | 54mA | 81mA |
| **PROGRAMMING ACCURACY** | | | | | | | | | |
| Voltage | 0.1% +10mV | 0.1% +10mV | 0.1% +10mV | 0.1%+10mV | 0.1%+10mV | 0.1%+10mV | 0.1% +10mV | 0.1% +10mV | 0.1% +10mV |
| Current | 0.1% + 30mA | 0.1% + 60mA | 0.1% + 100mA | 0.1%+20mA | 0.1%+50mA | 0.1%+80mA | 0.1% + 10mA | 0.1% + 30mA | 0.1% + 40mA |
| **MEASUREMENT ACCURACY** | | | | | | | | | |
| Voltage | 0.1% +10mV | 0.1% +10mV | 0.1% +10mV | 0.1%+10mV | 0.1%+10mV | 0.1%+10mV | 0.1% +10mV | 0.1% +10mV | 0.1% +10mV |
| Current | 0.1% +30mA | 0.1% +60mA | 0.1% +100mA | 0.1%+20mA | 0.1%+50mA | 0.1%+80mA | 0.1% +10mA | 0.1% +30mA | 0.1% +40mA |
| **RESPONSE TIME** | | | | | | | | | |
| Raise Time | 50ms | 50ms | 50ms | 50ms | 50ms | 50ms | 50ms | 50ms | 50ms |
| Fall Time(Full Load) | 50ms | 50ms | 50ms | 50ms | 50ms | 50ms | 50ms | 50ms | 50ms |
| Fall Time(No Load) | 500ms | 500ms | 500ms | 500ms | 500ms | 500ms | 500ms | 500ms | 500ms |
| Load Transient Recover Time (Load change from 50–100%) | 1ms | 1ms | 1ms | 1ms | 1ms | 1ms | 1ms | 1ms | 1ms |
| **PROGRAMMING RESOLUTION (By PC Remote Control Mode)** | | | | | | | | | |
| Voltage | 1mV | 1mV | 1mV | 1mV | 1mV | 1mV | 2mV | 2mV | 2mV |
| Current | 1mA | 2mA | 3mA | 1mA | 2mA | 3mA | 1mA | 2mA | 3mA |
| **MEASUREMENT RESOLUTION (By PC Remote Control Mode)** | | | | | | | | | |
| Voltage | 1mV | 1mV | 1mV | 1mV | 1mV | 1mV | 2mV | 2mV | 2mV |
| 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 | 4 – 44V | 4 – 44V | 4 – 44V | 8–88V | 8–88V | 8–88V |
| OCP | 3.6 –39.6A | 5–79.2A | 5–118.8A | 2.7 – 29.7A | 5 – 59.4A | 5 – 89.1A | 1.35–14.85A | 2.7–29.7A | 4.05–44.55A |
| OHP | Activated by elecated 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%±20mV | 0.1%±20mV | 0.1%±20mV |
| Current | 0.1%±40mA | 0.1%±70mA | 0.1%±100mA | 0.1%+30mA | 0.1%+60mA | 0.1%+80mA | 0.1%±20mA | 0.1%±40mA | 0.1%±50mA |
| **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(Option)/RS232-USB(Option) | | | | | | | | |
| Fan | With thermal sensing control | | | | | | | | |
| POWER SOURCE | 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 | 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-001



PSW-002



PSW-003



PSW-004



PSW-005



PSW-006



PSW-007



# Programmable Switching D.C. Power Supply (Multi-Range D.C. Power Supply)

| SPECIFICATIONS | PSW 160-7.2 | PSW 160-14.4 | PSW 160-21.6 | 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 – 160V | 0 – 160V | 0 – 160V | 0 – 250V | 0 – 250V | 0 – 250V | 0 – 800V | 0 – 800V | 0 – 800V |
| Current | 0 – 7.2A | 0 – 14.4A | 0 – 21.6A | 0 – 4.5A | 0 – 9A | 0 – 13.5A | 0 – 1.44A | 0 – 2.88A | 0 – 4.32A |
| Power | 360W | 720W | 1080W | 360W | 720W | 1080W | 360W | 720W | 1080W |
| **REGULATION(CV)** | | | | | | | | | |
| Load | 85mV | 85mV | 85mV | 130mV | 130mV | 130mV | 405mV | 405mV | 405mV |
| Line | 83mV | 83mV | 83mV | 128mV | 128mV | 128mV | 403mV | 403mV | 403mV |
| **REGULATION(CC)** | | | | | | | | | |
| Load | 12.2mA | 19.4mA | 26.6mA | 9.5mA | 14mA | 18.5mA | 6.44mA | 7.88mA | 9.32mA |
| Line | 12.2mA | 19.4mA | 26.6mA | 9.5mA | 14mA | 18.5mA | 6.44mA | 7.88mA | 9.32mA |
| **RIPPLE & NOISE (Noise Bandwidth 20MHz; Ripple Bandwidth=1MHz)** | | | | | | | | | |
| CV p-p | 60mV | 80mV | 100mV | 80mV | 100mV | 120mV | 150mV | 200mV | 200mV |
| CV rms | 12mV | 15mV | 20mV | 15mV | 15mV | 15mV | 30mV | 30mV | 30mV |
| CC rms | 15mA | 30mA | 45mA | 10mA | 20mA | 30mA | 5mA | 10mA | 15mA |
| **PROGRAMMING ACCURACY** | | | | | | | | | |
| Voltage | 0.1% +100mV | 0.1% +100mV | 0.1% +100mV | 0.1%+200mV | 0.1%+200mV | 0.1%+200mV | 0.1%+400mV | 0.1%+400mV | 0.1%+400mV |
| Current | 0.1% + 5mA | 0.1% +15mA | 0.1% +20mA | 0.1%+5mA | 0.1%+10mA | 0.1%+15mA | 0.1%+2mA | 0.1%+4mA | 0.1%+6mA |
| **MEASUREMENT ACCURACY** | | | | | | | | | |
| Voltage | 0.1% +100mV | 0.1% +100mV | 0.1% +100mV | 0.1%+200mV | 0.1%+200mV | 0.1%+200mV | 0.1%+400mV | 0.1%+400mV | 0.1%+400mV |
| Current | 0.1% +5mA | 0.1% +15mA | 0.1% +20mA | 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 | 100ms | 100ms | 100ms | 150ms | 150ms | 150ms |
| Fall Time(Full Load) | 100ms | 100ms | 100ms | 150ms | 150ms | 150ms | 300ms | 300ms | 300ms |
| Fall Time(No Load) | 1000ms | 1000ms | 1000ms | 1200ms | 1200ms | 1200ms | 2000ms | 2000ms | 2000ms |
| Load Transient Recover Time (Load change from 50–100%) | 2ms | 2ms | 2ms | 2ms | 2ms | 2ms | 2ms | 2ms | 2ms |
| **PROGRAMMING RESOLUTION (By PC Remote Control Mode)** | | | | | | | | | |
| Voltage | 3mV | 3mV | 3mV | 5mV | 5mV | 5mV | 14mV | 14mV | 14mV |
| Current | 1mA | 2mA | 3mA | 1mA | 1mA | 1mA | 1mA | 1mA | 1mA |
| **MEASUREMENT RESOLUTION (By PC Remote Control Mode)** | | | | | | | | | |
| Voltage | 3mV | 3mV | 3mV | 5mV | 5mV | 5mV | 14mV | 14mV | 14mV |
| Current | 1mA | 2mA | 3mA | 1mA | 1mA | 1mA | 1mA | 1mA | 1mA |
| **SERIES AND PARALLEL CAPABILITY** | | | | | | | | | |
| Parallel Operation | Up to 3 units including the master unit | | | 3 | 3 | 3 | 3 | 3 | 3 |
| Series Operation | Up to 2 units including the master unit | | | N/A | N/A | N/A | N/A | N/A | N/A |
| **PROTECTION FUNCTION** | | | | | | | | | |
| OVP | 16–176V | 16–176V | 16–176V | 20–275V | 20–275V | 20–275V | 20–880V | 20–880V | 20–880V |
| OCP | 0.72–7.92A | 1.44–15.84A | 2.16–23.76A | 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 elecated internal temperatures | | | | | | | | |
| **FRONT PANEL DISPLAY ACCURACY, 4 digits** | | | | | | | | | |
| Voltage | 0.1%±100mV | 0.1%±100mV | 0.1%±100mV | 0.1%±200mV | 0.1%±200mV | 0.1%±200mV | 0.1%±400mV | 0.1%±400mV | 0.1%±400mV |
| Current | 0.1%±5mA | 0.1%±30mA | 0.1%±30mA | 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 | Yes | | | | | | | | |
| Interface | USB/LAN/GPIB-USB(Option)/RS232-USB(Option) | | | | | | | | |
| Fan | With thermal sensing control | | | | | | | | |
| POWER SOURCE | 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 | 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-008



PSW-009



PSW-010



PSW-011



PSW-012





# 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 40-27** | (0~40V/0~27A/360W) Multi-Range DC Power Supply |
| **PSW 40-54** | (0~40V/0~54A/720W) Multi-Range DC Power Supply |
| **PSW 40-81** | (0–40V/0–81A/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/40V/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/40V/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/40V/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/40V/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-010** | Large filter (Type II/III) |
| **GTL-248** | GPIB Cable, Double Shielded, 2000mm |
| **GTL-250** | GPIB Cable, Double Shielded, 600mm |
| **GUR-001A** | USB to RS-232 Cable, 300mm(H3) |
| **GUR-001B** | RS-232 to USB Adapter with #4-40 UNC Rivet Nut |
| **GUG-001** | GPIB 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/40V/80V/160V) |
| **GET-002** | Extended Terminal with max. 10A(for PSW 250V/800V) |
| **GET-005** | Extended European Terminal with max. 20A (for PSW 30V/40V/80V/160V) |
| **GTL-130** | Test lead : 2 x red, 2 x black(for PSW 250V/800V) |

**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 GPIB to USB Adapter**

(for GDS-3000Series, PSW-Series)



**GET-001 Extended Terminal**

(for PSW 30V/40V/80V/160V)



**GET-002 Extended Terminal**

(for PSW 250V/800V)



**GET-005 Extended European Terminal**

(for PSW 30V/40V/80V/160V)



# Programmable Switching D.C. Power Supply



## PSU-Series

CE | USB | GPIB | Analog Control | LAN | LabVIEW Driver | RS-232 | RS-485

## FEATURES

- ✲ Voltage Output : 6V/8V/12.5V/15V/20V/30V/40V/ 50V/60V/80V/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-Series, a DC power supply with high power density design, is 1U in height and compatible with 19" Rack Mount Size. The series is suitable for test system installation or system integration by flexibly selecting models for the integration into the existing test system. The PSU-Series, featuring superior voltage and current control functions, comprises fifteen models with output voltage/current ranging from 6V/200A to 600V/2.6A. The Series is suitable for different test conditions and DUTs, including electronic components testing, micro resistors, relays, shunt resistors, 12V/24V/48V battery simulation, and automotive electronic device testing.

The 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.

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 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.

## PSU-Series Model Selection Table

| 1.5kW 1U High | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | 6.000 V | 8.000 V | 12.50 V | 15.00 V | 20.00 V | 30.00 V | 40.00 V | 50.00 V | 60.00 V | 80.00 V | 100.0 V | 150.0 V | 300.0 V | 400.0 V | 600.0 V |
| Current | 200.0 A | 180.0 A | 120.0 A | 100.0 A | 76.00 A | 50.00 A | 38.00 A | 30.0 A | 25.00 A | 19.00 A | 15.00 A | 10.00 A | 5.000 A | 3.800 A | 2.600 A |
| Power | 1200 W | 1440 W | 1500 W | 1500 W | 1520 W | 1500 W | 1520 W | 1500 W | 1500 W | 1520 W | 1500 W | 1500 W | 1500 W | 1520 W | 1560 W |
| 3kW 2U High | 6-400(B) | 8-360(B) | 12.5-240(B) | 15-200(B) | 20-152(B) | 30-100(B) | 40-76(B) | 50-60(B) | 60-50(B) | 80-38(B) | 100-30(B) | 150-20(B) | 300-10(B) | 400-7.6(B) | 600-5.2(B) |
| Voltage | 6.000 V | 8.000 V | 12.50 V | 15.00 V | 20.00 V | 30.00 V | 40.00 V | 50.00 V | 60.00 V | 80.00 V | 100.0 V | 150.0 V | 300.0 V | 400.0 V | 600.0 V |
| Current | 400.0 A | 360.0 A | 240.0 A | 200.0 A | 152.0 A | 100.0 A | 76.00 A | 60.00 A | 50.00 A | 38.00 A | 30.00 A | 20.00 A | 10.00 A | 7.600 A | 5.200 A |
| Power | 2400 W | 2880 W | 3000 W | 3000 W | 3040 W | 3000 W | 3040 W | 3000 W | 3000 W | 3040 W | 3000 W | 3000 W | 3000 W | 3040 W | 3120 W |
| 4.5kW 3U High | 6-600(B) | 8-540(B) | 12.5-360(B) | 15-300(B) | 20-228(B) | 30-150(B) | 40-114(B) | 50-90(B) | 60-75(B) | 80-57(B) | 100-45(B) | 150-30(B) | 300-15(B) | 400-11.4(B) | 600-7.8(B) |
| | 6-600(C) | 8-540(C) | 12.5-360(C) | 15-300(C) | 20-228(C) | 30-150(C) | 40-114(C) | 50-90(C) | 60-75(C) | 80-57(C) | 100-45(C) | 150-30(C) | 300-15(C) | 400-11.4(C) | 600-7.8(C) |
| | 6-600(D) | 8-540(D) | 12.5-360(D) | 15-300(D) | 20-228(D) | 30-150(D) | 40-114(D) | 50-90(D) | 60-75(D) | 80-57(D) | 100-45(D) | 150-30(D) | 300-15(D) | 400-11.4(D) | 600-7.8(D) |
| Voltage | 6.000 V | 8.000 V | 12.50 V | 15.00 V | 20.00 V | 30.00 V | 40.00 V | 50.00 V | 60.00 V | 80.00 V | 100.0 V | 150.0 V | 300.0 V | 400.0 V | 600.0 V |
| Current | 600.0 A | 540.0 A | 360.0 A | 300.0 A | 228.0 A | 150.0 A | 114.0 A | 90.0 A | 75.00 A | 57.00 A | 45.00 A | 30.00 A | 15.00 A | 11.40 A | 7.800 A |
| Power | 3600 W | 4320 W | 4500 W | 4500 W | 4560 W | 4500 W | 4560 W | 4500 W | 4500 W | 4560 W | 4500 W | 4500 W | 4500 W | 4560 W | 4680 W |
| 6kW 4U High | 6-800(B) | 8-720(B) | 12.5-480(B) | 15-400(B) | 20-304(B) | 30-200(B) | 40-152(B) | 50-120(B) | 60-100(B) | 80-76(B) | 100-60(B) | 150-40(B) | 300-20(B) | 400-15.2(B) | 600-10.4(B) |
| | 6-800(C) | 8-720(C) | 12.5-480(C) | 15-400(C) | 20-304(C) | 30-200(C) | 40-152(C) | 50-120(C) | 60-100(C) | 80-76(C) | 100-60(C) | 150-40(C) | 300-20(C) | 400-15.2(C) | 600-10.4(C) |
| | 6-800(D) | 8-720(D) | 12.5-480(D) | 15-400(D) | 20-304(D) | 30-200(D) | 40-152(D) | 50-120(D) | 60-100(D) | 80-76(D) | 100-60(D) | 150-40(D) | 300-20(D) | 400-15.2(D) | 600-10.4(D) |
| Voltage | 6.000 V | 8.000 V | 12.50 V | 15.00 V | 20.00 V | 30.00 V | 40.00 V | 50.00 V | 60.00 V | 80.00 V | 100.0 V | 150.0 V | 300.0 V | 400.0 V | 600.0 V |
| Current | 800.0 A | 720.0 A | 480.0 A | 400.0 A | 304.0 A | 200.0 A | 152.0 A | 120.0 A | 100.0 A | 76.0 A | 60.00 A | 40.00 A | 20.00 A | 15.20 A | 10.40 A |
| Power | 4800 W | 5760 W | 6000 W | 6000 W | 6080 W | 6000 W | 6080 W | 6000 W | 6000 W | 6080 W | 6000 W | 6000 W | 6000 W | 6080 W | 6240 W |

Note: B: Input voltage 170~265VAC, single phase; C: Input voltage 180~253VAC, three-phase three-wire; D: Input voltage 360~440VAC, three-phase four-wire; No CE certificate.

## SPECIFICATIONS

| Model | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated output voltage (*1) | | V | 6 | 8 | 12.5 | 15 | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 150 | 300 | 400 | 600 |
| Rated output current (*2) | | A | 200 | 180 | 120 | 100 | 76 | 50 | 38 | 30 | 25 | 19 | 15 | 10 | 5 | 3.8 | 2.6 |
| Rated output power | | W | 1200 | 1440 | 1500 | 1500 | 1520 | 1500 | 1520 | 1500 | 1500 | 1520 | 1500 | 1500 | 1500 | 1520 | 1560 |
| Constant Voltage Mode | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| Line regulation (*3) | | mV | 2.6 | 2.8 | 3.25 | 3.5 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 17 | 32 | 42 | 62 |
| Load regulation (*4) | | mV | 2.6 | 2.8 | 3.25 | 3.5 | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 17 | 32 | 42 | 62 |
| Ripple and noise (*5) | p-p (*6) | mV | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 80 | 80 | 100 | 150 | 200 | 300 |
| | r.m.s. (*7) | mV | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 10 | 25 | 40 | 60 |
| Temperature coefficient | | ppm/℃ | 100ppm/℃ after a 30 minute warm-up | | | | | | | | | | | | | | |
| Remote snese compensation voltage (single wire) | | V | 1 | 1 | 1 | 1 | 1 | 1.5 | 2 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 |
| Rise time (*8) | Rated load | ms | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 150 | 150 | 150 | 150 | 200 | 250 |
| | No load | ms | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 150 | 150 | 150 | 150 | 200 | 250 |
| Fall time (*9) | Rated load | ms | 10 | 50 | 50 | 50 | 50 | 80 | 80 | 80 | 80 | 150 | 150 | 150 | 150 | 200 | 250 |
| | No load | ms | 500 | 600 | 700 | 700 | 800 | 900 | 1000 | 1100 | 1100 | 1200 | 1500 | 2000 | 2500 | 3000 | 4000 |
| Transient response time (*10) | | ms | 1.5 | 1.5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| Constant Current Mode | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| Line regulation (*3) | | mA | 22 | 20 | 14 | 12 | 9.6 | 7 | 5.8 | 5 | 4.5 | 3.9 | 3.5 | 3 | 2.5 | 2.38 | 2.26 |
| Load regulation (*11) | | mA | 45 | 41 | 29 | 25 | 20.2 | 15 | 12.6 | 11 | 10 | 8.8 | 8 | 7 | 6 | 5.76 | 5.52 |
| Ripple and noise (*12) | r.m.s. | mA | 400 | 360 | 240 | 200 | 152 | 125 | 95 | 85 | 75 | 57 | 45 | 35 | 25 | 17 | 12 |
| Temperature coefficient | | ppm/℃ | 100ppm/℃ after a 30 minute warm-up | | | | | | | | | | | | | | |
| Protection Function | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| Over voltage protection (OVP) | Setting range | V | 0.6 - 6.6 | 0.8-8.8 | 1.25 - 13.75 | 1.5 - 16.5 | 2 - 22 | 3 - 33 | 4 - 44 | 5 - 55 | 5 - 66 | 5 - 88 | 5 - 110 | 5 - 165 | 5 - 330 | 5 - 440 | 5 - 660 |
| | Setting accuracy | mV | 60 | 80 | 125 | 150 | 200 | 300 | 400 | 500 | 600 | 800 | 1000 | 1500 | 3000 | 4000 | 6000 |
| Over current protection (OCP) | Setting range | A | 5 - 220 | 5-198 | 5 - 132 | 5 - 110 | 5 - 83.6 | 5 - 55 | 3.8 - 41.8 | 3 - 33 | 2.5 - 27.5 | 1.9 - 20.9 | 1.5 - 16.5 | 1 - 11 | 0.5 - 5.5 | 0.38 - 4.18 | 0.26 - 2.86 |
| | Setting accuracy | mA | 4000 | 3600 | 2400 | 2000 | 1520 | 1000 | 760 | 600 | 500 | 380 | 300 | 200 | 100 | 76 | 52 |
| Under voltage limit (UVL) | Setting range | | 0 - 6.3 | 0 - 8.4 | 0 - 13.12 | 0 - 15.75 | 0 - 21 | 0 - 31.5 | 0 - 42 | 0 - 52.5 | 0 - 63 | 0 - 84 | 0 - 105 | 0 - 157.5 | 0 - 315 | 0 - 420 | 0 - 630 |
| 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. | | | | | | | | | | | | | | |
| Analog Programming and Monitoring | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| 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.<br>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 votage = 2V, Maximum sink current = 8mA. | | | | | | | | | | | | | | |
| Front Panel | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| Display, 4 digits | Voltage accuracy 0.1% + | mV | 12 | 16 | 25 | 30 | 40 | 60 | 80 | 100 | 120 | 160 | 200 | 300 | 600 | 800 | 1200 |
| | Current accuracy 0.2% + | mA | 600 | 540 | 360 | 300 | 228 | 150 | 114 | 90 | 75 | 57 | 45 | 30 | 15 | 11.4 | 7.8 |
| 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 | | | | | | | | | | | | | | |
| Programming and Measurement (RS-232/485, USB, LAN, GPIB) | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| Output voltage programming accuracy | 0.05% + | mV | 3 | 4 | 6.25 | 7.5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 75 | 150 | 200 | 300 |
| Output current programming accuracy | 0.2% + | mA | 200 | 180 | 120 | 100 | 76 | 50 | 38 | 30 | 25 | 19 | 15 | 10 | 5 | 3.8 | 2.6 |
| Output voltage programming resolution | | mV | 0.2 | 0.27 | 0.4 | 0.5 | 0.7 | 1 | 1.3 | 1.7 | 2 | 2.7 | 3.4 | 5.2 | 10.2 | 13.6 | 20.4 |
| Output current programming resolution | | mA | 6 | 6 | 4 | 3.3 | 2.5 | 1.7 | 1.2 | 1 | 0.8 | 0.65 | 0.5 | 0.34 | 0.19 | 0.13 | 0.09 |
| Output voltage measurement accuracy | 0.1% + | mV | 6 | 8 | 12.5 | 15 | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 150 | 300 | 400 | 600 |
| Output current measurement accuracy | 0.2% + | mA | 400 | 360 | 240 | 200 | 152 | 100 | 76 | 60 | 50 | 38 | 30 | 20 | 10 | 7.6 | 5.2 |
| Output voltage measurement resolution | | mV | 0.2 | 0.27 | 0.4 | 0.5 | 0.7 | 1 | 1.3 | 1.7 | 2 | 2.7 | 3.4 | 5.2 | 10.2 | 13.6 | 20.4 |
| Output current measurement resolution | | mA | 6 | 6 | 4 | 3.3 | 2.5 | 1.7 | 1.2 | 1 | 0.8 | 0.65 | 0.5 | 0.34 | 0.19 | 0.13 | 0.09 |
| Input Characteristics | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| Norminal input rating | | | 100Vac ~ 240Vac, 50Hz ~ 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 | | VA | 2000 | | | | | | | | | | | | | | |
| Power factor | 100Vac / 200Vac | | 0.99 / 0.98 | | | | | | | | | | | | | | |
| Efficiency (*13) | 100Vac / 200Vac | % | 76.5 / 79 | 78/81 | 82 / 85 | 82 / 85 | 83 / 86 | 83 / 86 | 84 / 87 | 84 / 87 | 84 / 87 | 84 / 87 | 84 / 87 | 84 / 87 | 84 / 87 | 84 / 87 | 84 / 87 |
| Hold-up time | | | 20ms or greater | | | | | | | | | | | | | | |
| Interface Capabilities | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| 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) | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| 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 | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| Operaing temperature | | | 0 ℃ ~ 50 ℃ (*14) | | | | | | | | | | | | | | |
| Storage temperature | | | -25 ℃ ~ 70 ℃ | | | | | | | | | | | | | | |
| Operating humidity | | | 20% ~ 85% RH; No condensation | | | | | | | | | | | | | | |
| Storage humidity | | | 90% RH or less; No condensation | | | | | | | | | | | | | | |
| Altitude | | | Maximum 2000m | | | | | | | | | | | | | | |
| General Specifications | | PSU | 6-200 | 8-180 | 12.5-120 | 15-100 | 20-76 | 30-50 | 40-38 | 50-30 | 60-25 | 80-19 | 100-15 | 150-10 | 300-5 | 400-3.8 | 600-2.6 |
| Weight | main unit only | kg | Less than 8.7kg | | | | | | | | | | | | | | |
| Dimensions | (WxHxD) | mm | 423 x 43.6 x 447.2 | | | | | | | | | | | | | | |
| Cooling | | | Forced air cooling by internal fan. | | | | | | | | | | | | | | |
| EMC | | | Complies with the European EMC directive 89/336/EEC for Class A test and measurement products. | | | | | | | | | | | | | | |
| Safety | | | Complies with the European Low Voltage Directive 73/23/EEC and carries the CE-marking. | | | | | | | | | | | | | | |
| Withstand voltage | | | AC to Chassis : 1500Vac/1min; AC to Output terminal : 3000Vac/1min;Vout ≦ 150V; Output terminal to Chassis : 1000Vdc/1min; 150<Vout ≦ 600; Output terminal to Chassis : 1500Vdc/1min | | | | | | | | | | | | | | |
| Insulation resistance | | | Chassis and output terminal: chassis and AC input; AC input and output terminal: 100MΩ or more (DC 1000V) | | | | | | | | | | | | | | |

Notes:
(*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 ~ 20V model the ripple is measured at 2V ~ rated 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.
(*14) If install the front panel filter kit, the temperature is guaranteed to 40 ℃.

# Programmable Switching D.C. Power Supply

## SPECIFICATIONS

| Model | | PSU | 6-400 | 8-360 | 12.5-240 | 15-200 | 20-152 | 30-100 | 40-76 | 50-60 | 60-50 | 80-38 | 100-30 | 150-20 | 300-10 | 400-7.6 | 600-5.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated output voltage (*1) | | V | 6 | 8 | 12.5 | 15 | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 150 | 300 | 400 | 600 |
| Rated output current (*2) | | A | 400 | 360 | 240 | 200 | 152 | 100 | 76 | 60 | 50 | 38 | 30 | 20 | 10 | 7.6 | 5.2 |
| Rated output power | | W | 2400 | 2880 | 3000 | 3000 | 3040 | 3000 | 3040 | 3000 | 3000 | 3040 | 3000 | 3000 | 3000 | 3040 | 3120 |
| Constant Voltage Mode | | PSU | 6-400 | 8-360 | 12.5-240 | 15-200 | 20-152 | 30-100 | 40-76 | 50-60 | 60-50 | 80-38 | 100-30 | 150-20 | 300-10 | 400-7.6 | 600-5.2 |
| Line regulation (*3) | | mV | 0.01% of rated output voltage +2mV | | | | | | | | | | | | | | |
| Load regulation (*4) | | mV | 0.01% of rated output voltage +5mV | | | | | | | | | | | | | | |
| Ripple and noise (*5) | p-p (*6) | mV | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 100 | 100 | 120 | 300 | 300 | 500 |
| | r.m.s. (*7) | mV | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 15 | 15 | 25 | 35 | 35 | 120 |
| Temperature coefficient | | ppm/℃ | 100ppm/℃ after a 30 minute warm-up | | | | | | | | | | | | | | |
| Temperature stability | | | 0.05% of rated output voltage over 8hrs interval following 30 minutes warm-up. Constant line, load & temp. | | | | | | | | | | | | | | |
| Warm-up drift | | | Less than 0.05% of rated output voltage +2mV over 30 minutes following power on. | | | | | | | | | | | | | | |
| Remote snese compensation voltage (single wire) | | V | 1 | 1 | 1 | 1 | 1 | 1.5 | 2 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 |
| Rise time (*8) | No load | ms | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 150 | 150 | 150 | 150 | 200 | 250 |
| Fall time (*9) | Rated load | ms | 10 | 50 | 50 | 50 | 50 | 80 | 80 | 80 | 80 | 150 | 150 | 150 | 150 | 200 | 250 |
| | No load | ms | 500 | 600 | 700 | 700 | 800 | 900 | 1000 | 1100 | 1100 | 1200 | 1500 | 2000 | 2500 | 3000 | 4000 |
| Transient response time (*10) | | ms | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Constant Current Mode | | PSU | 6-400 | 8-360 | 12.5-240 | 15-200 | 20-152 | 30-100 | 40-76 | 50-60 | 60-50 | 80-38 | 100-30 | 150-20 | 300-10 | 400-7.6 | 600-5.2 |
| Line regulation (*3) | | mA | 0.05% of rated output current | | | | | | | | | | | | | | |
| Load regulation (*11) | | mA | 0.5% of rated output current | | | | | | | | | 1% of rated output current | | | | | |
| Load regulation thermal drift | | | Less than 0.1% of rated output current over 30 minutes following load change. | | | | | | | | | | | | | | |
| Ripple and noise (*12) | r.m.s. | mA | 850 | 800 | 650 | 590 | 520 | 290 | 185 | 137 | 107 | 85 | 69 | 58 | 30 | 20 | 15 |
| Temperature coefficient | | ppm/℃ | 100ppm/℃ after a 30 minute warm-up | | | | | | | | | | | | | | |
| Temperature stability | | | 0.05% of rated output current over 8hrs interval following 30 minutes warm-up. Constant line, load & temp. | | | | | | | | | | | | | | |
| Warm-up drift | | | 6–15V model : Less than 0.5% rated output current over 30 minutes following power on ; 20–600V model : Less than 0.25% rated output current over 30 minutes following power on. | | | | | | | | | | | | | | |
| Protection Function | | PSU | 6-400 | 8-360 | 12.5-240 | 15-200 | 20-152 | 30-100 | 40-76 | 50-60 | 60-50 | 80-38 | 100-30 | 150-20 | 300-10 | 400-7.6 | 600-5.2 |
| Over voltage protection (OVP) | Setting range | V | 0.6 - 6.6 | 0.8-8.8 | 1.25 - 13.75 | 1.5 - 16.5 | 2 - 22 | 3 - 33 | 4 - 44 | 5 - 55 | 5 - 66 | 5 - 88 | 5 - 110 | 5 - 165 | 5 - 330 | 5 - 440 | 5 - 660 |
| | Setting accuracy | mV | 60 | 80 | 125 | 150 | 200 | 300 | 400 | 500 | 600 | 800 | 1000 | 1500 | 3000 | 4000 | 6000 |
| Over current protection (OCP) | Setting range | A | 5 - 440 | 5-396 | 5 - 262 | 5 - 220 | 5 - 167.2 | 5 - 110 | 5 - 83.6 | 5 - 66 | 5 - 55 | 3.8 - 41.8 | 3 - 33 | 2 - 22 | 1 - 11 | 0.76 - 8.36 | 0.52 - 5.72 |
| | Setting accuracy | A | 8 | 7.2 | 4.8 | 4 | 3.04 | 2 | 1.52 | 1.2 | 1 | 0.76 | 0.6 | 0.4 | 0.2 | 0.152 | 0.104 |
| Under voltage limit (UVL) | Setting range | | 0 - 6.3 | 0 - 8.4 | 0 - 13.12 | 0 - 15.75 | 0 - 21 | 0 - 31.5 | 0 - 42 | 0 - 52.5 | 0 - 63 | 0 - 84 | 0 - 105 | 0 - 157.5 | 0 - 315 | 0 - 420 | 0 - 630 |
| 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 | | | | | | | | | | | | | | |
| Front Panel | | PSU | 6-400 | 8-360 | 12.5-240 | 15-200 | 20-152 | 30-100 | 40-76 | 50-60 | 60-50 | 80-38 | 100-30 | 150-20 | 300-10 | 400-7.6 | 600-5.2 |
| Display, 4 digits Voltage accuracy | 0.1% + | mV | 12 | 16 | 25 | 30 | 40 | 60 | 80 | 100 | 120 | 160 | 200 | 300 | 600 | 800 | 1200 |
| Current accuracy | 0.2% + | mA | 1200 | 1080 | 720 | 600 | 456 | 300 | 228 | 180 | 150 | 114 | 90 | 60 | 30 | 22.8 | 15.6 |
| 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 | | | | | | | | | | | | | | |
| Programming and Measurement (RS-232/485, USB, LAN, GPIB) | | PSU | 6-400 | 8-360 | 12.5-240 | 15-200 | 20-152 | 30-100 | 40-76 | 50-60 | 60-50 | 80-38 | 100-30 | 150-20 | 300-10 | 400-7.6 | 600-5.2 |
| Output voltage programming accuracy | 0.05% + | mV | 3 | 4 | 6.25 | 7.5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 75 | 150 | 200 | 300 |
| Output current programming accuracy | 0.2% + | mA | 400 | 360 | 240 | 200 | 152 | 100 | 76 | 60 | 50 | 38 | 30 | 20 | 10 | 7.6 | 5.2 |
| Output voltage programming resolution | | mV | 0.2 | 0.27 | 0.4 | 0.5 | 0.7 | 1 | 1.3 | 1.7 | 2 | 2.7 | 3.4 | 5.2 | 10.2 | 13.6 | 20.4 |
| Output current programming resolution | | mA | 12 | 12 | 8 | 6.6 | 5 | 3.4 | 2.4 | 2 | 1.6 | 1.3 | 1 | 0.68 | 0.38 | 0.26 | 0.18 |
| Output voltage measurement accuracy | 0.1% + | mV | 6 | 8 | 12.5 | 15 | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 150 | 300 | 400 | 600 |
| Output current measurement accuracy | 0.2% + | mA | 800 | 720 | 480 | 400 | 304 | 200 | 152 | 120 | 100 | 76 | 60 | 40 | 20 | 15.2 | 10.4 |
| Output voltage measurement resolution | | mV | 0.2 | 0.27 | 0.4 | 0.5 | 0.7 | 1 | 1.3 | 1.7 | 2 | 2.7 | 3.4 | 5.2 | 10.2 | 13.6 | 20.4 |
| Output current measurement resolution | | mA | 12 | 12 | 8 | 6.6 | 5 | 3.4 | 2.4 | 2 | 1.6 | 1.3 | 1 | 0.68 | 0.38 | 0.26 | 0.18 |
| Input Characteristics | | PSU | 6-400 | 8-360 | 12.5-240 | 15-200 | 20-152 | 30-100 | 40-76 | 50-60 | 60-50 | 80-38 | 100-30 | 150-20 | 300-10 | 400-7.6 | 600-5.2 |
| Norminal input rating | | | B type : 1P2W 200V models | | | | | | | | | | | | | | |
| Input voltage range | | | B type : 1P2W 170 ~ 265Vac | | | | | | | | | | | | | | |
| Input frequency range | | | 47Hz – 63Hz | | | | | | | | | | | | | | |
| Maximum input current | 200Vac | A | B type : 22A | | | | | | | | | | | | | | |
| Inrush current | | | B type : 1P2W 200V models Less than 100A. | | | | | | | | | | | | | | |
| Power factor | 200Vac | | 0.98 @1 Phase 200Vac | | | | | | | | | | | | | | |
| Efficiency (*13) | | % | 78.5 | 81 | 85 | 85 | 86 | 86 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |
| Hold-up time | | | 20ms or greater | | | | | | | | | | | | | | |
| Interface Capabilities | | PSU | 6-400 | 8-360 | 12.5-240 | 15-200 | 20-152 | 30-100 | 40-76 | 50-60 | 60-50 | 80-38 | 100-30 | 150-20 | 300-10 | 400-7.6 | 600-5.2 |
| 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 | | | | | | | | | | | | | | |
| Environmental Conditions | | PSU | 6-400 | 8-360 | 12.5-240 | 15-200 | 20-152 | 30-100 | 40-76 | 50-60 | 60-50 | 80-38 | 100-30 | 150-20 | 300-10 | 400-7.6 | 600-5.2 |
| Operating temperature | | | 0 ~C – 50 ~C (*14) | | | | | | | | | | | | | | |
| Storage temperature | | | -25 ~C ~ 70 ~C | | | | | | | | | | | | | | |
| Operating humidity | | | 20% ~ 85% RH; No condensation | | | | | | | | | | | | | | |
| Storage humidity | | | 90% RH or less; No condensation | | | | | | | | | | | | | | |
| Altitude | | | Maximum 2000m | | | | | | | | | | | | | | |
| General Specifications | | PSU | 6-400 | 8-360 | 12.5-240 | 15-200 | 20-152 | 30-100 | 40-76 | 50-60 | 60-50 | 80-38 | 100-30 | 150-20 | 300-10 | 400-7.6 | 600-5.2 |
| Weight | main unit only | kg | Less than 20kg | | | | | | | | | | | | | | |
| Dimensions | (WxHxD) | mm | 423 x 87.2 x 447.2 | | | | | | | | | | | | | | |
| Cooling | | | Forced air cooling by internal fan. | | | | | | | | | | | | | | |
| Withstand voltage | | | AC to Chassis:500Vac/1min; AC to Output terminal:3000Vac/1min; Vout ≦ 150V; Output terminal to Chassis:1000Vdc/1min; 150<Vout ≦ 600; Output terminal to Chassis: 1500Vdc/1min | | | | | | | | | | | | | | |
| Insulation resistance | | | Chassis and output terminal; chassis and AC input; AC input and output terminal: 100MΩ or more (DC 1000V) | | | | | | | | | | | | | | |

Notes:
(*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) Single phase 200V models : 170 – 265Vac.
(*4) From No-load to Full-load, constant input voltage. Measured at the sensing point in Remote Sense.
(*5) Measured at rated output voltage and current with JEITA RC-9131B 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 2% of its rated output for a load change from 50 to 100% 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 – 20V model the ripple is measured at 2V – rated 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.
(*14) If install the front panel filter kit, the temperature is guaranteed to 40 ~C.

## SPECIFICATIONS

| Model | | PSU | 6-600 | 8-540 | 12.5-360 | 15-300 | 20-228 | 30-150 | 40-114 | 50-90 | 60-75 | 80-57 | 100-45 | 150-30 | 300-15 | 400-11.4 | 600-7.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated output voltage (*1) | | V | 6 | 8 | 12.5 | 15 | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 150 | 300 | 400 | 600 |
| Rated output current (*2) | | A | 600 | 540 | 360 | 300 | 228 | 150 | 114 | 90 | 75 | 57 | 45 | 30 | 15 | 11.4 | 7.8 |
| Rated output power | | W | 3600 | 4320 | 4500 | 4500 | 4560 | 4500 | 4560 | 4500 | 4500 | 4560 | 4500 | 4500 | 4500 | 4560 | 4680 |
| Constant Voltage Mode | | PSU | 6-600 | 8-540 | 12.5-360 | 15-300 | 20-228 | 30-150 | 40-114 | 50-90 | 60-75 | 80-57 | 100-45 | 150-30 | 300-15 | 400-11.4 | 600-7.8 |
| Line regulation (*3) | | mV | 0.01% of rated output voltage +2mV | | | | | | | | | | | | | | |
| Load regulation (*4) | | mV | 0.01% of rated output voltage +5mV | | | | | | | | | | | | | | |
| Ripple and noise (*5) | p-p (*6) | mV | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 100 | 100 | 120 | 300 | 300 | 500 |
| | r.m.s. (*7) | mV | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 15 | 15 | 25 | 35 | 35 | 120 |
| Temperature coefficient | | ppm/℃ | 100ppm/℃ after a 30 minute warm-up | | | | | | | | | | | | | | |
| Temperature stability | | | 0.05% of rated output voltage over 8hrs interval following 30 minutes warm-up. Constant line, load & temp. | | | | | | | | | | | | | | |
| Warm-up drift | | | Less than 0.05% of rated output voltage +2mV over 30 minutes following power on. | | | | | | | | | | | | | | |
| Remote snese compensation voltage (single wire) | | V | 1 | 1 | 1 | 1 | 1 | 1.5 | 2 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 |
| Rise time (*8) | No load | ms | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 150 | 150 | 150 | 150 | 200 | 250 |
| Fall time (*9) | Rated load | ms | 10 | 50 | 50 | 50 | 50 | 80 | 80 | 80 | 80 | 150 | 150 | 150 | 150 | 200 | 250 |
| | No load | ms | 500 | 600 | 700 | 700 | 800 | 900 | 1000 | 1100 | 1100 | 1200 | 1500 | 2000 | 2500 | 3000 | 4000 |
| Transient response time (*10) | | ms | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Constant Current Mode | | PSU | 6-600 | 8-540 | 12.5-360 | 15-300 | 20-228 | 30-150 | 40-114 | 50-90 | 60-75 | 80-57 | 100-45 | 150-30 | 300-15 | 400-11.4 | 600-7.8 |
| Line regulation (*3) | | mA | 0.1% of rated output cur | 0.05% of rated output current | | | | | | | | | | | | | |
| Load regulation (*11) | | mA | 0.5% of rated output current | | | | | | | | | 1% of rated output current | | | | | |
| Load regulation thermal drift | | | Less than 0.1% of rated output current over 30 minutes following load change. | | | | | | | | | | | | | | |
| Ripple and noise (*12) | r.m.s. | mA | 1400 | 1315 | 1060 | 987 | 900 | 472 | 275 | 191 | 138 | 110 | 92 | 81 | 30 | 20 | 15 |
| Temperature coefficient | | ppm/℃ | 100ppm/℃ after a 30 minute warm-up | | | | | | | | | | | | | | |
| Temperature stability | | | 0.05% of rated output current over 8hrs interval following 30 minutes warm-up. Constant line, load & temp. | | | | | | | | | | | | | | |
| Warm-up drift | | | 6~15V model : Less than 0.5% rated output current over 30 minutes following power on.<br>20~600V model : Less than 0.25% rated output current over 30 minutes following power on. | | | | | | | | | | | | | | |
| Protection Function | | PSU | 6-600 | 8-540 | 12.5-360 | 15-300 | 20-228 | 30-150 | 40-114 | 50-90 | 60-75 | 80-57 | 100-45 | 150-30 | 300-15 | 400-11.4 | 600-7.8 |
| Over voltage protection (OVP) | Setting range | V | 0.6 - 6.6 | 0.8-8.8 | 1.25 - 13.75 | 1.5 - 16.5 | 2 - 22 | 3 - 33 | 4 - 44 | 5 - 55 | 5 - 66 | 5 - 88 | 5 - 110 | 5 - 165 | 5 - 330 | 5 - 440 | 5 - 660 |
| | Setting accuracy | mV | 60 | 80 | 125 | 150 | 200 | 300 | 400 | 500 | 600 | 800 | 1000 | 1500 | 3000 | 4000 | 6000 |
| Over current protection (OCP) | Setting range | A | 5 - 660 | 5-594 | 5 - 396 | 5 - 330 | 5 - 250.8 | 5 - 165 | 5 - 125.4 | 5 - 99 | 5 - 82.5 | 5 - 62.7 | 4.5 - 49.5 | 3 - 33 | 1.5 - 16.5 | 1.14 - 12.54 | 0.78 - 8.58 |
| | Setting accuracy | A | 12 | 10.8 | 7.2 | 6 | 4.56 | 3 | 2.28 | 1.8 | 1.5 | 1.04 | 0.9 | 0.6 | 0.3 | 0.228 | 0.156 |
| Under voltage limit (UVL) | Setting range | | 0 - 6.3 | 0 - 8.4 | 0 - 13.12 | 0 - 15.75 | 0 - 21 | 0 - 31.5 | 0 - 42 | 0 - 52.5 | 0 - 63 | 0 - 84 | 0 - 105 | 0 - 157.5 | 0 - 315 | 0 - 420 | 0 - 630 |
| 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 | | | | | | | | | | | | | | |
| Front Panel | | PSU | 6-600 | 8-540 | 12.5-360 | 15-300 | 20-228 | 30-150 | 40-114 | 50-90 | 60-75 | 80-57 | 100-45 | 150-30 | 300-15 | 400-11.4 | 600-7.8 |
| Display, 4 digits Voltage accuracy | 0.1% + | mV | 12 | 16 | 25 | 30 | 40 | 60 | 80 | 100 | 120 | 160 | 200 | 300 | 600 | 800 | 1200 |
| Current accuracy | 0.2% + | mA | 1800 | 1620 | 1080 | 900 | 684 | 450 | 342 | 270 | 225 | 171 | 135 | 90 | 45 | 34.2 | 23.4 |
| 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 | | | | | | | | | | | | | | |
| Programming and Measurement (RS-232/485, USB, LAN, GPIB) | | PSU | 6-600 | 8-540 | 12.5-360 | 15-300 | 20-228 | 30-150 | 40-114 | 50-90 | 60-75 | 80-57 | 100-45 | 150-30 | 300-15 | 400-11.4 | 600-7.8 |
| Output voltage programming accuracy | 0.05% + | mV | 3 | 4 | 6.25 | 7.5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 75 | 150 | 200 | 300 |
| Output current programming accuracy | 0.2% + | mA | 600 | 540 | 360 | 300 | 228 | 150 | 114 | 90 | 75 | 57 | 45 | 30 | 15 | 11.4 | 7.8 |
| Output voltage programming resolution | | mV | 0.2 | 0.27 | 0.4 | 0.5 | 0.7 | 1 | 1.3 | 1.7 | 2 | 2.7 | 3.4 | 5.2 | 10.2 | 13.6 | 20.4 |
| Output current programming resolution | | mA | 18 | 18 | 12 | 9.9 | 7.5 | 5.1 | 3.6 | 3 | 2.4 | 1.95 | 1.5 | 1.02 | 0.57 | 0.39 | 0.27 |
| Output voltage measurement accuracy | 0.1% + | mV | 6 | 8 | 12.5 | 15 | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 150 | 300 | 400 | 600 |
| Output current measurement accuracy | 0.2% + | mA | 1200 | 1080 | 720 | 600 | 456 | 300 | 228 | 180 | 150 | 114 | 90 | 60 | 30 | 22.8 | 15.6 |
| Output voltage measurement resolution | | mV | 0.2 | 0.27 | 0.4 | 0.5 | 0.7 | 1 | 1.3 | 1.7 | 2 | 2.7 | 3.4 | 5.2 | 10.2 | 13.6 | 20.4 |
| Output current measurement resolution | | mA | 18 | 18 | 12 | 9.9 | 7.5 | 5.1 | 3.6 | 3 | 2.4 | 1.95 | 1.5 | 1.02 | 0.57 | 0.39 | 0.27 |
| Input Characteristics | | PSU | 6-600 | 8-540 | 12.5-360 | 15-300 | 20-228 | 30-150 | 40-114 | 50-90 | 60-75 | 80-57 | 100-45 | 150-30 | 300-15 | 400-11.4 | 600-7.8 |
| Norminal input rating | | | B type : 1P2W 200V models, C type : 3P3W 200V models, D type : 3P4W 400V models | | | | | | | | | | | | | | |
| Input voltage range | | | B type : 1P2W 170 ~ 265Vac, C type : 3P3W 180 ~ 253Vac, D type : 3P4W 360 ~ 440Vac | | | | | | | | | | | | | | |
| Input frequency range | | | 47Hz ~ 63Hz | | | | | | | | | | | | | | |
| Maximum input current | 200Vac / 400Vac | A | B type : 33A、C type : 19A、D type 11A | | | | | | | | | | | | | | |
| Inrush current | | | B type : 1P2W 200V models Less than 150A; C type：3P3W 200V model Less than 100A; D type：3P4W 400V model Less than 50A. | | | | | | | | | | | | | | |
| Power factor | 200Vac / 400Vac | | 0.98 @1 Phase 200Vac / 0.95 @ 3 Phase 200/400Vac | | | | | | | | | | | | | | |
| Efficiency (*13) | | % | 78.5 | 81 | 85 | 85 | 86 | 86 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |
| Hold-up time | | | 20ms or greater | | | | | | | | | | | | | | |
| Interface Capabilities | | PSU | 6-600 | 8-540 | 12.5-360 | 15-300 | 20-228 | 30-150 | 40-114 | 50-90 | 60-75 | 80-57 | 100-45 | 150-30 | 300-15 | 400-11.4 | 600-7.8 |
| 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 | | | | | | | | | | | | | | |
| Environmental Conditions | | PSU | 6-600 | 8-540 | 12.5-360 | 15-300 | 20-228 | 30-150 | 40-114 | 50-90 | 60-75 | 80-57 | 100-45 | 150-30 | 300-15 | 400-11.4 | 600-7.8 |
| Operaing temperature | | | 0 ~ C ~ 50 ~ C (*14) | | | | | | | | | | | | | | |
| Storage temperature | | | -25 ~ C ~ 70 ~ C | | | | | | | | | | | | | | |
| Operating humidity | | | 20% ~ 85% RH; No condensation | | | | | | | | | | | | | | |
| Storage humidity | | | 90% RH or less; No condensation | | | | | | | | | | | | | | |
| Altitude | | | Maximum 2000m | | | | | | | | | | | | | | |
| General Specifications | | PSU | 6-600 | 8-540 | 12.5-360 | 15-300 | 20-228 | 30-150 | 40-114 | 50-90 | 60-75 | 80-57 | 100-45 | 150-30 | 300-15 | 400-11.4 | 600-7.8 |
| Weight | main unit only | kg | Less than 28.7kg | | | | | | | | | | | | | | |
| Dimensions | (WxHxD) | mm | 423 × 130.8 × 447.2 | | | | | | | | | | | | | | |
| Cooling | | | Forced air cooling by internal fan. | | | | | | | | | | | | | | |
| Withstand voltage | | | AC to Chassis : 1500Vac/1min; AC to Output terminal : 3000Vac/1min; Vout≦150V:Output terminal to Chassis:1000Vdc/1min; 150<Vout≦600; Output terminal to Chassis:1500Vdc/1min | | | | | | | | | | | | | | |
| Insulation resistance | | | Chassis and output terminal; chassis and AC input; AC input and output terminal: 100MΩ or more (DC 1000V) | | | | | | | | | | | | | | |

Notes:
(*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) Single phase 200V models: 170-265Vac. Three phase 200V models : 180-253Vac. Three phase 400V models : 360-440Vac.
(*4) From No-load to Full-load, constant input voltage. Measured at the sensing point in Remote Sense.
(*5) Measured at rated output voltage and current with JEITA RC-9131B 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 2% of its rated output for a load change from 50 ~ 100% 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 ~ 20V model the ripple is measured at 2V ~ rated output voltage and full output current. For other models, the ripple is measured at 10 ~ 100% output voltage and full output current.
(*13) Single phase and three phase 200V models : at 200Vac input voltage. Three phase 400V models : at 400Vac input voltage. At rated output power.
(*14) If install the front panel filter kit, the temperature is guaranteed to 40 ~ C.

# Programmable Switching D.C. Power Supply

## SPECIFICATIONS

| Model | | PSU | 6-800 | 8-720 | 12.5-480 | 15-400 | 20-304 | 30-200 | 40-152 | 50-120 | 60-100 | 80-76 | 100-60 | 150-40 | 300-20 | 400-15.2 | 600-10.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated output voltage (*1) | | V | 6 | 8 | 12.5 | 15 | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 150 | 300 | 400 | 600 |
| Rated output current (*2) | | A | 800 | 720 | 480 | 400 | 304 | 200 | 152 | 120 | 100 | 76 | 60 | 40 | 20 | 15.2 | 10.4 |
| Rated output power | | W | 4800 | 5760 | 6000 | 6000 | 6080 | 6000 | 6080 | 6000 | 6000 | 6080 | 6000 | 6000 | 6000 | 6080 | 6240 |
| Constant Voltage Mode | | PSU | 6-800 | 8-720 | 12.5-480 | 15-400 | 20-304 | 30-200 | 40-152 | 50-120 | 60-100 | 80-76 | 100-60 | 150-40 | 300-20 | 400-15.2 | 600-10.4 |
| Line regulation (*3) | | mV | 0.01% of rated output voltage +2mV | | | | | | | | | | | | | | |
| Load regulation (*4) | | mV | 0.01% of rated output voltage +5mV | | | | | | | | | | | | | | |
| Ripple and noise (*5) | p-p (*6) | mV | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 100 | 100 | 120 | 300 | 300 | 500 |
| | r.m.s. (*7) | mV | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 15 | 15 | 25 | 35 | 35 | 120 |
| Temperature coefficient | | ppm/℃ | 100ppm/℃ after a 30 minute warm-up | | | | | | | | | | | | | | |
| Temperature stability | | | 0.05% of rated output voltage over 8hrs interval following 30 minutes warm-up. Constant line, load & temp. | | | | | | | | | | | | | | |
| Warm-up drift | | | Less than 0.05% of rated output voltage +2mV over 30 minutes following power on. | | | | | | | | | | | | | | |
| Remote snese compensation voltage (single wire) | | V | 1 | 1 | 1 | 1 | 1 | 1.5 | 2 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 |
| Rise time (*8) | No load | ms | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 150 | 150 | 150 | 150 | 200 | 250 |
| Fall time (*9) | Rated load | ms | 10 | 50 | 50 | 50 | 50 | 80 | 80 | 80 | 80 | 150 | 150 | 150 | 150 | 200 | 250 |
| | No load | ms | 500 | 600 | 700 | 700 | 800 | 900 | 1000 | 1100 | 1100 | 1200 | 1500 | 2000 | 2500 | 3000 | 4000 |
| Transient response time (*10) | | ms | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Constant Current Mode | | PSU | 6-800 | 8-720 | 12.5-480 | 15-400 | 20-304 | 30-200 | 40-152 | 50-120 | 60-100 | 80-76 | 100-60 | 150-40 | 300-20 | 400-15.2 | 600-10.4 |
| Line regulation (*3) | | mA | 0.1% of rated output current | | | | 0.05% of rated output current | | | | | | | | | | |
| Load regulation (*11) | | mA | 0.5% of rated output current | | | | | | | | | 1% of rated output current | | | | | |
| Load regulation thermal drift | | | Less than 0.1% of rated output current over 30 minutes following load change. | | | | | | | | | | | | | | |
| Ripple and noise (*12) | r.m.s. | mA | 2000 | 1900 | 1500 | 1390 | 1250 | 650 | 365 | 245 | 170 | 140 | 116 | 104 | 30 | 20 | 15 |
| Temperature coefficient | | ppm/℃ | 100ppm/℃ after a 30 minute warm-up | | | | | | | | | | | | | | |
| Temperature stability | | | 0.05% of rated output current over 8hrs interval following 30 minutes warm-up. Constant line, load & temp. | | | | | | | | | | | | | | |
| Warm-up drift | | | 6–15V model : Less than 0.5% rated output current over 30 minutes following power on.<br>20–600V model : Less than 0.25% rated output current over 30 minutes following power on. | | | | | | | | | | | | | | |
| Protection Function | | PSU | 6-800 | 8-720 | 12.5-480 | 15-400 | 20-304 | 30-200 | 40-152 | 50-120 | 60-100 | 80-76 | 100-60 | 150-40 | 300-20 | 400-15.2 | 600-10.4 |
| Over voltage protection (OVP) | Setting range | V | 0.6 - 6.6 | 0.8 -8.8 | 1.25 - 13.75 | 1.5 - 16.5 | 2 - 22 | 3 - 33 | 4 - 44 | 5 - 55 | 5 - 66 | 5 - 88 | 5 - 110 | 5 - 165 | 5 - 330 | 5 - 440 | 5 - 660 |
| | Setting accuracy | mV | 60 | 80 | 125 | 150 | 200 | 300 | 400 | 500 | 600 | 800 | 1000 | 1500 | 3000 | 4000 | 6000 |
| Over current protection (OCP) | Setting range | A | 5 - 880 | 5 -792 | 5 - 528 | 5 - 440 | 5 - 334.4 | 5 - 220 | 5 - 167.2 | 5 - 132 | 5 - 110 | 5 - 83.6 | 5 - 66 | 4 - 44 | 2 - 22 | 1.52 - 16.72 | 1.04 - 11.44 |
| | Setting accuracy | A | 16 | 14.4 | 9.6 | 8 | 6.08 | 4 | 3.04 | 2.4 | 2 | 1.52 | 1.2 | 0.8 | 0.4 | 0.304 | 0.208 |
| Under voltage limit (UVL) | Setting range | | 0 - 6.3 | 0 -8.4 | 0 - 13.12 | 0 - 15.75 | 0 - 21 | 0 - 31.5 | 0 - 42 | 0 - 52.5 | 0 - 63 | 0 - 84 | 0 - 105 | 0 - 157.5 | 0 - 315 | 0 - 420 | 0 - 630 |
| 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 | | | | | | | | | | | | | | |
| Front Panel | | PSU | 6-800 | 8-720 | 12.5-480 | 15-400 | 20-304 | 30-200 | 40-152 | 50-120 | 60-100 | 80-76 | 100-60 | 150-40 | 300-20 | 400-15.2 | 600-10.4 |
| Display, 4 digits Voltage accuracy | 0.1% + | mV | 12 | 16 | 25 | 30 | 40 | 60 | 80 | 100 | 120 | 160 | 200 | 300 | 600 | 800 | 1200 |
| Current accuracy | 0.2% + | mA | 2400 | 2160 | 1440 | 1200 | 912 | 600 | 456 | 360 | 300 | 228 | 180 | 120 | 60 | 45.6 | 31.2 |
| 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 | | | | | | | | | | | | | | |
| Programming and Measurement (RS-232/485, USB, LAN, GPIB) | | PSU | 6-800 | 8-720 | 12.5-480 | 15-400 | 20-304 | 30-200 | 40-152 | 50-120 | 60-100 | 80-76 | 100-60 | 150-40 | 300-20 | 400-15.2 | 600-10.4 |
| Output voltage programming accuracy | 0.05% + | mV | 3 | 4 | 6.25 | 7.5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 75 | 150 | 200 | 300 |
| Output current programming accuracy | 0.2% + | mA | 800 | 720 | 480 | 400 | 304 | 200 | 152 | 120 | 100 | 76 | 60 | 40 | 20 | 15.2 | 10.4 |
| Output voltage programming resolution | | mV | 0.2 | 0.27 | 0.4 | 0.5 | 0.7 | 1 | 1.3 | 1.7 | 2 | 2.7 | 3.4 | 5.2 | 10.2 | 13.6 | 20.4 |
| Output current programming resolution | | mA | 24 | 24 | 16 | 13.2 | 10 | 6.8 | 4.8 | 4 | 3.2 | 2.6 | 2 | 1.36 | 0.76 | 0.52 | 0.36 |
| Output voltage measurement accuracy | 0.1% + | mV | 6 | 8 | 12.5 | 15 | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 150 | 300 | 400 | 600 |
| Output current measurement accuracy | 0.2% + | mA | 1600 | 1440 | 960 | 800 | 608 | 400 | 304 | 240 | 200 | 152 | 120 | 80 | 40 | 30.4 | 20.8 |
| Output voltage measurement resolution | | mV | 0.2 | 0.27 | 0.4 | 0.5 | 0.7 | 1 | 1.3 | 1.7 | 2 | 2.7 | 3.4 | 5.2 | 10.2 | 13.6 | 20.4 |
| Output current measurement resolution | | mA | 24 | 24 | 16 | 13.2 | 10 | 6.8 | 4.8 | 4 | 3.2 | 2.6 | 2 | 1.36 | 0.76 | 0.52 | 0.36 |
| Input Characteristics | | PSU | 6-800 | 8-720 | 12.5-480 | 15-400 | 20-304 | 30-200 | 40-152 | 50-120 | 60-100 | 80-76 | 100-60 | 150-40 | 300-20 | 400-15.2 | 600-10.4 |
| Norminal input rating | | | B type : 1P2W 200V models, C type : 3P3W 200V models, D type : 3P4W 400V models | | | | | | | | | | | | | | |
| Input voltage range | | | B type : 1P2W 170 – 265Vac, C type : 3P3W 180 – 253Vac, D type : 3P4W 360 – 440Vac | | | | | | | | | | | | | | |
| Input frequency range | | | 47Hz – 63Hz | | | | | | | | | | | | | | |
| Maximum input current | 200Vac / 400Vac | A | B type : 44A, C type : 29A, D type 22A | | | | | | | | | | | | | | |
| Inrush current | | | B type : 1P2W 200V models Less than 200A; C type : 3P3W 200V model Less than 100A; D type : 3P4W 400V model Less than 100A. | | | | | | | | | | | | | | |
| Power factor | 200Vac / 400Vac | | 0.98 @1 Phase 200Vac / 0.95 @ 3 Phase 200/400Vac | | | | | | | | | | | | | | |
| Efficiency (*13) | | % | 78.5 | 81 | 85 | 85 | 86 | 86 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |
| Hold-up time | | | 20ms or greater | | | | | | | | | | | | | | |
| Interface Capabilities | | PSU | 6-800 | 8-720 | 12.5-480 | 15-400 | 20-304 | 30-200 | 40-152 | 50-120 | 60-100 | 80-76 | 100-60 | 150-40 | 300-20 | 400-15.2 | 600-10.4 |
| 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 | | | | | | | | | | | | | | |
| Environmental Conditions | | PSU | 6-800 | 8-720 | 12.5-480 | 15-400 | 20-304 | 30-200 | 40-152 | 50-120 | 60-100 | 80-76 | 100-60 | 150-40 | 300-20 | 400-15.2 | 600-10.4 |
| Operating temperature | | | 0˚C – 50˚C (*14) | | | | | | | | | | | | | | |
| Storage temperature | | | -25˚C – 70˚C | | | | | | | | | | | | | | |
| Operating humidity | | | 20% ~ 85% RH; No condensation | | | | | | | | | | | | | | |
| Storage humidity | | | 90% RH or less; No condensation | | | | | | | | | | | | | | |
| Altitude | | | Maximum 2000m | | | | | | | | | | | | | | |
| General Specifications | | PSU | 6-800 | 8-720 | 12.5-480 | 15-400 | 20-304 | 30-200 | 40-152 | 50-120 | 60-100 | 80-76 | 100-60 | 150-40 | 300-20 | 400-15.2 | 600-10.4 |
| Weight | main unit only | kg | Less than 37.4kg | | | | | | | | | | | | | | |
| Dimensions | (WxHxD) | mm | 423 x 174.4 x 447.2 | | | | | | | | | | | | | | |
| Cooling | | | Forced air cooling by internal fan. | | | | | | | | | | | | | | |
| Withstand voltage | | | AC to Chassis : 1500Vac/1min; AC to Output terminal : 3000Vac/1min; Vout ≦ 150V; Output terminal to Chassis:1000Vdc/1min; 150<Vout ≦ 600; Output terminal to Chassis:1500Vdc/1min | | | | | | | | | | | | | | |
| Insulation resistance | | | Chassis and output terminal; chassis and AC input; AC input and output terminal: 100MΩ or more (DC 1000V) | | | | | | | | | | | | | | |

Notes:
(*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) Single phase 200V models: 170 – 265Vac. Three phase 200V models : 180 – 253Vac. Three phase 400V models : 360 – 440Vac.
(*4) From No-load to Full-load, constant input voltage. Measured at the sensing point in Remote Sense.
(*5) Measured at rated output voltage and current with JEITA RC-9131B 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 2% of its rated output for a load change from 50 ~ 100% 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 ~ 20V model the ripple is measured at 2V ~ rated output voltage and full output current. For other models, the ripple is measured at 10 ~ 100% output voltage and full output current.
(*13) Single phase and three phase 200V models : at 200Vac input voltage. Three phase 400V models : at 400Vac input voltage. At rated output power.
(*14) If install the front panel filter kit, the temperature is guaranteed to 40˚C.

## 1U Handle & Bracket





PSU-3kW



PSU-4.5kW



PSU-6kW

## ORDERING INFORMATION

| | | |
|---|---|---|
| **PSU 6-200** | 1200W | Programmable Switching DC Power Supply |
| **PSU 8-180** | 1440W | Programmable Switching DC Power Supply |
| **PSU 12.5-120** | 1500W | Programmable Switching DC Power Supply |
| **PSU 15-100** | 1500W | Programmable Switching DC Power Supply |
| **PSU 20-76** | 1520W | Programmable Switching DC Power Supply |
| **PSU 30-50** | 1500W | Programmable Switching DC Power Supply |
| **PSU 40-38** | 1520W | Programmable Switching DC Power Supply |
| **PSU 50-30** | 1500W | Programmable Switching DC Power Supply |
| **PSU 60-25** | 1500W | Programmable Switching DC Power Supply |
| **PSU 80-19** | 1520W | Programmable Switching DC Power Supply |
| **PSU 100-15** | 1500W | Programmable Switching DC Power Supply |
| **PSU 150-10** | 1500W | Programmable Switching DC Power Supply |
| **PSU 300-5** | 1500W | Programmable Switching DC Power Supply |
| **PSU 400-3.8** | 1520W | Programmable Switching DC Power Supply |
| **PSU 600-2.6** | 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

| | |
|---|---|
| **PSU-01B** | Bus bar for 2 units in parallel connection |
| **PSU-01C** | Cable for 2 units in parallel connection |
| **PSU-02B** | Bus bar for 3 units in parallel connection |
| **PSU-02C** | Cable for 3 units in parallel connection |
| **PSU-03B** | Bus bar for 4 units in parallel connection |
| **PSU-03C** | Cable for 4 units in parallel connection |
| **PSU-232** | RS232 Cable with DB9 connector kit |
| **PSU-485** | RS485 Cable with DB9 connector kit |
| **PSU-001** | Front panel filter kit(factory Installed) |
| **PSU-01A** | Joins a vertical stack of 2 PSU units together. 2U-sized handles x2, joining plates x2 |
| **PSU-02A** | Joins a vertical stack of 3 PSU units together. 3U-sized handles x2, joining plates x2 |
| **PSU-03A** | Joins a vertical stack of 4 PSU units together. 4U-sized handles x2, joining plates x2 |
| **PSU-ISO-I** | Isolate current remote control card(factory option) |
| **PSU-ISO-V** | Isolate voltage remote control card(factory option) |
| **GTL-246** | USB Cable, USB 2.0A-B Type Cable, 4P |
| **GTL-258** | GPIB Cable, 2000mm |
| **GTL-259** | RS-232 Cable with DB9 connector to RJ45 |
| **GTL-260** | RS-485 Cable with Db9 connector to RJ45 |
| **GTL-261** | Serial Master Cable+Terminator, 0.5M |
| **GTL-262** | RS-485 Slave cable |
| **GRM-001** | Slide bracket 2pcs/set ,PSU option |
| **PSU-GPIB** | GPIB Interface card (factory option) |
| **GPW-001** | UL/CSA power cord 3m ,PSU option |
| **GPW-002** | VDE power cord 3m ,PSU option |
| **GPW-003** | PSE power cord 3m ,PSU option |

### FREE DOWNLOAD

**Driver** LabView Driver

**PSU-001**



**PSU-01C**



**PSU-02C**



**GPW-001**



**PSU-01A**



**PSU-01B**



**PSU-232**



**PSU-03B**



**GPW-002**



**PSU-02A**



**PSU-02B**



**PSU-485**



**PSU-03C**



**GPW-003**



**PSU-03A**



**GRM-001**



**GTL-259**



**GTL-260**



**GTL-261**



**GTL-262**



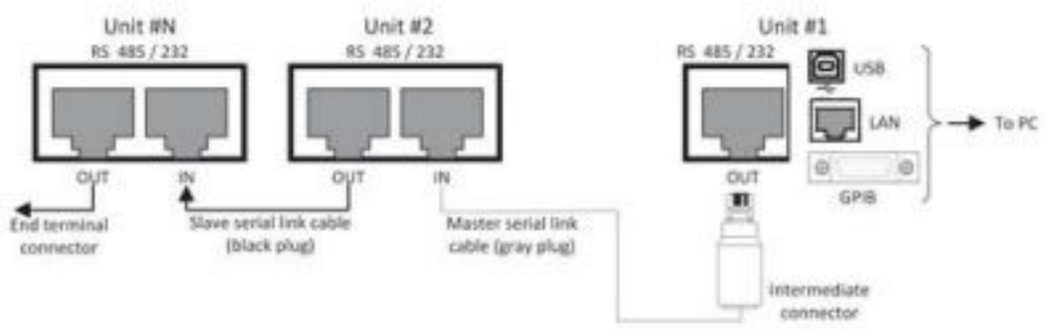
## A. SERIES/PARALLEL OPERATION AND HIGH POWER DENSITY

| Series Connection | 1 unit | 2 units |
|---|---|---|
| Height of sets | 1U | 2U |
| PSU 6-200 | 6V | 12V |
| | 200A | 200A |
| PSU 8-180 | 8V | 16V |
| | 180A | 180A |
| PSU 12.5-120 | 12.5V | 25V |
| | 120A | 120A |
| PSU 15-100 | 15V | 30V |
| | 100A | 100A |
| PSU 20-76 | 20V | 40V |
| | 76A | 76A |
| PSU 30-50 | 30V | 60V |
| | 50A | 50A |
| PSU 40-38 | 40V | 80V |
| | 38A | 38A |
| PSU 50-30 | 50V | 100V |
| | 30A | 30A |
| PSU 60-25 | 60V | 120V |
| | 25A | 25A |
| PSU 80-19 | 80V | 160V |
| | 19A | 19A |
| PSU 100-15 | 100V | 200V |
| | 15A | 15A |
| PSU 150-10 | 150V | 300V |
| | 10A | 10A |
| PSU 300-5 | 300V | 600V |
| | 5A | 5A |
| PSU 400-3.8 | 400V | NA |
| | 3.8A | NA |
| PSU 600-2.6 | 600V | NA |
| | 2.6A | NA |

| Series Parallel | 1 unit | 2 units | 3 units | 4 units |
|---|---|---|---|---|
| Height of sets | 1U | 2U | 3U | 4U |
| PSU 6-200 | 6V | 6V | 6V | 6V |
| | 200A | 400A | 600A | 800A |
| PSU 8-180 | 8V | 8V | 8V | 8V |
| | 180A | 360A | 540A | 720A |
| PSU 12.5-120 | 12.5V | 12.5V | 12.5V | 12.5V |
| | 120A | 240A | 360A | 480A |
| PSU 15-100 | 15V | 15V | 15V | 15V |
| | 100A | 200A | 300A | 400A |
| PSU 20-76 | 20V | 20V | 20V | 20V |
| | 76A | 152A | 228A | 304A |
| PSU 30-50 | 30V | 30V | 30V | 30V |
| | 50A | 100A | 150A | 200A |
| PSU 40-38 | 40V | 40V | 40V | 40V |
| | 38A | 76A | 114A | 152A |
| PSU 50-30 | 50V | 50V | 50V | 50V |
| | 30A | 60A | 90A | 120A |
| PSU 60-25 | 60V | 60V | 60V | 60V |
| | 25A | 50A | 75A | 100A |
| PSU 80-19 | 80V | 80V | 80V | 80V |
| | 19A | 38A | 57A | 76A |
| PSU 100-15 | 100V | 100V | 100V | 100V |
| | 15A | 30A | 45A | 60A |
| PSU 150-10 | 150V | 150V | 150V | 150V |
| | 10A | 20A | 30A | 40A |
| PSU 300-5 | 300V | 300V | 300V | 300V |
| | 5A | 10A | 15A | 20A |
| PSU 400-3.8 | 400V | 400V | 400V | 400V |
| | 3.8A | 7.6A | 11.4A | 15.2A |
| PSU 600-2.6 | 600V | 600V | 600V | 600V |
| | 2.6A | 5.2A | 7.8A | 10.4A |

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.

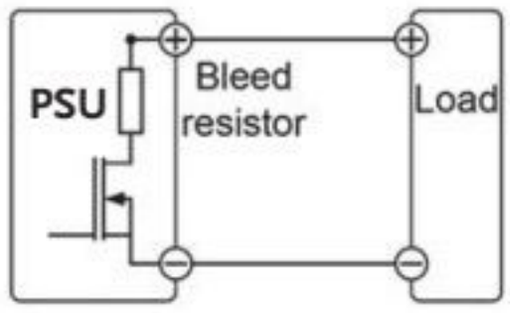
## B. REMOTE PROGRAM CONTROL (UP TO 31 UNITS CONNECTION)




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.
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.

* For the detailed information please refer to User Manual

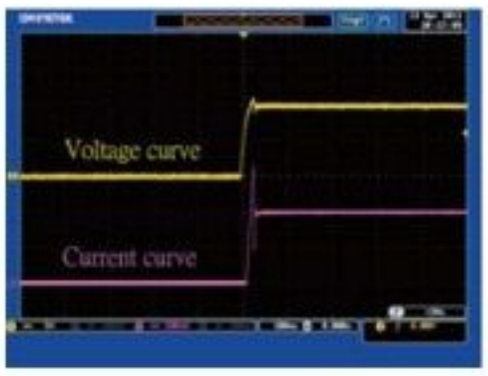
## C. BLEEDER CONTROL



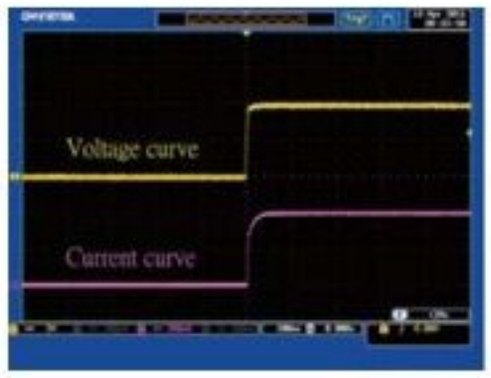

**PSU-Series Built-in Bleed Resistor**

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.

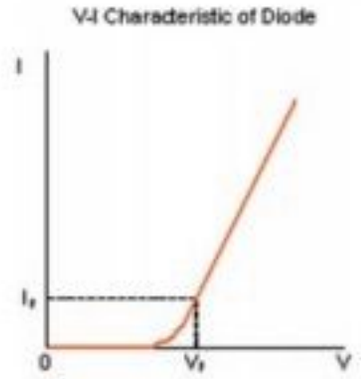
## D. C.V/C.C PRIORITY MODE



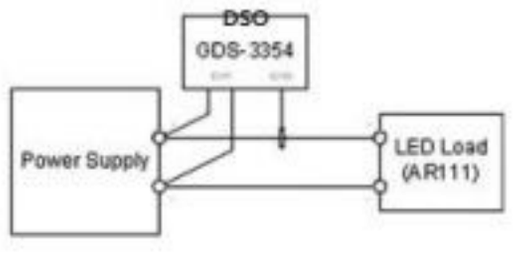

**Under the conventional C.V mode, inrush current and surge voltage appeared at forward voltage(Vf) of LED.**




**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.

## E. ADJUSTABLE SLEW RATE

| VOLTAGE SLEW RATE | CURRENT SLEW RATE |
|---|---|
| 0.001V~0.060V/msec (PSU 6-200) | 0.001A~2.000A / msec (PSU 6-200) |
| 0.001V~0.080V/msec(PSU 8-180) | 0.001A~1.800A / msec (PSU 8-180) |
| 0.001V~0.125V/msec (PSU 12.5-120) | 0.001A~1.200A / msec (PSU 12.5-120) |
| 0.001V~0.150V/msec(PSU 15-100) | 0.001A~1.000A / msec(PSU 15-100) |
| 0.001V~0.200V/msec (PSU 20-76) | 0.001A~0.760A / msec (PSU 20-76) |
| 0.001V~0.300V/msec(PSU 30-50) | 0.001A~0.500A / msec(PSU 30-50) |
| 0.001V~0.400V/msec (PSU 40-38) | 0.001A~0.380A / msec (PSU 40-38) |
| 0.001V~0.500V/msec(PSU 50-30) | 0.001A~0.300A / msec(PSU 50-30) |
| 0.001V~0.600V/msec (PSU 60-25) | 0.001A~0.250A / msec (PSU 60-25) |
| 0.001V~0.800V/msec(PSU 80-19) | 0.001A~0.190A / msec(PSU 80-19) |
| 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**

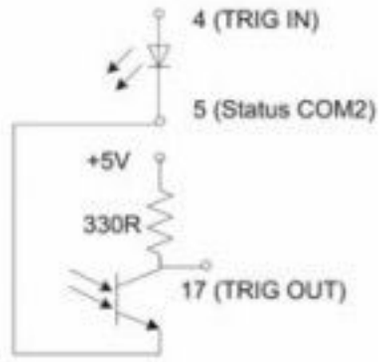
The PSU series can adjust slew rate for current and voltage. Via setting the rise and fall time of voltage and current, users can verify DUT's characteristics during voltage and current variation. Additionally, slew rate adjustment can mitigate voltage shift to effectively prevent DUT from being damaged by inrush current. This function is ideal for tests such as capacitive load and motor.

## F. OVP,OCP AND UVL

| MODEL | OCP | OVP | UVL |
|---|---|---|---|
| PSU 6-200 | 5 ~ 220A | 0.6 ~ 6.6V | 0 ~ 6.3V |
| PSU 8-180 | 5 ~ 198A | 0.8 ~ 8.8V | 0 ~ 8.4V |
| PSU 12.5-120 | 5 ~ 132A | 1.25 ~ 13.75V | 0 ~ 13.12V |
| PSU 15-100 | 5 ~ 110A | 1.5 ~ 16.5V | 0 ~ 15.75V |
| PSU 20-76 | 5 ~ 83.6A | 2 ~ 22V | 0 ~ 21V |
| PSU 30-50 | 5 ~ 55A | 3 ~ 33V | 0 ~ 31.5V |
| PSU 40-38 | 3.8 ~ 41.8A | 4 ~ 44V | 0 ~ 42V |
| PSU 50-30 | 3 ~ 33A | 5 ~ 55V | 0 ~ 52.5V |
| PSU 60-25 | 2.5 ~ 27.5A | 5 ~ 66V | 0 ~ 63V |
| PSU 80-19 | 1.9 ~ 20.9A | 5 ~ 88V | 0 ~ 84V |
| PSU 100-15 | 1.5 ~ 16.5A | 5 ~ 110V | 0 ~ 105V |
| PSU 150-10 | 1 ~ 11A | 5 ~ 165V | 0 ~ 157.5V |
| PSU 300-5 | 0.5 ~ 5.5A | 5 ~ 330V | 0 ~ 315V |
| PSU 400-3.8 | 0.38 ~ 4.18A | 5 ~ 440V | 0 ~ 420V |
| PSU 600-2.6 | 0.26 ~ 2.86A | 5 ~ 660V | 0 ~ 630V |

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.

## G. 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.

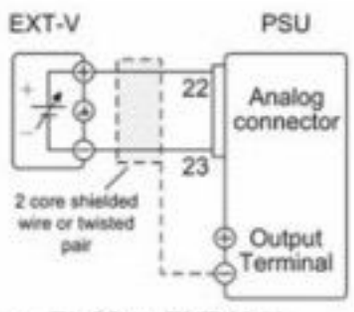
**Trigger Input function :**

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 :**

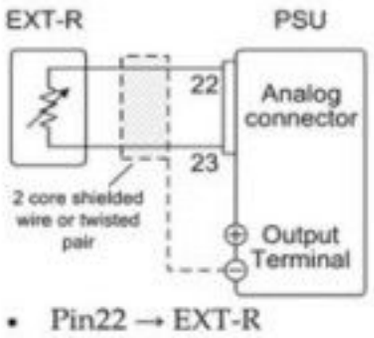
1. Allow users to set the effective pulse width from 0–60ms for trigger output (0: the LOW or HIGH signal of DC level for trigger output)
2. Set LOW or HIGH for output DC level
3. PSU produces trigger output signal when setting output or changing preset value or uploading preset memory parameters.

## H. EXTERNAL ANALOG CONTROL FUNCTION



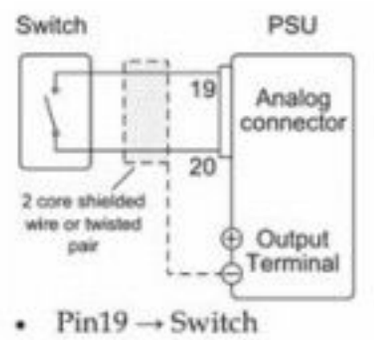

- Pin23 → EXT-V (-)
- Pin22 → EXT-V (+)
- Wire shield → negative (-) output terminal

**External Voltage Controls Voltage Range**




- Pin22 → EXT-R
- Pin23 → EXT-R
- Wire shield → negative (-) output terminal

**External Resistance Controls Voltage Range**




- Pin19 → Switch
- Pin20 → Switch
- Wire shield → negative (-) output terminal

**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.



# Fanless Multi-Range D.C. Power Supply



## PFR-100L



## PFR-100M

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

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.



## 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
- ✲ Interface: USB,LAN,RS-232/485(std.); GPIB(opt.)
- ✲ 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 |

| SPECIFICATIONS | | | |
|---|---|---|---|
| Model | | PFR-100L | PFR-100M |
| **OUTPUT RATING** | | | |
| Rated Output Voltage | | 50V | 250V |
| Rated Output Current | | 10A | 2A |
| Rated Output Power | | 100W | 100W |
| **REGULATION(CV)** | | | |
| Load Regulation (*2) | | 10mV | 33mV |
| Line Regulation (*1) | | 3mV | 5mV |
| **REGULATION(CC)** | | | |
| Load Regulation (*9) | | 10mA | 3.2mA |
| Line Regulation (*1) | | 8mA | 1.2mA |
| **RIPPLE & NOISE (*3)** | | | |
| Vp-p (*4) | | 50mV | 150mV |
| Vr.m.s.(*5) | | 4mV | 15mV |
| A r.m.s. | | 10mA | 2mA |
| **PROGRAMMING ACCURACY** | | | |
| Voltage | 0.1% of setting + | 40mV | 200mV |
| Current | 0.2% of setting + | 20mA | 2mA |
| **MEASUREMENT ACCURACY** | | | |
| Voltage | 0.1% of reading + | 40mV | 200mV |
| Current | 0.2% of reading + | 20mA | 2mA |
| **RESPONSE TIME** | | | |
| 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 |
| **PROGRAMMING RESOLUTION** | | | |
| Voltage | | 2mV | 10mV |
| Current | | 1mA | 0.1mA |
| **MEASUREMENT RESOLUTION** | | | |
| Voltage | | 2mV | 10mV |
| Current | | 1mA | 0.1mA |
| **PROTECTION FUNCTION** | | | |
| 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. |







## Rear Panel



# 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 | | | |
| Operating 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 | |
| READBACK TEMP. COEFFICIENT(After A 30 Minute Warm-up) | | | |
| Voltage | | 100ppm/℃ | |
| Current | | 200ppm/℃ | |
| OTHER | | | |
| Analog Control | | Yes | |
| Interface | | USB,LAN,RS-232/485(std.); GPIB(opt.) | |
| AC Input | | 85–265VAC, 47–63Hz, single phase | |
| 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 | GTL-259 | RS-232 Cable with DB9 connector to RJ45 |
| PSU-232 | RS-232 Cable with DB9 Connector Kit | GTL-260 | RS-485 Cable with DB9 connector to RJ45 |
| PSU-485 | RS-485 Cable with DB9 Connector Kit | GTL-261 | Serial Master Cable+Terminator, 0.5M |
| GTL-246 | USB Cable (USB 2.0 Type A-TypeB Cable) | GTL-262 | RS-485 Slave 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-GPIB | Optional GPIB Interface for PFR (Factory installed) | | |

GTL-259



GTL-260



GTL-261



GTL-262



## GRA-431-J/E Rack Mount Kit(JIS/EIA)





**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



# Programmable Switching D.C. Power Supply (Multi-range D.C. Power Supply)



## PSB-2400L2



## PSB-2400L/PSB-2400H/ PSB-2800L/PSB-2800H



## PSB-2800LS

CE USB RS-232 GPIB
Analog Control | Local Bus | Front/Rear Output | LabVIEW Driver

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<br>Current<br>Power | 0 – 80V<br>0 – 40A<br>400W | 0 – 80V<br>0 – 80A<br>800W | 0 – 80V x 2CH<br>0 – 40A x 2CH<br>800W | 0 – 800V<br>0 – 3A<br>400W | 0 – 800V<br>0 – 6A<br>800W | 80V<br>80A<br>800W |
| **REGULATION (CV)** | | | | | | |
| Load<br>Line | 0.01% ± 3mV of rated voltage<br>0.01% ± 2mV of rated voltage | | | 0.01% ± 30mV of rated voltage<br>0.01% ± 20mV of rated voltage | | N/A |
| **REGULATION (CC)** | | | | | | |
| Load<br>Line | 0.02% ± 3mA of rated current<br>0.01% ± 2mA of rated current | | | 0.05% ± 15mA of rated current<br>0.05% ± 10mA of rated current | | N/A |
| **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)<br>35mV(when current measures>2A) | 25mV(when current measures<2A)<br>40mV(when current measures>2A) | |
| CC rms | 30mA | 60mA | 30mA | 15mA | 20mA | |
| **PROGRAMMING ACCURACY** | | | | | | |
| Voltage<br>Current<br>Power | 0.1% setting±2digits<br>0.2%setting±2digits<br>± 10W | | | 0.1% setting±2digits<br>0.2% setting±2digits<br>±10W (only output voltage measures more than 1% of rated voltage) | | N/A |
| **READ BACK ACCURACY** | | | | | | |
| Voltage<br>Current<br>Power | 0.2% reading±2digits<br>0.3% reading±2digits<br>0.5% reading±5digits | | | 0.2% reading±2digits<br>0.3% reading±2digits<br>0.5% reading±Vout x 40mA | | N/A |
| **RESPONSE TIME** | | | | | | |
| Raise Time(Full load/No load)<br>Fall Time(Full load)<br>Fall Time(No load)<br>Load Transient Recover Time (Load change from 50~100%) | 50ms<br>100ms<br>500ms<br>1ms | | | 200ms<br>500ms<br>1000ms<br>7ms | | N/A |
| **PROGRAMMING RESOLUTION** | | | | | | |
| Voltage<br>Current<br>Power | 10mV<br>10mA<br>10W | | | 100mV<br>10mA<br>10W | | N/A |
| **MEASUREMENT RESOLUTION** | | | | | | |
| Voltage<br>Current<br>Power | 10mV<br>10mA<br>10W | | | 100mV<br>10mA<br>10W | | N/A |
| **SERIES AND PARALLEL CAPABILITY** | | | | | | |
| Channel Number<br>Series Operation<br>Parallel Operation<br>Parallel with booster PSB-2800LS | 1<br>Up to 2 Units<br>Up to 4 Units<br>N/A | 1<br>Up to 2 Units<br>Up to 4 Units<br>Up to 3 Units | 2<br>N/A<br>N/A<br>N/A | 1<br>N/A<br>Up to 2 Units<br>N/A | 1<br>N/A<br>Up to 2 Units<br>N/A | For PSB-2800L Only |
| **PPROTECTION FUNCTION** | | | | | | |
| OVP (Fixed)<br>OVP (Variable)<br>OCP (Fixed)<br>OCP (Variable)<br>OHP | Output off when 110% of rated voltage<br>Output off when operating; Setting range:1V–84V with front panel<br>Output off when 110% of rated current<br>Output off when operating;Setting range:1A–42A(84A for model number)<br>Output off above heat sink setting temperature | | | Output off when output voltage exceeds 110% of rated voltage<br>Presettable in range from 10V – 840V om front panel<br>Output off when output voltage exceed 110% of rated current<br>Presettable in range from 0.1A – 6.30A om front panel<br>Output off at the intemal heat sink temperature over setting value | | N/A |
| **ENVIRONMENT CONDITION** | | | | | | |
| Operation Temp<br>Storage Temp<br>Operating Humidity<br>Storage Humidity | 0℃ – 40℃<br>-20℃ – 70℃<br>30% – 80% RH (no dew condensation)<br>30% – 80% RH (no dew condensation) | | | | | N/A |
| **OTHER** | | | | | | |
| Inrush Current<br>Power Consumption/Factor | 35A Max<br>560VA/0.99 | 70A Max<br>1120VA/0.99 | 70A Mmax<br>1120VA/0.99 | 35A Max<br>560VA/0.99 | 70A Max<br>1120VA/0.99 | 70A Max<br>1120VA/0.99 |
| Cooling Method<br>Power Source<br>Interface (Standard)<br>Interface (Optional)<br>Analog Control | Forced air-cooling with fan motor<br>100VAC – 240VAC, 50/60Hz, Single phase<br>RS-232C/USB<br>GPIB<br>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







## ORDERING INFORMATION

| | |
|---|---|
| **PSB-2400L** | 0~80V/0~40A/400W Multi-Range DC Power Supply |
| **PSB-2800L** | 0~80V/0~80A/800W Multi-Range DC Power Supply |
| **PSB-2400L2** | 0~80V x 2/0~40A x 2/800W Multi-Range DC Power Supply |
| **PSB-2400H** | 0~800V/0~3A/400W Multi-Range DC Power Supply |
| **PSB-2800H** | 0~800V/0~6A/800W Multi-Range DC Power Supply |
| **PSB-2800LS** | 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

| | |
|---|---|
| **PSB-001** | GPIB Card |
| **PSB-003** | Parallel Connection Kit for Horizontal Installation. Kit Includes : (PSB-007 Joint Kit, Horizontal bus bar x 2 , PSB-005 x1) |
| **PSB-004** | Parallel Connection Kit for Vertical Installation. Kit Includes : (PSB-007 Joint Kit, Verical bus bar x 2, PSB-005 x 1) |
| **PSB-005** | Parallel Connection Signal Cable |
| **PSB-006** | Series Connection Signal Cable |
| **PSB-007** | Joint Kit : Includes 4 Joining Plates, (M3x6)screws x 4 ; (M3x8)screw x 2 |
| **PSB-008** | RS232C Cable (PSB-2000 Only) |
| **GTL-246** | USB Cable |
| **GTL-248** | GPIB Cable |
| **GRJ-1101** | Modular Cable |
| **GRA-424** | Rack Mount Kit |

### FREE DOWNLOAD

| | |
|---|---|
| **Driver** | Labview Driver |

**PSB-003 Parallel Connection Kit for Horizontal Installation**



**PSB-004 Parallel Connection Kit for Vertical Installation**



**PSB-001 GPIB Control Board**



**GRJ-1101 Modular Cable**



**PSB-008 RS-232C Cable** (PSB-2000 Only)



**PSB-005 Parallel Connection Signal Cable**



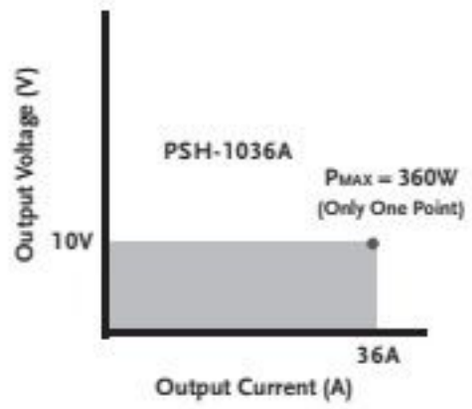
**PSB-006 Series Connection Signal Cable**



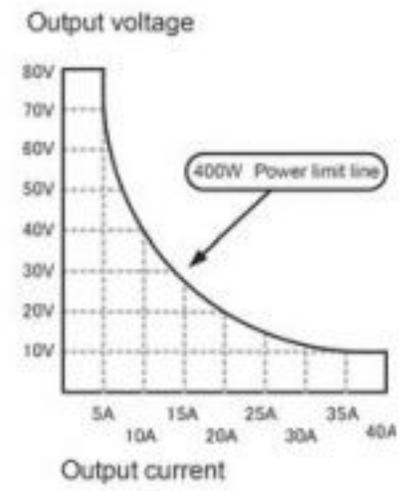
**PSB-007 Joint Kit**



## A. MULTI-RANGE OUTPUT OPERATION




**The operation area of a Conventional Power Supply**




**The operation area of a Multi-Range Power Supply for PSB-2000 Series**

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 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 Pmax=Vmax x Imax,, 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 :

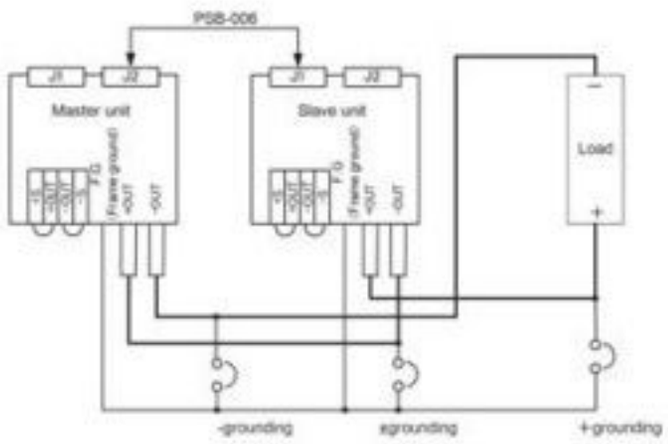
| MODEL | PSB-2400L | PSB-2800L | PSB-2400L2 | PSB-2400H | PSB-2800H | PSB-2800LS* |
|---|---|---|---|---|---|---|
| Channel Number | 1 | 1 | 2 | 1 | 1 | NA |
| Voltage Rating** | 0 ~ 80V | 0 ~ 80V | 0 ~ 80V x 2CH | 0 ~ 800V | 0 ~ 800V | 80V |
| Current Rating*** | 0 ~ 40A | 0 ~ 80A | 0 ~ 40A x 2CH | 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.

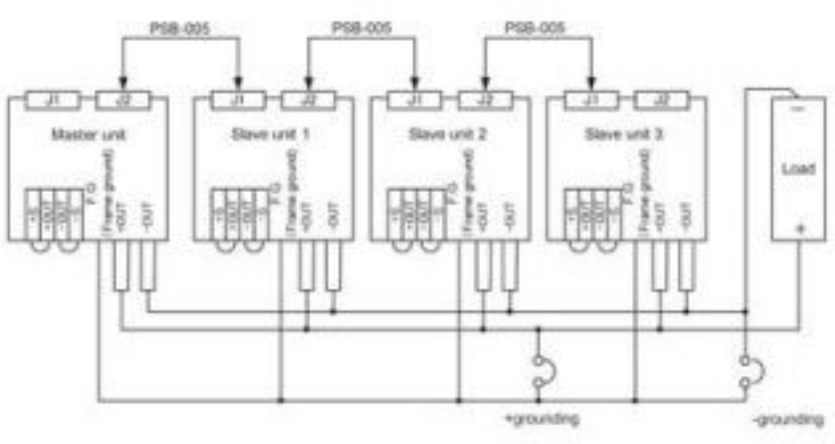
** The maximum current under the highest output voltage is power/voltage. For instance, when PSB-2400L outputs 80V the maximum current is 400W/80V = 5A .

*** Same as above. When PSB2400L outputs 40A the highest voltage is 400W/40A = 10V .

## C. SERIES AND PARALLEL CONNECTIONS




**Series Connection**




**Parallel 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 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

CE | GPIB | USB | LabVIEW Driver | Analog Control | LAN | Front/Rear Output

### 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)<br>Output Current(A)<br>Output Power(W) | 0~40<br>0~40<br>400W | 0~160<br>0~10<br>400W | 0~40<br>0~80<br>800W | 0~160<br>0~20<br>800W |
| **REGULATION (CV)** | | | | |
| Load Regulation (mV)<br>Line Regulation (mV) | 25<br>23 | 85<br>83 | 25<br>23 | 85<br>83 |
| **REGULATION (CC)** | | | | |
| Load Regulation (mA)<br>Line Regulation (mA) | 45<br>45 | 15<br>15 | 85<br>85 | 25<br>25 |
| **RIPPLE & NOISE (Noise Bandwidth 20MHz ; Ripple Bandwidth = 1MHz)** | | | | |
| CV p-p<br>CV rms<br>CC rms | 60<br>7<br>80 | 60<br>12<br>20 | 80<br>11<br>160 | 80<br>15<br>40 |
| **PROGRAMMING ACCURACY** | | | | |
| Voltage (mV) 0.1% +<br>Current (mA) 0.1% + | 10<br>20 | 50<br>10 | 10<br>40 | 50<br>20 |
| **MEASUREMENT ACCURACY** | | | | |
| Voltage (mV) 0.1% +<br>Current (mA) 0.1% + | 10<br>20 | 50<br>10 | 10<br>40 | 50<br>20 |
| **RESPONSE TIME** | | | | |
| Raise Time (ms)<br>Fall Time(Full load) (ms)<br>Fall Time(No load) (ms)<br>Load Transient Recover Time(ms)<br>(Load change from 50 to 100%) | 50<br>50<br>500<br>1 | 100<br>150<br>1200<br>1 | 50<br>50<br>500<br>1 | 100<br>150<br>1200<br>1 |
| **PROGRAMMING RESOLUTION (By PC Remote Control Mode)** | | | | |
| Voltage (mV)<br>Current (mA) | 1<br>1 | 3<br>1 | 1<br>2 | 3<br>1 |
| **MEASUREMENT RESOLUTION (By PC Remote Control Mode)** | | | | |
| Voltage (mV)<br>Current (mA) | 1<br>1 | 3<br>1 | 1<br>2 | 3<br>1 |
| **SERIES AND PARALLEL CAPABILITY** | | | | |
| Parallel Operation<br>Series Operation | Up to 4 units including the master unit<br>Up to 2 units including the master unit | | | |
| **PPROTECTION FUNCTION** | | | | |
| OVP (V)<br>OCP (A)<br>OHP | 4-44<br>4-44<br>Turn the output off. | 5-176<br>1-11<br>Turn the output off. | 4-44<br>5-88<br>Turn the output off. | 5-176<br>2-22<br>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(Option) | | | |
| 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

**PSB-1400L** 40V/40A/400W Programmable Multi-Range D.C. Power Supply
**PSB-1400M** 160V/10A/400W Programmable Multi-Range D.C. Power Supply
**PSB-1800L** 40V/80A/800W Programmable Multi-Range D.C. Power Supply
**PSB-1800M** 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

| | |
|---|---|
| **PSW-001** | Analog remote control connector kit |
| **PSW-002** | Simple IDC tool |
| **PSW-003** | Contact removal tool |
| **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 |
| **PSB-105** | GPIB card |
| **PSB-106** | Basic accessory kit :<br>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 |
| **GRA-418-J** | Rack Mount Kit(JIS) |
| **GRA-418-E** | Rack Mount Kit(EIA) |
| **GTL-123** | Test leads:1x red,1x black |

### FREE DOWNLOAD

| | |
|---|---|
| **Driver** | Labview Driver |

### 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



**PSB-105** GPIB card



# Programmable Switching D.C. Power Supply



## PSH-Series

RS-232 | GPIB | Rear-Panel Output | PC Software | LabVIEW Driver

## 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<br>Current | 20V<br>18A | 36V<br>10A | 36V<br>20A | 36V<br>30A |
| **REGULATION ( C.V. )** | | | | |
| Load<br>Line | ≦ 0.1%+5mV<br>≦ 0.05%+5mV | ≦ 0.1%+5mV<br>≦ 0.05%+5mV | ≦0.1%+5mV<br>≦0.05%+5mV | ≦ 0.1%+5mV<br>≦ 0.05%+5mV |
| **REGULATION ( C.C. )** | | | | |
| Load<br>Line | ≦ 0.2%+5mA<br>≦ 0.2%+5mA | ≦ 0.2%+5mA<br>≦ 0.2%+5mA | ≦0.2%+10mA<br>≦0.2%+10mA | ≦ 0.2%+15mA<br>≦ 0.2%+15mA |
| **RIPPLE & NOISE** | | | | |
| Voltage (mVrms)<br>Voltage (mVp-p)<br><br>Current (mArms) | ≦ 10mVrms<br>≦ 100mVp-p<br>20Hz–20MHz<br>≦ 0.2% | ≦ 10mVrms<br>≦ 100mVp-p<br>20Hz–20MHz<br>≦ 0.2% | ≦ 10mVrms<br>≦ 100mVp-p<br>20Hz–20MHz<br>≦0.2%+20mA | ≦ 10mVrms<br>≦ 100mVp-p<br>20Hz–20MHz<br>≦ 0.2%+40mA |
| **RESOLUTION** | | | | |
| Voltage<br>Current | 10mV<br>10mA | 10mV<br>10mA | 10mV<br>10mA | 10mV<br>10mA |
| **PROGRAM ACCURACY** | | | | |
| Voltage<br>Current | ≦ 0.05%+25mV<br>≦ 0.2%+30mA | ≦ 0.05%+25mV<br>≦ 0.2%+30mA | ≦ 0.05%+25mV<br>≦ 0.2%+30mA | ≦ 0.05%+25mV<br>≦ 0.2%+30mA |
| **READBACK RESOLUTION (Meter)** | | | | |
| Voltage<br>Current | Same as Resolution<br>Same as Resolution | Same as Resolution<br>Same as Resolution | Same as Resolution<br>Same as Resolution | As Resolution<br>As Resolution |
| **READBACK ACCURACY (Meter)** | | | | |
| Voltage<br>Current | Same as Program Accuracy<br>Same as Program Accuracy | Same as Program Accuracy<br>Same as Program Accuracy | Same as Program Accuracy<br>Same as Program Accuracy | As Program Accuracy<br>As Program Accuracy |
| **READBACK TEMP. COEFFICIENT** | | | | |
| Voltage (25 ±5℃) | ≦100ppm/°C | ≦100ppm/°C | ≦100ppm/°C | ≦100ppm/°C |
| **RESPONSE (Rise/Fall) TIME** | | | | |
| Voltage Up<br>(10%–90%)<br>Voltage Down<br>(90%–10%) | ≦150mS<br>(≦95% rating load)<br>≦150mS<br>(≧10% rating load) | ≦150mS<br>(≦95% rating load)<br>≦150mS<br>(≧10% rating load) | ≦150mS<br>(≦95% rating load)<br>≦150mS<br>(≧ 10% rating load) | ≦150mS<br>(≦95% rating load)<br>≦150mS<br>(≧10% rating load) |
| **RECOVERY TIME ( 50% Step Load Change From 25%–75% )** | | | | |
| CV Mode | ≦ 2mS | ≦ 2mS | ≦2mS | ≦2mS |
| **PROTECTION** | | | | |
| OVP/OCP/OTP | V | V | V | V |
| Rush Current | V | V | V | V |
| **OUTPUT ON/OFF CONTROL** | | | | |
| | V | V | V | V |
| **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



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.

## PSP-603/405/2010

CE RS-232 PC Software

## 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

**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 (mArms) | ≤ 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 |
| **READBACK (METER) RESOLUTION** | | | |
| Voltage | Same as Resolution | Same as Resolution | Same as Resolution |
| Current | Same as Resolution | Same as Resolution | Same as Resolution |
| **READBACK (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 | V | V | V |
| **OUTPUT ON/OFF CONTROL** | | | |
| | V | V | V |
| **DISPLAY** | | | |
| LCD | | | |
| **INTERFACE (STANDARD)** | | | |
| RS-232C | | | |
| **POWER SOURCE** | | | |
| AC 115V/230V±15% , 50/60Hz | | | |
| **DIMENSIONS & WEIGHT** | | | |
| 225(W) x 100(H) x 305(D) mm ; Approx. 4kg | | | |

### European Type Jack Terminal



### Rear Panel



## 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

# 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

CE Rear-Panel Output

### 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 ≤5mV<br>Load regulation ≤5mV |
| Ripple & Noise | ≤5mVrms, 100mVp-p 20Hz ~ 20MHz |
| Recovery Time | ≤500μS<br>(50% Load change, Minimum load 0.5A) |
| Temp. Coefficient | ≤ 100ppm /°C |
| Output Range | 0 to rating voltage continuously adjustable |

| CONSTANT CURRENT OPERATION | |
|---|---|
| Regulation | Line regulation ≤3mA<br>Load regulation ≤3mA |
| Ripple Current | ≤3mArms (SPS-606)<br>≤5mArms (SPS-3610)<br>≤10mArms (SPS-2415)<br>≤10mArms (SPS-1820)<br>≤30mArms (SPS-1230) |
| Output Range | 0 to rating current continuously adjustable<br>(HI/LO range switchable) |

| METER | |
|---|---|
| Type | 3 1/2 digit, 0.39" LED display |
| Accuracy | ± (0.5% of rdg + 2digits) |

| INSULATION | |
|---|---|
| Chassis and Terminal | 20MΩ or above ( DC 500V ) |
| Chassis and AC Cord | 30MΩ or above ( DC 500V ) |

| POWER SOURCE |
|---|
| AC 115V/ 230V± 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

# Multiple Output Dual Range D.C. Power Supply



## SPD-3606

CE Remote I/O

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.

## 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(Option)
- ☆ Optional European Jack Type Terminal

### European Type Jack Terminal



### Rear Panel



## GPS-001

### Voltage/Current protection Knob




## 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 | ≤ 0.01% + 3mV |
| Load | ≤ 0.01% + 5mV (rating current ≤ 6A) |
| | ≤ 0.01% + 8mV (rating current ≤ 12A) |
| Ripple & Noise | ≤ 5mVrms (5Hz ~ 1MHz ); ≤ 50mVpp (20Hz ~ 20MHz) |
| Recovery Time | ≤ 100 μs(50% load change, minimum load 0.5A) |
| **CURRENT REGULATION** | |
| Line | ≤ 0.2% + 3mA |
| Load | ≤ 0.2% + 3mA |
| Ripple & Noise | ≤ 3mArms |
| **TRACKING OPERATION** | |
| Tracking Error | ≤ 0.5% + 10mV of master |
| Series Regulation | ≤ 300mV |
| Ripple & Noise | ≤ 10mVrms (5Hz ~ 1MHz) ; ≤ 100mVpp (20Hz ~ 20MHz) |
| **OUTPUT ON/OFF RESPONSE TIME** | |
| Voltage Up (10% ~ 90%) | ≤ 100ms (≤ 95% rating load) |
| Voltage Down (90% ~ 10%) | ≤ 100ms (≥ 10% rating load) |
| **OVP** | |
| Accuracy | ± (0.5% of reading + 0.5V) |
| **METER** | |
| Type | 3 1/2digit 0.5" LED display |
| Accuracy | ± (0.5% of reading + 2 digits) |
| Resolution | 100mV/10mA |
| **INSULATION** | |
| Chassis & Terminal | 100MΩor above (DC 1000V) |
| Chassis & AC code | 100MΩor above (DC 1000V) |
| **TEMPERATURE COEFFICIENT** | |
| Voltage | ≤ 100ppm/°C + 3mV |
| Current | ≤ 150ppm/°C + 3mA |
| **REMOTE CONTROL** | |
| Output On/Off | |
| **FAN NOISE** | |
| ≤50dB | |
| **OPERATION ENVIRONMENT** | |
| Ambient temperature 0 ~ 40°C ; Relative humidity≤80% | |
| **STORAGE ENVIRONMENT** | |
| Ambient temperature -10 ~ 70°C ; Relative humidity≤70% | |
| **POWER SOURCE** | |
| AC 115V/230V±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



## GSM-20H10

NEW

CE | RS-232 | USB Host | USB Device | LAN | Digit I/O | GPIB

### FEATURES

- Maximum Output ±210V/±1.05A/22W
- Built-in 4 Sequence Output Modes (Stair, Log, SRC-MEM, Custom), up to 2500 Points
- OVP /OTP Protection Function
- 0.012% Basic Measure Accuracy with 6½-digit Resolution
- Variable Sampling Speed
- SDM (Source Delay Measure) Cycle
- 2-, 4-, and 6-wire Remote V-source and Measure Sensing
- Variable Display Digits
- Built-in Limit Function
- Built-in 5 Calculation Functions
- 4.3" TFT LCD, Digital Number Keyboard
- Built-in RTC Clock
- Interface: RS-232, USBTMC, LAN, GPIB (Opt.)

GW Instek GSM-20H10 is a Source Measure Unit that provides highly stable DC power and instrument-grade 6½-digit multimeter measurements. While operating, it can be used as a voltage source, current source, voltmeter, ammeter, and ohmmeter, which is uniquely ideal for the evaluation of component characteristics and the test applications of production, including nanomaterials and components, semiconductor architecture, organic materials, high-efficiency illumination, passive components and material characteristics analysis, etc.

GSM-20H10 provides four-quadrant operation of ±210V/±1.05A/22W. The first and third quadrants operate as power supplies to supply power to the load. The second and fourth quadrants function as loads to consume power internally. Voltage value, current value and resistance value can be measured while operating the power supply or load function with an accuracy of 0.012% and a resolution of 1μV/10pA/10μΩ.

With respect to sampling rate, GSM-20H10 supports a sampling rate of up to 50k points/second, which can accurately analyze the characteristics of the DUT. With the large 4.3-inch screen, all measurement settings, parameters and results can be completely displayed on the screen. The SDM (Source Delay Measure) function is provided to delay sampling when the signal changes so as to prevent the unstable signal from being captured and cause misjudgment. There are four built-in sequence output modes (Stair, Log, SRC-MEM, Custom), which can support up to 2500 points of sequence variation output.

Pertaining to protection, GSM-20H10 provides OVP/OTP modes. The design of OVP allows users to self-define the range of OVP. OTP can effectively prevent errors caused by temperature drift during the test process. For interfaces, this product supports standard SCPI commands and provides RS-232, USBTMC, LAN, GPIB (optional) interfaces to meet users' different interface needs.



GSM-20H10

### Rear Panel



### SM-01/SM-02 Digital I/O Adapter



## ORDERING INFORMATION

| | |
|---|---|
| **GSM-20H10 with GPIB** | Source Measure Unit |
| **GSM-20H10** | Source Measure Unit |

ACCESSORIES :

CD User manual x 1, Quick Start manual x 1, Test Lead GTL-207A x 1, Alligator Clip x 2

### OPTIONAL ACCESSORIES

| | |
|---|---|
| **SM-01** | Digital I/O Adapter, Convert DB15 to DB9 + 8-pin micro-DIN |
| **SM-02** | Digital I/O Adapter, Convert DB15 to DB37 + 8-pin micro-DIN |
| **GTL-246** | USB Cable (USB 2.0 A-B Type, approx.. 1200mm) |
| **GTL-248** | GPIB Cable, 2000mm |

**NOTE :**
1. Speed = Normal (1 NPLC). For 0.1 PLC, add 0.005% of range to offset specifications, except 200mV, 1A ranges, add 0.05%. For 0.01 PLC, add 0.05% of range to offset specifications, except 200mV, 1A ranges, add 0.5%.
2. Required to reach 0.1% of final value after Command is processed. Resistive load. 10μA to 100mA range.
3. Overshoot into a fully resistive 100kΩ load, 10Hz to 1MHz BW, adjacent ranges: 100mV typical, except 20V/200V.
4. Maximum time required for the output to begin to change following the receipt of:SOURce:VOLTage|CURRent <nrf> Command.
5. Reading rates applicable for voltage or current measurements, autorange off, filter off, display off, trigger delay = 0, and binary reading forma.
6. Purely resistive lead. 1μA and 10μA ranges <65ms.
7. 1000 point sweep was characterized with the source on a fixed rang.
8. Pass/Fail test performed using one high limit and one low math limit.
9. Includes time to re-program source to a new level before making measurement.
10. Time from falling edge of START OF TEST signal to falling edge of END OF TEST signal.
11. Command processing time of :SOURce:VOLTage|CURRent: TRIGgered<nrf> Command not included.

## SPECIFICATIONS

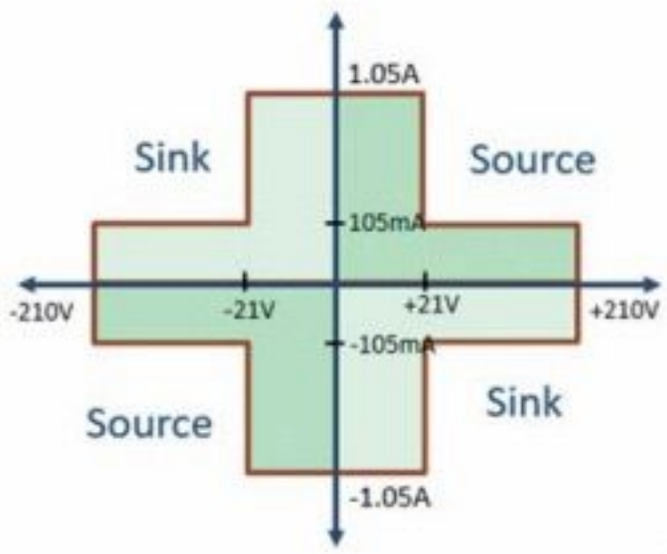
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **MAXIMUM RANGE** | **Voltage** | | ±210V | | | | | |
| | **Current** | | ±1.05A | | | | | |
| | **Power** | | 22W | | | | | |
| | **Voltage Resolution** | | 1μV | | | | | |
| | **Current Resolution** | | 10pA | | | | | |
| **SOURCE** | **DC Voltage** | **Output Voltage** | ±21V / ±1.05A, ±210V / ±105 mA | | | | | |
| | | **Current Limit** | Min. 0.1% of range | | | | | |
| | | **Programming Resolution & Accuracy *1** | Range | ±200.000mV | ±2.00000V | ±20.0000V | ±200.000V | |
| | | | Resolution | 1μV | 10μV | 100μV | 1mV | |
| | | | Accuracy | ±(0.02%+600μV) | ±(0.02%+600μV) | ±(0.02%+2.4mV) | ±(0.02%+24mV) | |
| | | **Load Regulation** | 0.01% of range + 100μV | | | | | |
| | | **Line Regulation** | 0.01% of range | | | | | |
| | | **Overshoot** | <0.1% typical (full scale step,resistive load, 10mA range) | | | | | |
| | | **Recovery Time (1000% Load Change)** | <250μs (within 0.1% plus load regulation errors, 1A and 100mA compliance.) | | | | | |
| | | **Ripple and Noise** | 4mVrms(20Hz~ 1MHz) / 10mVpp(20Hz~ 1MHz) | | | | | |
| | | **Temperature Coefficient** | ±(0.15 x accuracy specification)/°C (0°~18°C & 28°~50°C) | | | | | |
| | **DC Current** | **Output Current** | ±1.05A / ±21V, ±105 mA / ±210V | | | | | |
| | | **Voltage Limit** | Min. 0.1% of range | | | | | |
| | | **Programmed Source Resolution & Accuracy *1** | Range | ±1.00000μA | ±10.0000μA | ±100.000μA | ±1.00000mA | ±10.00000mA | ±100.000mA | ±1.00000A |
| | | | Resolution | 10pA | 100pA | 1nA | 10nA | 100nA | 1μA | 10μA |
| | | | Accuracy | ±(0.035%+600pA) | ±(0.033%+2nA) | ±(0.031%+20nA) | ±(0.034%+200nA) | ±(0.045%+2μA) | ±(0.066%+20μA) | ±(0.27%+900μA) |
| | | **Load Regulation** | 0.01% of range + 100pA | | | | | |
| | | **Line Regulation** | 0.01% of range | | | | | |
| | | **Overshoot** | <0.1% typical (1mA step, RL = 10kΩ, 20V range) | | | | | |
| | | **Temperature Coefficient** | ±(0.15 x accuracy specification)/°C (0°~18°C & 28°~50°C) | | | | | |
| | **General** | **Output Settling Time *2** | 100μs typical time | | | | | |
| | | **Output Rise Time (±30%)** | 300μs, 200V range, 100mA compliance ; 150μs, 20V range, 100mA compliance | | | | | |
| | | **DC Floating Voltage** | Output can be floated up to ±250VDC | | | | | |
| | | **Remote Sense** | Up to 1V drop per load lead | | | | | |
| | | **Compliance Accuracy** | Add 0.3% of range and ±0.02% of reading to base specification | | | | | |
| | | **Range Change Overshoot *3** | Adjacent range changes between 200mV, 2V and 20V ranges, 100mV typical | | | | | |
| | | **Minimum Compliance Value** | 0.1% of range | | | | | |
| | | **Command Processing Time *4** | Autorange On:10ms. Autorange Off: 7ms | | | | | |
| **MEASUREMENT** | **Voltage** | **Input Resistance** | >10 GΩ | | | | | |
| | | **Measurement Resolution & Accuracy** | Range | ±200.000mV | ±2.00000V | ±20.0000V | ±200.000V | |
| | | | Resolution | 1μV | 10μV | 100μV | 1mV | |
| | | | Accuracy | ±(0.012%+300μV) | ±(0.012%+300μV) | ±(0.015%+1.5mV) | ±(0.015%+10mV) | |
| | | **Temperature Coefficient** | ±(0.15 x accuracy specification)/°C (0°~18°C & 28°~50°C) | | | | | |
| | **Current** | **Voltage Burden (4-wire mode)** | < 1mV | | | | | |
| | | **Programmed Source Resolution & Accuracy *1** | Range | ±1.00000μA | ±10.0000μA | ±100.000μA | ±1.00000mA | ±10.00000mA | ±100.000mA | ±1.00000A |
| | | | Resolution | 10pA | 100pA | 1nA | 10nA | 100nA | 1μA | 10μA |
| | | | Accuracy | ±(0.029%+300pA) | ±(0.027%+700pA) | ±(0.025%+6nA) | ±(0.027%+60nA) | ±(0.035%+600nA) | ±(0.055%+6μA) | ±(0.22%+570μA) |
| | | **Temperature Coefficient** | ±(0.1 x accuracy specification) / °C (0°~18°C & 28°~50°C) | | | | | |
| | **Resistance** | **Range** | | <2.00000Ω | 2.00000Ω | 20.0000Ω | 200.000Ω | 2.00000kΩ | 20.0000kΩ |
| | | | Resolution | --- | 10μΩ | 100μΩ | 1mΩ | 10mΩ | 100mΩ |
| | | | Test current | --- | --- | 100mA | 10mA | 1mA | 100μA |
| | | | Accuracy | Source IACC+Meas.VACC | Source IACC+Meas.VACC | ±(0.1%+0.003Ω), Normal | ±(0.08%+0.03Ω), Normal | ±(0.07%+0.3Ω), Normal | ±(0.06%+3Ω), Normal |
| | | | | | | ±(0.07%+0.001Ω), Enhanced | ±(0.05%+0.01 Ω), Enhanced | ±(0.05%+0.1Ω), Enhanced | ±(0.04%+1Ω), Enhanced |
| | | | | 200.000kΩ | 2.00000MΩ | 20.0000MΩ | 200.000MΩ | >200.000MΩ | |
| | | | Resolution | 1Ω | 10Ω | 100Ω | 1kΩ | --- | |
| | | | Test current | 10μA | 5μA | 0.5μA | 100nA | --- | |
| | | | Accuracy | ±(0.07%+30Ω), Normal | ±(0.11%+300Ω), Normal | ±(0.11%+1kΩ), Normal | ±(0.66%+10kΩ), Normal | Source IACC+Meas.VACC | |
| | | | | ±(0.05%+10Ω), Enhanced | ±(0.05%+100Ω), Enhanced | ±(0.05%+500Ω), Enhanced | ±(0.35%+5kΩ), Enhanced | | |
| | | **Temperature Coefficient** | ±(0.15 x accuracy specification)/°C (0°~18°C & 28°~50°C) | | | | | |
| | | **Source I mode, Manual OHMS** | Total uncertainty = I source accuracy + V measure accuracy (4-wire remote sense) | | | | | |
| | | **Source V mode, Manual OHMS** | Total uncertainty = V source accuracy + I measure accuracy (4-wire remote sense) | | | | | |
| | | **6-wire OHMS Mode** | Available using active ohms guard and guard sense. Max. Guard Output Current: 50mA (except 1A range). Accuracy is load dependent | | | | | |
| | | **Guard Output Impedance** | <0.1Ω in ohms mode | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **SYSTEM SPEED *5** | **Maximum Range Change Rate** | | 75/second | | | | | | | |
| | **Maximum Measure Auto Range Time** | | 40ms (fixed source) *6 | | | | | | | |
| | **Sequence Reading Rates *7 (rdg./second) for 60Hz (50Hz)** | **Speed** | NPLC / Trig Origin | Measure | | Source-Measure *9 | | Source-Measure Pass/Fail test *8, *9 | | Measure Memory *9 | |
| | | | | TO MEMORY | TO GPIB | TO MEMORY | TO GPIB | TO MEMORY | TO GPIB | TO MEMORY | TO GPIB |
| | | **Fast** | 0.01 / internal | 2081 (2030) | 1198 (1210) | 1551 (1515) | 1000 (900) | 902 (900) | 809 (840) | 165 (162) | 164 (162) |
| | | **488.2** | 0.01 / external | 1239 (1200) | 1079 (1050) | 1018 (990) | 916 (835) | 830 (830) | 756 (780) | 163 (160) | 162 (160) |
| | | **Medium** | 0.1 / internal | 510 (433) | 509 (433) | 470 (405) | 470 (410) | 389 (343) | 388 (343) | 133 (126) | 132 (126) |
| | | **488.2** | 0.1 / external | 438 (380) | 438 (380) | 409 (360) | 409 (365) | 374 (333) | 374 (333) | 131 (125) | 131 (125) |
| | | **Normal** | 1 / internal | 59 (49) | 59 (49) | 58 (48) | 58 (48) | 56 (47) | 56 (47) | 44 (38) | 44 (38) |
| | | **488.2** | 1 / external | 57 (48) | 57 (48) | 57 (48) | 57 (47) | 56 (47) | 56 (47) | 44 (38) | 44 (38) |
| | **Single Reading Operation Rates (rdg./second) for 60Hz (50Hz)** | **Speed** | NPLC/ Trig Origin | Measure | | Source-Measure *9 | | Source-Measure Pass/Fail test *8, *9 | | | |
| | | | | TO GPIB | | TO GPIB | | TO GPIB | | | |
| | | **Fast(488.2)** | 0.01 / internal | 256 (256) | | 79 (83) | | 79 (83) | | | |
| | | **Medium(488.2)** | 0.1 / internal | 167 (166) | | 72 (70) | | 69 (70) | | | |
| | | **Normal(488.2)** | 1 / internal | 49 (42) | | 34 (31) | | 35 (30) | | | |
| | **Component Interface Handler Time for 60Hz (50Hz) *8, *10** | **Speed** | NPLC / Trig Origin | Measure | | Source Pass/Fail test | | Source-Measure Pass/Fail test *8, *11 | | | |
| | | | | TO GPIB | | TO GPIB | | TO GPIB | | | |
| | | **Fast** | 0.01 / internal | 1.04 ms (1.08 ms) | | 0.5 ms (0.5 ms) | | 4.82 ms (5.3 ms) | | | |
| | | **Medium** | 0.1 / internal | 2.55 ms (2.9 ms) | | 0.5 ms (0.5 ms) | | 6.27 ms (7.1 ms) | | | |
| | | **Normal** | 1 / internal | 17.53 ms (20.9 ms) | | 0.5 ms (0.5 ms) | | 21.31 ms (25.0 ms) | | | |
| | **Load Impedance** | | Stable into 20,000pF typical | | | | | | | | |
| | **Differential Mode Voltage** | | 250VPk | | | | | | | | |

| | | |
|---|---|---|
| **SYSTEM GENERAL** | **Common Mode Voltage** | 250VDC |
| | **Common Mode Isolation** | >10GΩ, <1000pF |
| | **Over Range** | 105% of range, source and measure |
| | **Max. Voltage Drop** | 5V |
| | **Max. Sense lead Resistance** | 1MΩ |
| | **Sense Input Impedance** | >100GΩ |
| | **Guard Offset Voltage** | <150μV, typical |
| | **Source Output Modes** | Fixed DC level, Memory List (mixed function), Stair (linear and log) |
| | **Source Memory List** | 100 points max. |
| | **Memory Buffer** | 5,000 readings @ 5 digits (two 2,500 point buffers). Includes selected measured value(s) and time stamp. Lithium battery backup(3 yr + battery life) |
| | **Programmability** | IEEE-488.2 (SCPI), RS-232 ; 5 user-definable power-up states plus factory default and *RST. |
| | **Digital I/O Connector** | Active low input. Start of test, end of test, 3 category bits. ; +5V@ 300mA supply. ; 1 trigger input, 4 TTL/Relay Drive outputs (33V@500mA, diode) |
| | **Remote Interface** | USB/GPIB/LAN/RS-232 |
| | **Insulation** | Chassis and terminal : 20MΩ or above (DC 500V) ; Chassis and AC cord : 30MΩ or above (DC 500V) |
| | **Operation Environment** | Indoor use, Altitude: ≤ 2000m Ambient temperature: 0 – 40°C Relative humidity: ≤ 80%; Installation category: II, Pollution degree: 2 |
| | **Storage Environment** | Temperature: -20°C ~ 70°C; Humidity: < 80% |
| | **Input Power** | 100-240VAC, 50-60Hz |
| | **Power Consumption** | 80W |
| | **Dimensions & Weight** | 214 (W) x 86 (H) x 356.5 (D) mm, Approx. 4.8kg |

# Source Measure Unit

## A. MAXIMUM OUTPUT: ±210V/±1.05A/22W

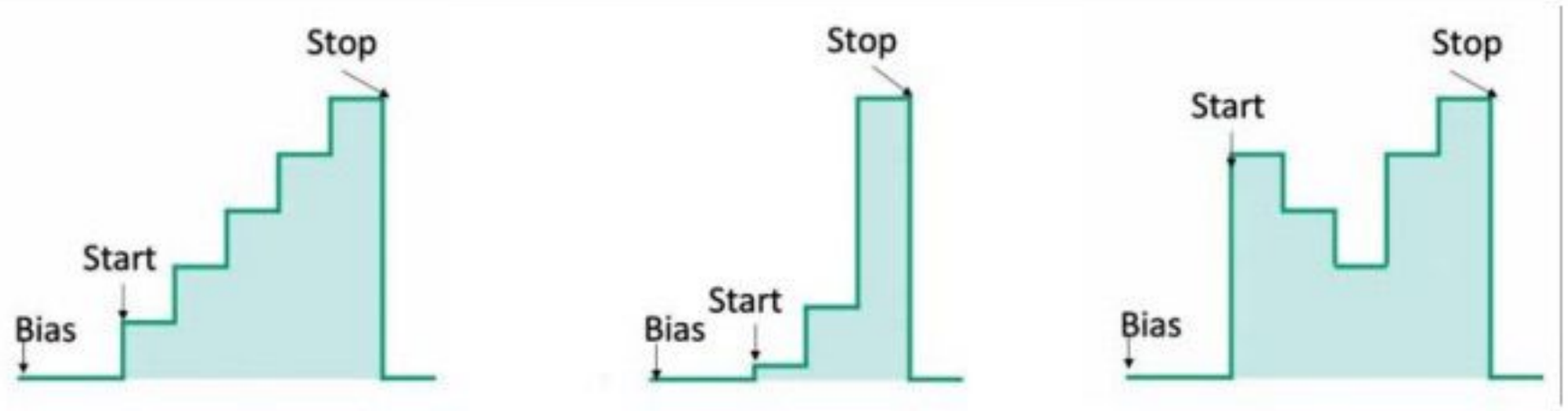



The power source output of the GSM-20H10 has two ranges.

The voltage range is ±21 volts, and the current is ±1.05A.
The voltage range is ±210 volts, and the current range is ±105mA.
The power capacity is 22W.

Provide a full range of four-quadrant measurement without duty cycle limit.

## B. BUILT-IN 4 SEQUENCE OUTPUT MODES, UP TO 2500 POINTS




**LINEAR STAIRCASE SWEEP** | **LOG STAIRCASE SWEEP** | **CUSTOM MODE**

GSM-20H10 Source Measure Unit provides four sequence output modes: linear staircase, log staircase, SRC-MEM (source memory) and Custom (self-defined).

With these output modes, users can quickly generate output as needed. The total number of sequence points is 2,500.

## C. OVP/OTP PROTECTION FUNCTION




In terms of protection, GSM-20H10 provides OVP/OTP protection modes; in the design of OVP, users can define the range of OVP, and the protection of OTP can effectively prevent errors caused by temperature drift during the test process.

## D. 0.012% BASIC MEASURE ACCURACY WITH 6½DIGIT RESOLUTION




GSM-20H10 provides a measurement accuracy of up to 0.012%, and provides a meter display function of up to 6½ digits, allowing users to have more accurate results when measuring small signals...

## E. VARIABLE SAMPLING SPEED

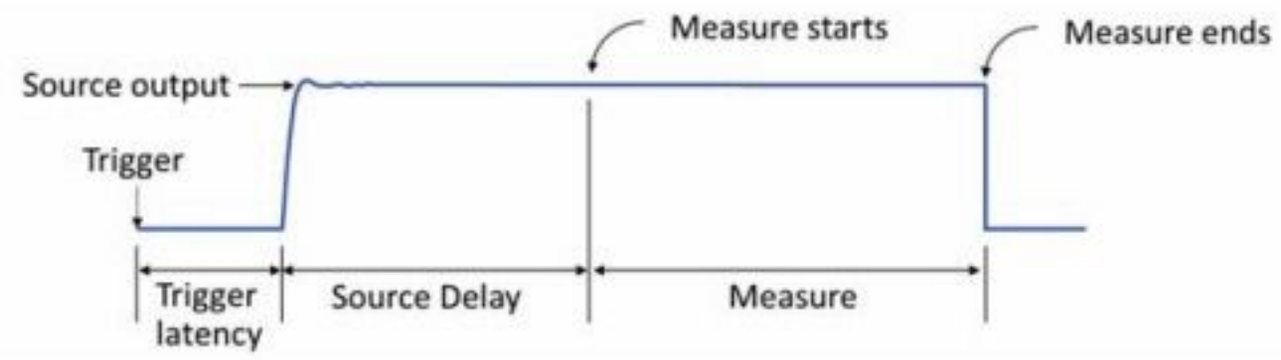



| SAMPLING MODE | FAST | MEDIUM | NORMAL | HIGH | OTHER |
|---|---|---|---|---|---|
| Speed, NPLC | 0.01 | 0.1 | 1 | 10 | User defined |
| Digit | 3½ | 4½ | 5½ | 6½ | Selectable |

The sampling rate of GSM-20H10 is variable. Therefore, users can choose the sampling rate from 0.01 PLC to 10 PLC according to their needs.

Where NPLC represents the number of power line cycles, for example, AC power frequency is 50Hz, 1 PLC means 20ms, 2 PLC means 40ms, and so on.

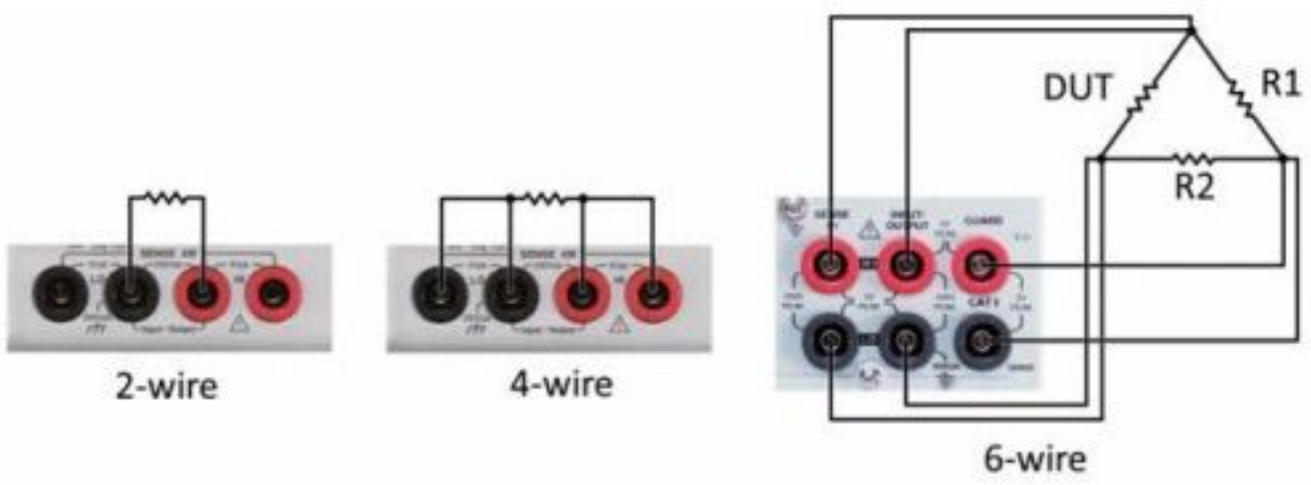
## F. SDM (SOURCE DELAY MEASURE) CYCLE




The initial state of the source output may be unstable. If the meter starts measuring after the source is output, users can set the source delay to start the meter measurement after passing the unstable period so as to obtain stable measurement results.

GSM-20H10 Source Measure Unit delay range is 0 to 9999.999 seconds.

## G. 2-, 4-, AND 6-WIRE REMOTE V-SOURCE AND MEASURE SENSING




Other than 2-wire, GSM-20H10 also provides 4-wire and 6-wire resistance measurements.

4-wire measurement eliminates the effect of lead resistance, realizing accurate measurement of small resistances below 100ohm at high currents.

6-wire combining 4-wire connection and the protection of ohm characteristics eliminate the effects of internal parallel resistance, realizing the resistance measurement of a tiny wire.

## H. VARIABLE DISPLAY DIGITS




The display bits of GSM-20H10 are variable. Therefore, users can choose the number of display bits among 3.5, 4.5, 5.5, and 6.5 bits according to their needs.

## I. BUILT-IN LIMIT FUNCTION




GSM-20H10 has three built-in Pass/Fail limit line tests with a total of 11 sets.

## J. BUILT-IN 5 CALCULATION FUNCTIONS

- Power = V•I
- $\text{CompOhms} = \frac{(V2-V1)}{(I2-I1)}$
- $\text{Vceoff}(\%) = \left[\frac{\Delta R}{(R2+\Delta V)}\right] * 100\%$
- $\text{VarAlpha}\ , \alpha = \frac{log(I2+I1)}{log(v2+V1)}$
- $\text{Dev} = \left[\frac{(X-Y)}{Y}\right] * 100\%$




GSM-20H10 provides five built-in calculation functions: Power, Offset Compensation Ohms, Voltage Coefficient, Varistor Alpha, and Percent Deviation.

# Programmable High Precision D.C. Power Supply



## PPH-1503

CE | USB Device | PC Software | Front Output | LAN | GPIB | LabVIEW Driver | Rear Output



## PPH-1503D/1506D/1510D

CE | USB Host | USB Device | Front Output | PC Software | LAN | GPIB | LabVIEW Driver | Rear Output

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.

## 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

## 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<br>Rear Terminal: 0~10A(0~ 4.5V) |
| | 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 Ouput | | ✓ | ✓ (CH1) | ✓ (CH1) | ✓ (CH1) |
| High Measurement Resolution | | ✓ (1mV/0.1μA) | ✓ (1mV/0.1μA) | ✓ (1mV/0.1μA) | ✓ (1mV/0.1μA) |
| 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:<br>LAN, USB, Analog Control Interface | GPIB<br>USB<br>LAN | ✓<br>✓ (CDC)<br>✓ | ✓<br>✓ (TMC)<br>✓ | ✓<br>✓ (TMC)<br>✓ | ✓<br>✓ (TMC)<br>✓ |

## PPH-1503 Rear Panel



## PPH-1503D/1506D/1510D Rear Panel



## 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

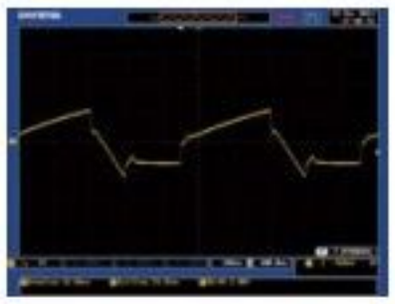
| Model | PPH-1503 | PPH-1503D | | PPH-1506D | | PPH-1510D | |
|---|---|---|---|---|---|---|---|
| **OUTPUT RATING** | | | | | | | |
| Number of Output Channel | 1 | 2 | | 2 | | 2 | |
| Channel No. | Ch 1 | Ch 1 | Ch 2 | Ch 1 | Ch 2 | Ch 1 | Ch 2 |
| Power | 45W | 45W | 18W | 45W | 36W | 45W | 36W |
| Voltage | 0 ~ 15V or 0 ~ 9V | 0 ~ 15V or 0 ~ 9V | 0 ~ 12V | 0 ~ 15V or 0 ~ 9V | 0 ~ 12V | 0 ~ 15V or 0 ~ 9V | 0 ~ 12V |
| Current | 0 ~ 3A or 0 ~ 5A | 0 ~ 3A or 0 ~ 5A | 0 ~ 1.5A | 0 ~ 3A or 0 ~ 5A | 0 ~ 3.0A | 0 ~ 3A or 0 ~ 5A<br>Rear:0~10A(under 0~4.5V) | 0 ~ 3.0A |
| 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%+50μA | — | | — | | — | |
| **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)<br>>5A : 12mVp-p(20Hz~20MHz) | |
| CV rms | 1mV | 3mV(0~1MHz) | | 3mV(0~1MHz) | | 3mV(0~1MHz) | |
| CC rms | — | — | | — | | — | |
| **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 | 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 | 0.2%+400μA(5A) | 0.2%+400μA | 0.2%+400μA(5A) | 0.2%+400μA |
| Current (500mA) | — | 0.2%+100μA | — | 0.2%+100μA | — | 0.2%+100μA | — |
| Current (5mA ) | 0.2%+1μA | 0.2%+1μA | 0.2%+1μA | 0.2%+1μA | 0.2%+1μA | 0.2%+1μA | 0.2%+1μA |
| **RESPONSE TIME** | | | | | | | |
| Transient Recovery Time (Response to 1000% Load Change) | <40μS(within 100mV)<br><80μS(within 20mV) | <40μS(within 100mV, Rear)<br><50μS(within 100mV,Front)<br><80μS(within 20mV) | | <40μS(within 100mV, Rear)<br><50μS(within 100mV,Front)<br><80μS(within 20mV) | | <40μS(within 100mV, Rear)<br><50μS(within 100mV,Front)<br><80μS(within 20mV) | |
| **PROGRAMMING RESOLUTION** | | | | | | | |
| Voltage | 2.5mV | 2.5mV | 2.5mV | 2.5mV | 2.5mV | 2.5mV | 2.5mV |
| Current (5A range) | 1.25mA | 1.25mA(5A) | 1.25mA | 1.25mA(5A) | 1.25mA | 1.25mA(5A) | 1.25mA |
| Current (500mA range) | — | 0.125mA | — | 0.125mA | — | 0.125mA | — |
| Current (5mA range) | | 1.25μA | | 1.25μA | | 1.25μA | |
| **READBACK RESOLUTION** | | | | | | | |
| Voltage | 1mV | 1mV | 1mV | 1mV | 1mV | 1mV | 1mV |
| Current (5A range) | 0.1mA | 0.1mA(5A) | 0.1mA(1.5A) | 0.1mA(5A) | 0.1mA(3A) | 0.1mA(5A) | 0.1mA(3A) |
| Current (500mA range) | — | 0.01mA | — | 0.01mA | — | 0.01mA | — |
| Current (5mA range) | 0.1μA | 0.1μA | 0.1μA | 0.1μA | 0.1μA | 0.1μA | 0.1μA |
| **PROTECTION FUNCTION** | | | | | | | |
| OVP Accuracy | 50mV | Ch1: 0.8V | Ch2: 50mV | Ch1: 0.8V | Ch2: 50mV | Ch1: 0.8V | Ch2: 50mV |
| OVP Resolution | 10mV | 10mV | 10mV | 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 | | 0 ~ 20VDC | | 0 ~ 20VDC | | 0 ~ 20VDC |
| Maximum Input Voltage | — | | -3V, +22V | | -3V, +22V | | -3V, +22V |
| Input Resistance and Capacitance | 100000MΩ | | 20MΩ | | 20MΩ | | 20MΩ |
| **PROGRAMMABLE OUTPUT RESISTANCE** | | | | | | | |
| Range | — | 0.001Ω ~ 1.000 Ω | — | 0.001Ω ~ 1.000 Ω | — | 0.001Ω ~ 1.000 Ω | — |
| Programming Accuracy | | 0.5% + 10 mΩ | | 0.5% + 10 mΩ | | 0.5% + 10 mΩ | |
| Resolution | | 1mΩ | | 1mΩ | | 1mΩ | |
| **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,10μs/Steps | | 0 ~ 100ms,10μs/Steps | | 0 ~ 100ms,10μs/Steps | |
| Average Readings | 1 ~ 100 | 1 ~ 100 | | 1 ~ 100 | | 1 ~ 100 | |
| Long Integration Pulse Time | 1S ~ 63S | 1S ~ 63S | | 1S ~ 63S | | 1S ~ 63S | |
| Long Integration Measurement Time | 850ms(60Hz)/840ms(50Hz)~60s,or Auto time<br>16.7ms/Steps(60Hz),20ms/Steps(50Hz) | 850ms(60Hz)/840ms(50Hz)~60s,or Auto time<br>16.7ms/Steps(60Hz),20ms/Steps(50Hz) | | 850ms(60Hz)/840ms(50Hz)~60s,or Auto time<br>16.7ms/Steps(60Hz),20ms/Steps(50Hz) | | 850ms(60Hz)/840ms(50Hz)~60s,or Auto time<br>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 | Rear Panel | Front/Rear Panel | Rear Panel | Front/Rear Panel | Rear Panel |
| DVM Input | Front/Rear Panel | — | Front Panel | — | Front Panel | — | Front 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°C | 0 ~ 40°C | | 0 ~ 40°C | | 0 ~ 40°C | |
| Operation Humidity | ≤ 80% | ≤ 80% | | ≤ 80% | | ≤ 80% | |
| Storage Temperature | -20°C ~ 70°C | -20°C ~ 70°C | | -20°C ~ 70°C | | -20°C ~ 70°C | |
| 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);<br>2A-0.1*(Vout-5)<br>(Vout>5V) | Ch1:0~4V:3.5A;<br>4~15V:3.5A-(0.25A/V)<br>*(Vset-4V) | Ch2: 0~5V:2A;<br>5~12V:2A-(0.1A/V)<br>*(Vset-5V) | Ch1:0~4V:3.5A;<br>4~15V:3.5A-(0.25A/V)<br>*(Vset-4V) | Ch2:0~5V:3A;<br>5~12V:3A-(0.25A/V)<br>*(Vset-5V) | Ch1:0~4V:3.5A;<br>4~15V:3.5A-(0.25A/V)<br>*(Vset-4V) | Ch2:0~5V:3A;<br>5~12V:3A-(0.25A/V)<br>*(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 | |

# Programmable High Precision D.C. Power Supply

## A. FAST RESPONSE TO LOAD AND VOLTAGE CHANGES



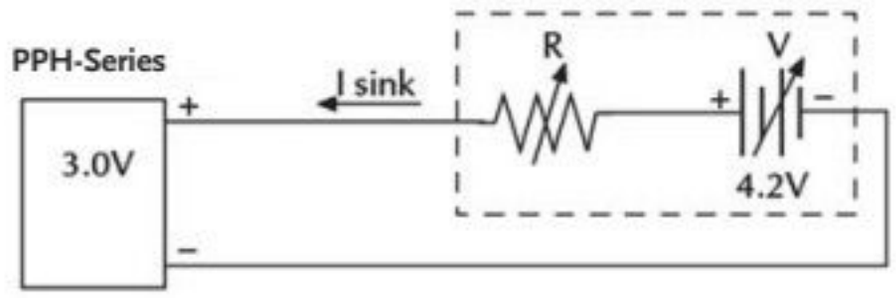
PPH-Series



Conventional Power Supply

When DUT such as cellular phone switches to idling, receiving or transmitting mode, the current drawn from power supply changes over tenfold. The sudden current change will cause the supplied voltage to drop as well. The conventional power supply is considered a dull device since it will take several milliseconds for the dropped voltage to return to the original level. PPH-Series is designed to simulate battery response when a significant voltage drop occurs. Recovery time of 40 µs or less is guaranteed when the maximum voltage drop is within 100mV.

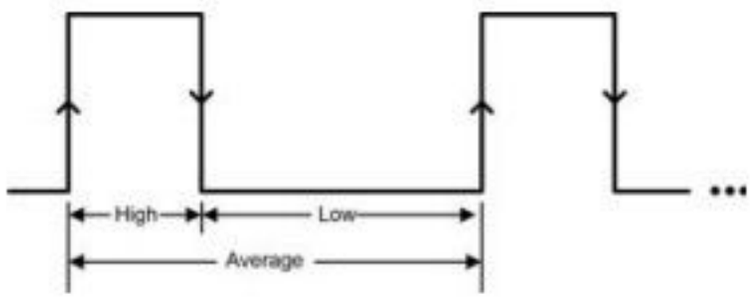
## B. SINK CURRENT FUNCTION




PPH-Series and an Electrical Potential Circuit

When connecting with an electric potential circuit and the output voltage of the tested electric potential circuit is greater than that of PPH-Series by approximately 0.3V to 2.5V, PPH-Series will automatically convert its power supply role to the sink current role acting as a load of voltage source. At this time, the voltage setting of PPH-Series can be regarded as the CV setting of an electronic load. A single PPH-Series can be used to charge battery and to simulate battery's load to consume power without extra instruments. PPH-Series is ideal for tests on battery and portable charger.

## C. PULSE CURRENT MEASUREMENTS




Pulse Current Measurement

PPH-Series DC power supply can perform current measurements for pulsing loads. To avoid false pulse detection, users can use a trigger level of up to 5A. All pulses, noise or other transients that are less than set trigger level will be ignored. The manual integration time range setting is 33 us to 833,333 us. Pulse current measurement can measure transient current consumption to provide the information for the allocation of power supply system for products' preliminary design, i.e. power supply circuits, battery selections for clients' product analyses. Portable communications products, i.e. RF modules and designs based upon blue tooth system can better use pulse current measurement function.

## D. LONG INTEGRATION CURRENT MEASUREMENT




Long Integration Current Measurement

Long integration current measurement is to measure the average current of periodical pulse current in a long period of time. The measured pulse current must be a complete periodical waveform or multiple complete periodical waveforms. The total measurement time is up to 60 seconds. Measurements can be taken from pulse's positive edge trigger or negative edge trigger. Users can also take measurements from the beginning of power output. Long integration current measurement is to analyze power consumption for a period of time. For instance, users can measure the average power consumption of a cellular phone in use to analyze its internal RF module parameters.

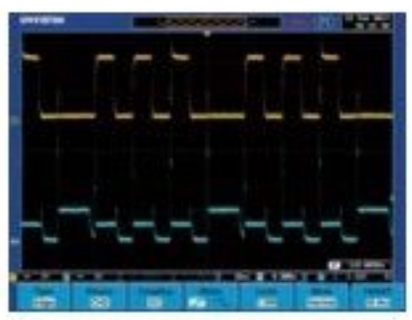
## E. BUILT-IN DIGITAL VOLTMETER




DVM Input for PPH-Series

The built-in Digital Volt-Meter (DVM) of PPH-Series has a dedicated input terminal located on the front panel. With the DC voltage measurement range from 0 to +20VDC, PPH-Series not only provides power supply for DUT but also measures the voltage on DUT. The read back accuracy reaches ±(0.05%+3mV) and read back resolution is 1mV. Users are able to save the cost of purchasing an extra voltage meter. Furthermore, DVM measurements can be remotely controlled by SCPI commands via a PC.

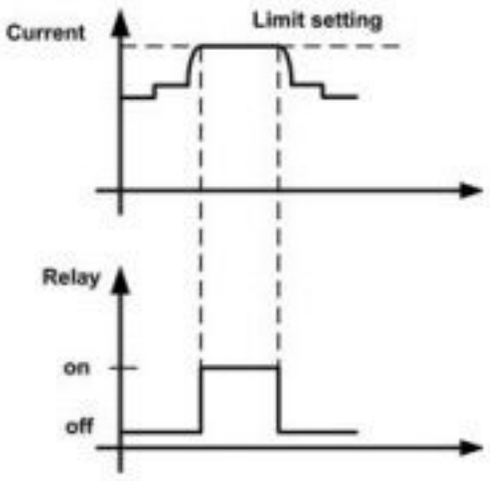
## F. MEASUREMENTS FOR POWER CONSUMPTION ANALYSIS



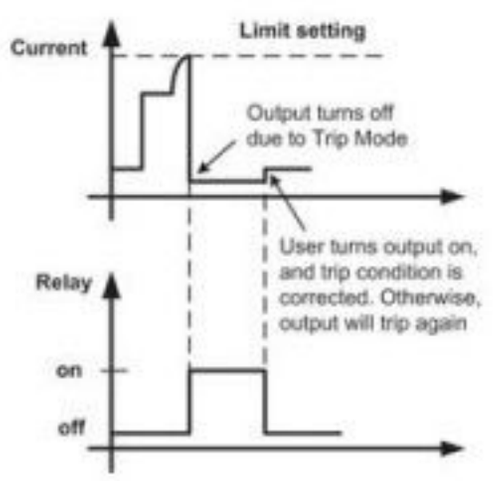
Voltage and Current Waveforms of the Receiving Signals of a Cellular Phone

One particular requirement of power consumption for portable wireless communications devices is Pulse Current. Portable devices such as cellular phones must transmit and receive (detect) signal periodically by drawing pulse current instead of constant current from battery to ensure devices' sound connection in network. To analyze the transient power consumption of a DUT, the peak of short pulse current and average current measurements over a long period of time are crucial. PPH-Series provides pulse current and long integration functions, the former can measure the peak value of a pulse, the latter can measure the average value of pulses. PPH-Series provides DUT with pulse current measurement and analyzes the transient power consumption to qualify the device for specified power consumption requirements.

## G. EXTERNAL RELAY CONTROL



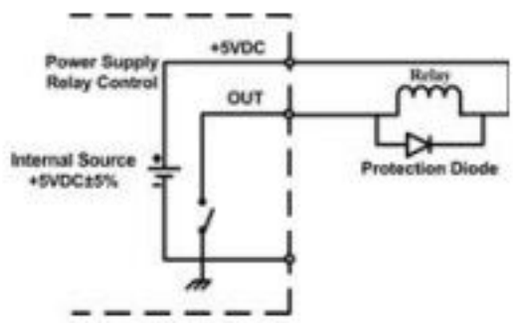

**Limit Relay**




**Trip Relay**

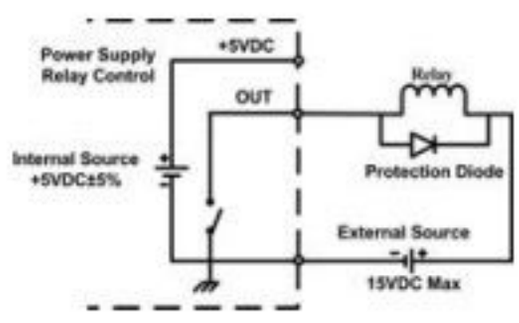
PPH-Series provides Limit relay and Trip relay modes and is equipped with corresponding output ports, in which output signals control external relay. Under Limit relay mode and the current limit is reached, PPH-Series will switch from Constant Voltage to Constant Current automatically. Under "Trip relay" mode and the current limit is reached, PPH-Series will turn output off. Furthermore, External Relay control can be used if users simultaneously use other devices for test system. When "Limit Relay" mode is selected and the current limit is reached, External Relay control signal will go high and will return back to the low level when the current level goes back below the constant current setting. When "Trip Relay" mode is selected and the current limit is reached, the relay control signal will go high and the output is disabled. When the output goes back on and the current is less than the current setting, the relay control signal will back to the low level. Users can use relay control signal to control other devices for test system.

**Relay Can be Driven by Using Internal +5V or External Power Source :**




**+5VDC Relay Output**

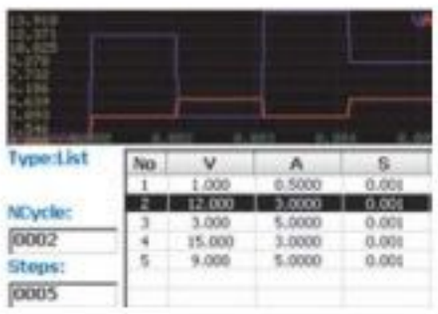
Using the +5VDC relay output to drive an external relay. Ensure the current does not exceed 150mA.




**External Power Source**

Using an external power source to drive the external relay. The voltage of the source can not exceed 15V and the current can not exceed 150mA.

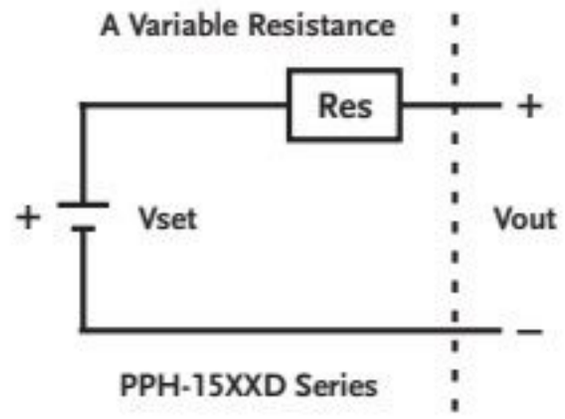
## H. SEQUENCE FUNCTION




**Functional Setting Page for Sequence Function**

For the practical usage, PPH-15xxD can be programmed to output a sequential voltage variation according to the requirements. There are 1000 steps for users to edit output voltage, current and execution time. Programmable execution time range is from 0.001 second to 3600 seconds and the resolution is 0.001 second. Programmable recurring frequency is from 1 to 9999 or it can be set to infinite execution (set recurring frequency to 0).

## I. BATTERY SIMULATION FUNCTION




**Battery Equivalent Model**

PPH-15xxD's battery simulation function is equivalent to a variable resistance circuit internally connected in series to simulate battery's output impedance. The function can also be regarded as a power supply with a variable internal resistor. The variable internal resistance range is from 0.000Ω to 1.000Ω and the resolution is 1mΩ. PPH-15xxD can be utilized as a battery or an ideal voltage source Vset to be connected with variable resistance Res in series. The following diagram shows battery simulation to produce output voltage Vout.

# Programmable High-precision D.C. Power Supply




NEW

## PPX-Series

CE | RS-232 | RS-485 | USB | LAN | Ext I/O | GPIB

## FEATURES

- ✲ CV, CC Priority Start Function
- ✲ Four Levels of Current Measurement Resolution (min. 0.1μA)/Two Levels of Voltage Measurement Resolution (min. 0.1mV)
- ✲ Power Output ON/OFF Delay Function
- ✲ Adjustable Voltage and Current Slew Rate
- ✲ Bleeder Circuit Control
- ✲ Delayed Over-current Protection(OCP Delay)
- ✲ Sequential Power Output Function
- ✲ Remote Sensing Function & Data Logger
- ✲ 10 Sets of Memory Function
- ✲ Over Voltage Protection, Under Voltage Limit, Over Current Protection, Over Temperature Protection, AC Alarm Function
- ✲ Supports K-Type Thermocouple Temperature Measurement
- ✲ Interfaces: USB, LAN, RS-232, RS-485, Analog Control; Opt: GPIB

The PPX-Series programmable high-precision DC power supplies include six models; PPX-1005(10V/5A/50W), PPX-2002(20V/2A/40W), PPX-2005(20V/5A/100W) ), PPX-3601(36V/1A/36W), PPX-3603(36V/3A/108W), and PPX-10H01(100V/1A/100W). This series has the output low noise (0.35mVrms) and fast transient response characteristics (<50μs) of conventional linear power supplies. It also provides constant voltage and constant current priority output modes, and the series can also set the voltage and current rising/falling slew rates separately, and the delay time for the output to be turned on and off.

The PPX-Series has four current levels and two voltage levels to provide users with high-precision measurements, and via the Data Logger function, the measurement records can be stored in the USB for long-term measurement and recording of IoT devices, portable devices, wearable devices, and sensor components.

In order to extend the use time of portable devices and wearable devices, manufacturers are not only committed to improving the operating efficiency of the circuit, but also reducing standby power consumption as much as possible. In order to satisfy users' low-power measurement applications, GW Instek has launched the PPX-Series with current measurement resolutions (0.1μA, 1μA, 10μA, 0.1mA) and voltage measurement resolutions (0.1mV, 1mV) to provide power for portable devices and wearable devices. When the device enters the sleep mode or the standby mode, the PPX series can still measure the subtle current changes of the DUT.

The PPX-Sseries provides the Test Sequence function, which allows users to arbitrarily define output waveforms. The voltage rising or falling time and the voltage maintenance time of each step can be set. For the operation, users can directly edit parameters on the front panel of the PPX-Series, or the CSV file can be edited via computer and imported into the PPX-Series, and the PPX-Series can be remotely edited. In addition, the OCP Delay function of the PPX-Series allows users to flexibly adjust the time to enable the over-current protection according to the characteristics of the DUT to protect the DUT and at the same time to test the current change of the DUT within a certain period of time.

Other than voltage, current, and power measurement, the PPX-Series also supports temperature measurement. While collocating with a K Type Thermocouple, the temperature range can be measured from -200°C ~ +1372°C. Supported standard communication interfaces include USB, LAN, RS-232, RS-485 and optional GPIB interface.







## PPX-Series

**GTL-205A**



**GTL-259**



**GTL-260**



**GTL-261**



**GTL-262**



## SPECIFICATIONS

| Model | PPX-1005 | PPX-2002 | PPX-2005 | PPX-3601 | PPX-3603 | PPX-10H01 |
|---|---|---|---|---|---|---|
| **DC Output Mode** | | | | | | |
| Output Voltage | 10.000V | 20.000V | 20.000V | 36.000V | 36.000V | 100.00V |
| Output Current | 5.0000A | 2.0000A | 5.0000A | 1.0000A | 3.0000A | 1.0000A |
| Output Power | 50W | 40W | 100W | 36W | 108W | 100W |
| **CONSTANT VOLTAGE OPERATION** | | | | | | |
| Line Regulation | ±(0.01% of setting+1mV) | ±(0.01% of setting+1mV) | ±(0.01% of setting+1mV) | ±(0.01% of setting+3mV) | ±(0.01% of setting+3mV) | ±(0.01% of setting+7mV) |
| Load Regulation | ±(0.01% of setting+2mV) | ±(0.01% of setting+2mV) | ±(0.01% of setting+3mV) | ±(0.01% of setting+3mV) | ±(0.01% of setting+4mV) | ±(0.01% of setting+7mV) |
| Transient Response*1 | <50μs | <50μs | <50μs | <50μs | <50μs | <100μs |
| Ripple Noise(Vrms*2/Vpp*3) | 0.35mVrms/<6mVpp | 0.5mVrms/<8mVpp | 0.5mVrms/<8mVpp | 0.8mVrms/<10mVpp | 0.8mVrms/<10mVpp | 1.2mVrms/<15mVpp |
| Rise Time*4 Rated load | 20ms | 50ms | 50ms | 50ms | 50ms | 100ms |
| Rise Time*4 No load | 20ms | 50ms | 50ms | 50ms | 50ms | 100ms |
| Fall Time*5 Rated load | 10ms | 20ms | 20ms | 20ms | 20ms | 50ms |
| Fall Time*5 No load | 100ms | 150ms | 150ms | 150ms | 150ms | 250ms |
| Setting Range (105%) | 0V ~ 10.5V | 0V ~ 21.0V | 0V ~ 21.0V | 0V ~ 37.8V | 0V ~ 37.8V | 0V ~ 105.0V |
| Setting Resolution | 1mV | 1mV | 1mV | 1mV | 1mV | 10mV |
| Setting Accuracy (23℃±5℃) | ±(0.03% of setting+3mV) | ±(0.03% of setting+5mV) | ±(0.03% of setting+5mV) | ±(0.03% of setting+8mV) | ±(0.03% of setting+8mV) | ±(0.03% of setting+20mV) |
| Remote Sensing Compensation Voltage(single line) | 1V | 1V | 1V | 1V | 1V | 3V |
| Temperature Coefficient (TYP.) | 100 ppm/℃ | 100 ppm/℃ | 100 ppm/℃ | 100 ppm/℃ | 100 ppm/℃ | 100 ppm/℃ |
| **CONSTANT CURRENT OPERATION** | | | | | | |
| Line Regulation | ±(0.02% of setting+250μA) | ±(0.02% of setting+100μA) | ±(0.02% of setting+250μA) | ±(0.02% of setting+50μA) | ±(0.02% of setting+150μA) | ±(0.02% of setting+50μA) |
| Load Regulation | ±(0.02% of setting+250μA) | ±(0.02% of setting+100μA) | ±(0.02% of setting+250μA) | ±(0.02% of setting+50μA) | ±(0.02% of setting+150μA) | ±(0.02% of setting+50μA) |
| Ripple Noise(Arms*2) | 2mA | 1mA | 2mA | 400μA | 1mA | 1mA |
| Setting Range (105%) | 0A ~ 5.25A | 0A ~ 2.1A | 0A ~ 5.25A | 0A ~ 1.05A | 0A ~ 3.15A | 0A ~ 1.05A |
| Setting Resolution | 0.1mA | 0.1mA | 0.1mA | 0.1mA | 0.1mA | 0.1mA |
| Setting Accuracy (23℃±5℃) | ±(0.05% of setting+3.0mA) | ±(0.05% of setting+1.0mA) | ±(0.05% of setting+3.0mA) | ±(0.05% of setting+0.5mA) | ±(0.05% of setting+1.5mA) | ±(0.05% of setting+1.0mA) |
| Temperature Coefficient (TYP.) | 200 ppm/℃ | 200 ppm/℃ | 200 ppm/℃ | 200 ppm/℃ | 200 ppm/℃ | 200 ppm/℃ |
| **MEASUREMENT AND DISPLAY** | | | | | | |
| Voltage Range H | 10.000V | 20.000V | 20.000V | 36.000V | 36.000V | 100.00V |
| Voltage Range L | 1.0000V | 2.0000V | 2.0000V | 3.6000V | 3.6000V | 10.000V |
| Current Range H | 5.0000A | 2.0000A | 5.0000A | 1.0000A | 3.0000A | 1.0000A |
| Current Range M | 500.00mA | 200.00mA | 500.00mA | 100.00mA | 300.00mA | 100.00mA |
| Current Range L | 50.000mA | 20.000mA | 50.000mA | 10.000mA | 30.000mA | 10.000mA |
| Current Range LL | 5.0000mA | 2.0000mA | 5.0000mA | 1.0000mA | 3.0000mA | 1.0000mA |
| Measurement Resolution Voltage(H) | 1mV | 1mV | 1mV | 1mV | 1mV | 10mV |
| Measurement Resolution Voltage(L) | 0.1mV | 0.1mV | 0.1mV | 0.1mV | 0.1mV | 1mV |
| Measurement Resolution Current(H) | 0.1mA | 0.1mA | 0.1mA | 0.1mA | 0.1mA | 0.1mA |
| Measurement Resolution Current(M) | 0.01mA | 0.01mA | 0.01mA | 0.01mA | 0.01mA | 0.01mA |
| Measurement Resolution Current(L) | 0.001mA | 0.001mA | 0.001mA | 0.001mA | 0.001mA | 0.001mA |
| Measurement Resolution Current(LL) | 0.0001mA | 0.0001mA | 0.0001mA | 0.0001mA | 0.0001mA | 0.0001mA |
| Measurement Accuracy Voltage(H/L) | ±(0.03% of rdg + 2mV) | ±(0.03% of rdg + 4mV) | ±(0.03% of rdg + 5mV) | ±(0.03% of rdg + 6mV) | ±(0.03% of rdg + 8mV) | ±(0.03% of rdg + 15mV) |
| Temperature Coefficient*6(TYP.) | 100 ppm/℃ | 100 ppm/℃ | 100 ppm/℃ | 100 ppm/℃ | 100 ppm/℃ | 100 ppm/℃ |
| Current(H/M) | ±(0.05% of rdg + 2.5mA) | ±(0.05% of rdg + 1.0mA) | ±(0.05% of rdg + 2.5mA) | ±(0.05% of rdg + 0.4mA) | ±(0.05% of rdg + 1.2mA) | ±(0.05% of rdg + 1.0mA) |
| Current(L/LL) | ±(0.1% of rdg + 40μA) | ±(0.1% of rdg + 24μA) | ±(0.1% of rdg + 40μA) | ±(0.1% of rdg + 16μA) | ±(0.1% of rdg + 28μA) | ±(0.1% of rdg + 24μA) |
| Temperature Coefficient*6(TYP.) | 200 ppm/℃ | 200 ppm/℃ | 200 ppm/℃ | 200 ppm/℃ | 200 ppm/℃ | 200 ppm/℃ |
| **TEMPERATURE MEASURED** | | | | | | |
| Temperature (K-Type Thermocouple) Range | -200℃~+1372℃ | | | | | |
| Temperature (K-Type Thermocouple) Resolution | 0.25℃ | | | | | |
| Temperature (K-Type Thermocouple) Accuracy | ±(0.5% + 2℃) | | | | | |
| **PROTECTION** | | | | | | |
| Over Voltage Protection(OVP) Operation | Turns the output off, displays OVP and lights ALARM | | | | | |
| Over Voltage Protection(OVP) Setting Range | 0.5V ~ 11.0V | 1.0V ~ 22.0V | 1.0V ~ 22.0V | 1.8V ~ 39.6V | 1.8V ~ 39.6V | 5.0V ~ 110.0V |
| Over Voltage Protection(OVP) Setting Accuracy | (5% to 110% of the rated output voltage) ±(1% of rating) | | | | | |
| Over Current Protection(OCP) Operation | Turns the output off, displays OCP and lights ALARM | | | | | |
| Over Current Protection(OCP) Setting Range | 0.25A ~ 5.5A | 0.1A ~ 2.2A | 0.25A ~ 5.5A | 0.05A ~ 1.1A | 0.15A ~ 3.3A | 0.05A ~ 1.1A |
| Over Current Protection(OCP) Setting Accuracy | (5% to 110% of the rated output current) ±(1% of rating) | | | | | |
| Over Temperature Protection(OTP) Operation | Turns the output off, displays OTP and lights ALARM | | | | | |
| **OTHER** | | | | | | |
| Interface Capabilities LAN | MAC Address, DNS IP Address, User Password, Gateway IP Address, Instrument IP Address, Subnet Mask | | | | | |
| Interface Capabilities USB | Type A: Host, Type B: Slave, Speed: 1.1/2.0, USB-CDC | | | | | |
| Interface Capabilities RS-232/RS-485 | Complies with the EIA-RS-232/RS-485 specifications (excluding the connector) | | | | | |
| Nominal Input Voltage*7 | 100Vac / 120Vac / 220Vac / 240Vac(±10%), 50Hz / 60Hz, single phase | | | | | |
| Input Frequency Range | 47Hz ~ 63Hz | | | | | |
| Max. Inrush Current | 25Amax | 20Amax | 30Amax | 35Amax | 40Amax | 30Amax |
| Max. Power Consumption | 200VA | 150VA | 300VA | 150VA | 300VA | 300VA |
| Operaing Temperature | 0°C ~ 40°C | | | | | |
| Storage Temperature | -20°C ~ 70°C | | | | | |
| Operating Humidity | 20% ~ 80% RH; No condensation | | | | | |
| Storage Humidity | 20% ~ 85% RH; No condensation | | | | | |
| Dimensions & Weight | 107(W) × 124(H) × 313(D) mm (not including protrusions); Approx. 5.5kg | | | | | |

NOTE: *1. 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
*2. Measurement frequency bandwidth is 5 Hz to 1 MHz
*3. Measurement frequency bandwidth is 10 Hz to 20 MHz
*4. From 10%~90% of rated output voltage, with rated resistive load
*5. From 90%~10% of rated output voltage, with rated resistive load
*6. Temperature coefficient: after a 30 minute warm-up
*7. Before connecting the power plug to an AC line outlet, make sure the voltage selector switches of the bottom panel in the correct position.It might be damaged the instrument by connecting to the wrong AC line voltage

# Programmable High-precision D.C. Power Supply

**Rear Panel**



**GRA-441-J/E Rack Mount Kit(JIS/EIA)**



## ORDERING INFORMATION

| | |
|---|---|
| **PPX-1005** | 10V/5A/50W Programmable High-precision DC Power Supply |
| **PPX-2002** | 20V/2A/40W Programmable High-precision DC Power Supply |
| **PPX-2005** | 20V/5A/100W Programmable High-precision DC Power Supply |
| **PPX-3601** | 36V/1A/36W Programmable High-precision DC Power Supply |
| **PPX-3603** | 36V/3A/108W Programmable High-precision DC Power Supply |
| **PPX-10H01** | 100V/1A/100W Programmable High-precision DC Power Supply |

ACCESSORIES :

CD (User Manual), Power Cord, Test Lead(GTL-104A for PPX-1005/PPX-2005/PPX-3603, 1m, 10A)(GTL-105A for PPX-2002/PPX-3601,1m,3A)(GTL-204A for PPX-1005/PPX-2005/PPX-3603<European Type Jack Terminal>,1m,10A)(GTL-203A for PPX-2002/PPX-3601/PPX-10H01<European Type Jack Terminal>, 1m, 3A)(GTL-201A, Ground lead for European Type Jack Terminal)

**OPTIONAL ACCESSORIES**

| | |
|---|---|
| **GTL-246** | USB Cable(USB 2.0 Type A-Type B Cable,4P) |
| **GTL-205A** | Temperature probe adapter(thermal coupling, K-Type), about 1000mm |
| **GTL-258** | GPIB Cable, 2000mm |
| **GTL-259** | RS-232 Cable with DB9 connector to RJ45 |
| **GTL-260** | RS-485 Cable with DB9 connector to RJ45 |
| **GTL-261** | Serial Master Cable+Terminator, 0.5M |
| **GTL-262** | RS-485 Slave cable |
| **GRA-441-J** | Rack for PPX-Series(JIS) |
| **GRA-441-E** | Rack for PPX-Series(EIA) |
| **PPX-G** | GPIB Interface(factory installed) |



## A. DISPLAY MODE




**Voltage and Current**




**Voltage, Current and Wattage**



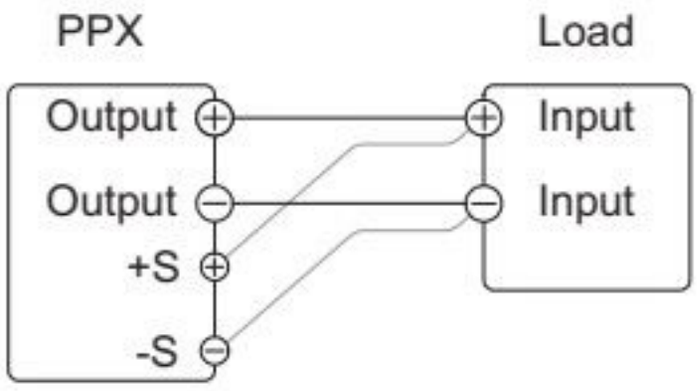

**Voltage, Current and Sequence Test**




**Voltage, Current and Temperature Measurement**

The PPX-Series has four display modes, namely 1) voltage and current 2) voltage, current and wattage 3) voltage, current and Sequence Test 4)voltage, current and temperature measurement, which are convenient for users to switch to different display modes according to test requirements.

## B. REMOTE SENSING




**REMOTE SENSING CONNECTION DIAGRAM**

The Remote Sensing function can be used to compensate for the voltage drop caused by the resistance on the test connection lead from the power output to the load. PPX-1005/2002/2005/3601/3603 compensates for voltages up to 1 volt, and PPX-10H01 compensates for voltages up to 3 volts. When testing, choose a test connection lead with a voltage drop less than the compensation voltage of the PPX series as much as possible.

## C. TEMPERATURE MEASUREMENT




**Blue: Temperature Control on with no GTL-205A Connected**




**Green: Output Safe is Activated and Output is on with GTL-205A Connected**




**White: Temperature Control on with GTL-205A Connected**




**Red: The Alarm of Short Circuit Occurs From Temperature Measurement**

The PPX-Series can measure DUT temperature while outputting power. Before measuring the temperature, please use the optional accessory GTL-205A (temperature probe adapter with K-type thermocouple) to connect the DUT and TC input terminals on the front panel of the PPX-Series respectively. During the measurement process, users can set the monitoring temperature for the DUT. Once the measurement temperature reaches the monitoring temperature value, the PPX-Series will stop the output. The PPX-Series can measure the temperature range of -200.0℃~1372.0℃ (-328.0℉~2501.6 ℉). Users can choose the display unit as ℃ or ℉ according to the requirement.

## D. DATA LOGGER




Dlog Icon Appears

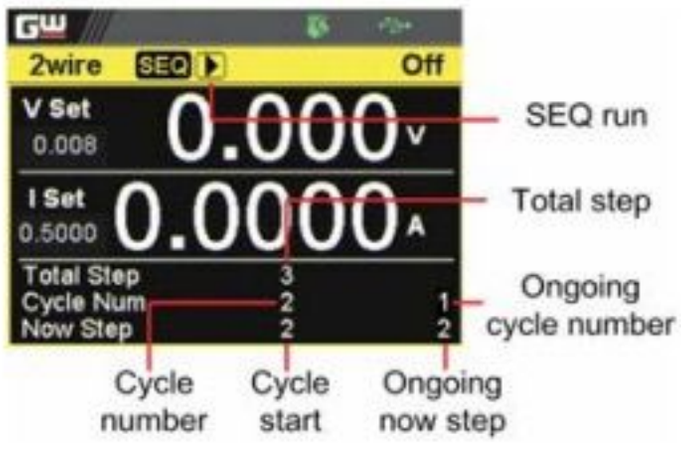
**Data Logger Function**



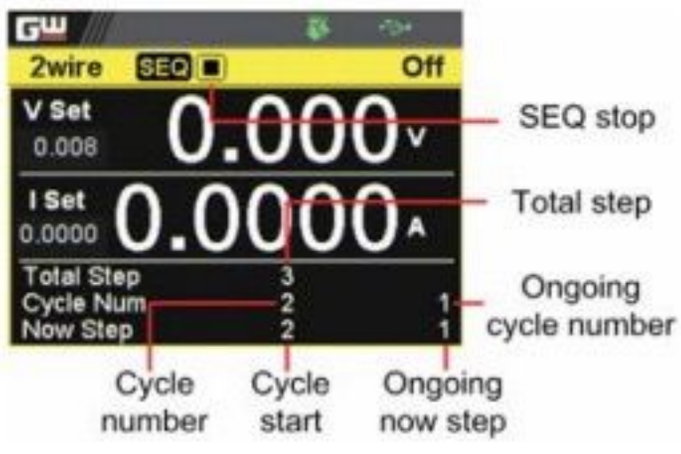

**Save Data Log Into USB Disk**

The PPX-Series can record the measured voltage, current and temperature data to a USB flash drive or can be remotely controlled to read the data. Data sampling interval is 0.1~999.9 seconds.

## E. SEQUENCE TEST




**SEQ Run in Cycle Mode**




**SEQ Stop in Cycle Mode**

The Sequence Test function allows users to plan the PPX-Series to execute a sequential power output. The PPX-Series will automatically execute the planned power output to the DUT to realize automated measurement. The PPX-Series can store

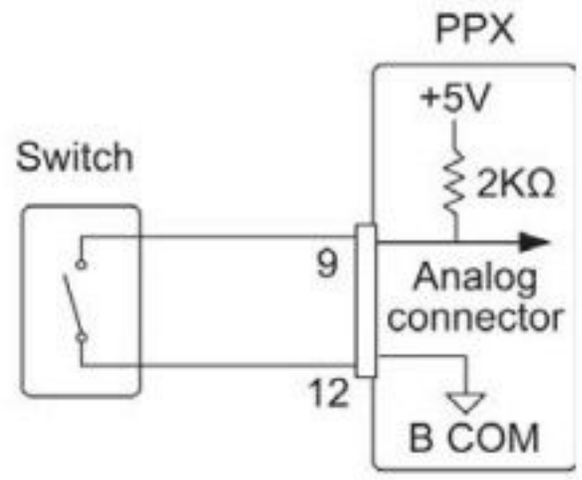
## F. V/I SLEW RATE

| Model | R_V Slew Rate/ F_V Slew Rate Setting Range |
|---|---|
| PPX-1005 | 0.0001V/ms ~ 0.1V/ms |
| PPX-2002 | 0.0001V/ms ~ 0.2V/ms |
| PPX-2005 | 0.0001V/ms ~ 0.2V/ms |
| PPX-3601 | 0.0001V/ms ~ 0.36V/ms |
| PPX-3603 | 0.0001V/ms ~ 0.36V/ms |
| PPX-10H01 | 0.001V/ms ~ 0.5V/ms |

**Voltage Rising/Falling Slew Rate**

The PPX-Series can adjust the slew rate of current and voltage. Via setting the rising and falling time of voltage and current, users can verify the performance of the DUT during the voltage/current changes. In addition, the adjustment of the slew rate slows down the voltage transfer, which can effectively avoid the damage of the inrush current to the DUT, therefore, the series is especially suitable for the testing of capacitive loads and motors.

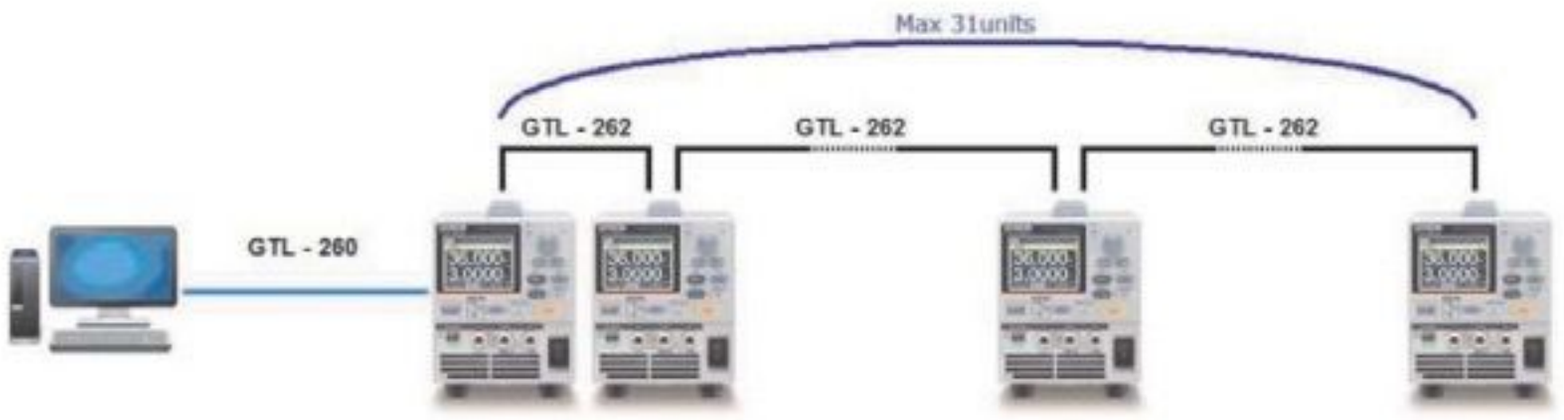
## G. ANALOG REMOTE CONTROL




**External Control of Output**

The PPX-Series supports the analog control function, including external voltage to control voltage output/current output, external resistance to control voltage output/current output, external control of power output, trigger input/trigger output, and voltage/current monitoring.

## H. MULTIPLE UNIT CONNECTION




**Multiple Unit Connection**

The PPX series can connect up to 31 units. The PC is connected to the first unit of PPX through GTL-260, and the remaining PPX units are connected in a daisy-chained method via GTL-262. When using PPX-Series Multiple Unit Connection for remote program control and slave expansion, there is no need to use other remote control equipment (E.g. switch/Hub), which can help users save equipment purchase costs.

# Triple-channel Programmable DC Power Supply



## GPP-3060/6030/3650 NEW

CE | RS-232 | GPIB | USB | LAN | Ext I/O

## FEATURES

- ✲ 4.3"TFT LCD Display
- ✲ Setting Resolution: 1mV/0.1mA; Read Back Resolution: 0.1mV/0.1mA
- ✲ Low Ripple Noise: ≦1mVrms/≦2mArms
- ✲ Transient Response Time: ≦100μs
- ✲ Load Function (CC, CV, CR mode)
- ✲ 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
- ✲ Supports Setting Value, Measurement Value and Output Waveform Display
- ✲ 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-3060/6030 Supports a USB (Type A) Output Terminal
- ✲ Intelligent Temperature Control Fan Effectively Reduces Noise
- ✲ Standard: RS-232, USB, Ext I/O Optional (manufacturer installed only): LAN, LAN+GPIB

GPP-3060 and GPP-6030 triple-channel programmable DC power supplies are extension models of the GPP-X323 series. The maximum output power of these three models is 385W. GPP-3650 supports CH1/CH2: 0 ~ 36V / 0 ~5A output; CH3 supports 1.8V, 2.5V, 3.3V, 5.0V / 5A. GPP-3060 supports CH1/CH2: 0 ~ 30V / 0 ~ 6A output; GPP-6030 supports CH1/CH2: 0 ~ 60V / 0 ~ 3A output; CH3 of both models supports 1.8V, 2.5V, 3.3V, 5.0V/5A.

GPP-3650, GPP-3060 and GPP-6030 inherit the high program resolution (1mV/0.1mA) and read back resolution (0.1mV/0.1mA) of the GPP series with low-ripple noise characteristics ≦1mVrms/≦ 2mArms and ≦100μs output transient recovery ability. An independent output on-off switch is provided for each channel.

For series and parallel applications of CH1 and CH2, the tracking function can automatically switch to series or parallel output without additional external wiring. Multiple display modes including single channel or multi-channel setting value, measurement value and waveform display to collocate with the built-in output monitoring function allow users to set the monitoring conditions according to their needs so as to generate an alarm or stop the output during the measurement process in order to stop the measurement and protect the customer's DUT. The output recorder function can record the voltage/current of the output process in the internal memory, and save the result as a (*.REC) or (*.CSV) file, and then save it to a USB flash drive. The unique load function of the GPP series can arbitrarily set CH1/CH2 as power supply or load function. For example, one channel is set as power output, and the other channel is set as load function to consume the power of the DUT to satisfy simple battery charging and discharging or load characteristic test by a single power supply. The sequence output function allows users to edit the power output waveforms by themselves, and also allows users to set the sequential constant voltage (CV) or constant current (CC) load waveforms such as serial power output or dynamic load simulation test. Channel 3 (CH3) incorporates 3A USB (Type A) output terminal, which can be used for USB charging test.

Pertaining to measurement protections, OVP/OCP/OPP/OTP protection functions are provided. The protection mechanism of OVP/OCP/OTP is implemented by hardware circuits, which has a faster response time to protect equipment or DUT while comparing with competitors who use software for protection. The OVP and OCP functions allow users to set the protection action point according to the conditions of the DUT. OPP only provides protection during the operation of the load function.

In addition, GPP-3650 , GPP-3060 and GPP-6030 incorporate terminal output on the rear panel, and include a voltage remote sensing terminal. Users can choose front panel or rear panel terminal output, which is convenient for stand-alone or rack operation. Output value setting and Sequence/ The Delay/Recorder functions provide 10 sets of internal memory, which can be uploaded/stored by a USB flash drive.



## GPP-3650

### Rear Panel



### European Type Jack Terminal



### GRA-449-J Rack Mount Kit (JIS)



### GRA-449-E Rack Mount Kit (EIA)



# Triple-channel Programmable DC Power Supply

## SPECIFICATIONS

| | | GPP-3060 | | | GPP-6030 | | | GPP-3650 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Output Mode** | | | | | | | | | | |
| Number of Channel | | CH1 | CH2 | CH3 | CH1 | CH2 | CH3 | CH1 | CH2 | CH3 |
| Voltage | | 0 ~ 30.000V | 0 ~ 30.000V | 1.8V/2.5V/3.3V/5.0V,±5% | 0 ~ 60.000V | 0 ~ 60.000V | 1.8V/2.5V/3.3V/5.0V,±5% | 0 ~ 36.000V | 0 ~ 36.000V | 1.8V/2.5V/3.3V/5.0V,±5% |
| Current | | 0 ~ 6.0000A | 0 ~ 6.0000A | 5A (USB Port 3A) | 0 ~ 3.0000A | 0 ~ 3.0000A | 5A (USB Port 3A) | 0 ~ 5.0000A | 0 ~ 5.0000A | 5A (USB Port 3A) |
| Tracking Series Voltage / Current | | 0 ~ 60.000V / 0 ~ 6.0000A | | - | 0 ~ 120.000V / 0 ~ 3.0000A | | - | 0 ~ 72.000V / 0 ~ 5.0000A | | - |
| Tracking Parallel Voltage / Current | | 0 ~ 30.000V / 0 ~ 12.0000A | | - | 0 ~ 60.000V / 0 ~ 6.0000A | | - | 0 ~ 36.000V / 0 ~ 10.0000A | | - |
| Warning | | The CH3 output current from the 2 terminals should Not exceed 5A. | | | | | | | | |
| **Constant Voltage Operation** | | | | | | | | | | |
| Line Regulation | | ≤ 0.01% + 3mV | | ≤ 3mV | ≤ 0.01% + 3mV | | ≤ 3mV | ≤ 0.01% + 3mV | | ≤ 3mV |
| Load regulation | | ≤ 0.01% + 5mV (rating current ≤ 10A) | | ≤ 5mV | ≤ 0.01% + 5mV (rating current ≤ 10A) | | ≤ 5mV | ≤ 0.01% + 5mV (rating current ≤ 10A) | | ≤ 5mV |
| Ripple & noise (5Hz-1MHz) | | ≤1mVrms | | ≤ 2mVrms | ≤1mVrms | | ≤ 2mVrms | ≤1mVrms | | ≤ 2mVrms |
| Transient recovery time | | ≤100μs | | | | | | | | |
| | | (50% load change · minimum load 0.5A) | | | | | | | | |
| Temperature coefficient | | ≤ 300ppm/°C | | | | | | | | |
| **Constant Current Operation** | | | | | | | | | | |
| Line Regulation | | ≤ 0.01% + 3mA | | | | | | | | |
| Load regulation | | ≤ 0.01% + 3mA | | | | | | | | |
| Ripple & noise | | ≤ 2mArms | | | | | | | | |
| **Resolution** | | | | | | | | | | |
| Programming | Voltage | 1mV | | - | 2mV | | - | 2mV | | - |
| | Current | 0.2mA | | | 0.1mA | | | 0.1mA | | |
| Reedback | Voltage | 0.1mV | | | 0.1mV | | | 0.1mV | | |
| | Current | 0.1mA | | | 0.1mA | | | 0.1mA | | |
| **Tracking Operation(CH1/CH2)** | | | | | | | | | | |
| Tracking error | | ≤ 0.1% +10mV of Master (No Load, with load add load regulation ≤200mV) | | | ≤ 0.2% +20mV of Master (No Load, with load add load regulation ≤200mV) | | | ≤ 0.1% +10mV of Master (No Load, with load add load regulation ≤200mV) | | |
| Parallel regulation | Line | ≤ 0.01% + 3mV | | - | ≤ 0.01% + 3mV | | - | ≤ 0.01% + 3mV | | - |
| | Load | ≤ 0.01% + 5mV (rating current ≤ 10A) | | | ≤ 0.01% + 5mV (rating current ≤ 10A) | | | ≤ 0.01% + 5mV (rating current ≤ 10A) | | |
| | | ≤ 0.02% + 5mV (rating current > 10A) | | | ≤ 0.02% + 5mV (rating current > 10A) | | | ≤ 0.02% + 5mV (rating current > 10A) | | |
| Series regulation | Line | ≤ 0.01% + 5mV | | | ≤ 0.01% + 5mV | | | ≤ 0.01% + 5mV | | |
| | Load | ≤ 200mV | | | ≤ 200mV | | | ≤ 200mV | | |
| Ripple & noise | | ≤2mVrms(5Hz-1MHz) | | | ≤2mVrms(5Hz-1MHz) | | | ≤2mVrms(5Hz-1MHz) | | |
| Note | | Tracking is not supported in LOAD mode. | | | | | | | | |
| **Meter** | | | | | | | | | | |
| Full Scale | Voltage | 32.0000V | 1.8V/2.5V/3.3V/5.0V | | 62.0000V | 1.8V/2.5V/3.3V/5.0V | | 36.0000V | 1.8V/2.5V/3.3V/5.0V | |
| | Current | 6.2000A | | | 3.2000A | | | 5.2000A | | |
| Programming Resolution | Voltage | 5 digits | | - | 5 digits | | - | 5 digits | | - |
| | Current | 5 digits | | | 5 digits | | | 5 digits | | |
| Reedback Resolution | Voltage | 6 digits | | | 6 digits | | | 6 digits | | |
| | Current | 5 digits | | | 5 digits | | | 5 digits | | |
| Setting accuracy | Voltage | ± (0.03% of reading + 10mV) | | | ± (0.03% of reading + 10mV) | | | ± (0.03% of reading + 10mV) | | |
| | Current | ± (0.3% of reading + 10mA) | | | ± (0.3% of reading + 10mA) | | | ± (0.3% of reading + 10mA) | | |
| Readback accuracy | Voltage | ± (0.03% of reading + 10mV) | | | ± (0.03% of reading + 10mV) | | | ± (0.03% of reading + 10mV) | | |
| | Current | ± (0.3% of reading + 10mA) | | | ± (0.3% of reading + 10mA) | | | ± (0.3% of reading + 10mA) | | |
| **DC Load Mode** | | | | | | | | | | |
| Display | Voltage | 1 – 32.00V | | | 1 – 62.00V | | | 1 – 36.5.00V | | |
| | Current | 0 – 6.200A | | | 0 – 3.200A | | | 0 – 5.200A | | |
| | Power | 0 – 50.00W | | | 0 – 50.00W | | | 0 – 50.00W | | |
| CV Mode | CH1/CH2 | 1.500V - 32.00V | | | 1.500V - 62.00V | | | 1.500V - 36.50V | | |
| | Setting Accuracy | ≤±(0.1% + 30mV) | | | ≤±(0.1% + 30mV) | | | ≤±(0.1% + 30mV) | | |
| | Reedback Accuracy | ≤±(0.1% + 30mV) | | | ≤±(0.1% + 30mV) | | | ≤±(0.1% + 30mV) | | |
| | Resoltion | 10mV | | | 10mV | | | 10mV | | |
| CC Mode | CH1/CH2 | 0 – 6.200A | | | 0 – 3.200A | | | 0 – 5.200A | | |
| | Setting Accuracy | ≤±(0.3% + 10mA) | | | ≤±(0.3% + 10mA) | | | ≤±(0.3% + 10mA) | | |
| | Reedback Accuracy | ≤±(0.3% + 10mA) | | | ≤±(0.3% + 10mA) | | | ≤±(0.3% + 10mA) | | |
| | Resoltion | 1mA | | | 1mA | | | 1mA | | |
| CR Mode | CH1/CH2 | 1Ω- 1kΩ | | | 1Ω- 1kΩ | | | 1Ω- 1kΩ | | |
| | Setting Accuracy | ≤±(3% + 1Ω) (voltage≥0.1V, and current≥0.1A) | | | ≤±(3% + 1Ω) (voltage≥0.1V, and current≥0.1A) | | | ≤±(3% + 1Ω) (voltage≥0.1V, and current≥0.1A) | | |
| | Reedback Accuracy | ≤±(3% + 1Ω) (voltage≥0.1V, and current≥0.1A) | | | ≤±(3% + 1Ω) (voltage≥0.1V, and current≥0.1A) | | | ≤±(3% + 1Ω) (voltage≥0.1V, and current≥0.1A) | | |
| | Resoltion | 1Ω | | | 1Ω | | | 1Ω | | |
| **Protection** | | | | | | | | | | |
| OVP | Power Mode | OFF,ON(0.5V-35.0V) | Fixed 5.5V | | OFF,ON(0.5V-65.0V) | Fixed 5.5V | | OFF,ON(0.5V-38.0V) | Fixed 5.5V | |
| | Load Mode | OFF,ON(1.5V-35.0V) | - | | OFF,ON(1.5V-65.0V) | - | | OFF,ON(1.5V-38.0V) | - | |
| | Setting Accuracy | ±100mV | | | | | | | | |
| | Resoltion | 100mV | | | | | | | | |
| OCP | Power Mode | OFF,ON(0.05A-6.50A) | 3.1A(USB port) | | OFF,ON(0.05A-3.50A) | 3.1A(USB port) | | OFF,ON(0.05A-5.50A) | 3.1A(USB port) | |
| | Load Mode | OFF,ON(0.05A-6.50A) | - | | OFF,ON(0.05A-3.50A) | - | | OFF,ON(0.05A-5.50A) | - | |
| | Setting Accuracy | ±20mA | | | | | | | | |
| | Resoltion | 10mA | | | | | | | | |
| Insulation resistance | Between chassis and terminal | 20MΩ or above (DC 500V) | | | | | | | | |
| | Between chassis and DC power cord | 30MΩ or above (DC 500V) | | | | | | | | |
| **General** | | | | | | | | | | |
| Operation Environment | | Indoor use, Altitude: ≤ 2000m | | | | | | | | |
| | | Ambient temperature: 0 ~ 40°C | | | | | | | | |
| | | Relative humidity: ≤ 80% | | | | | | | | |
| | | Installation category: II / Pollution degree: 2 | | | | | | | | |
| Storage Environment | | TEMPERATURE: -10°C ~ 70°C | | | | | | | | |
| | | HUMIDITY: ≤70% | | | | | | | | |
| Power Input | | AC 100V/120V/220V/230V±10%, 50/60Hz | | | | | | | | |
| Power Consumption | | 900VA, 680W | | | | | | | | |
| Accessories | | CD User manual x1, Quick Start manual x1, Power Code x1 | | | | | | | | |
| | | Test lead: GTL-104A x 3 | | | | | | | | |
| | | (Europe) Test lead: GTL-204A x 3, GTL-201A x1 | | | | | | | | |
| Dimensions | | 213 (W) x 145 (H) x 362 (D) mm | | | | | | | | |
| Weight | | Approx. 10kg | | | | | | | | |

## ORDERING INFORMATION

**GPP-3060** 385W Triple-channel Programmable DC Power Supply

**GPP-6030** 385W Triple-channel Programmable DC Power Supply

**GPP-3650** 385W Triple-channel Programmable DC Power Supply

ACCESSORIES :

CD (User manual), Quick start manual, Power cord, test lead: GTL-104A x 3, European test leads: GTL-204A x 3, GTL-201A x 1

### OPTIONAL ACCESSORIES

**GTL-246** USB Cable

**GRA-449-E** Rack Mount Kit (EIA)

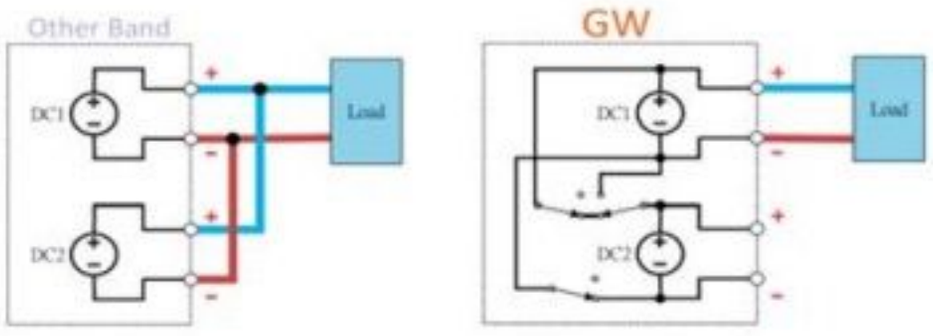
**GRA-449-J** Rack Mount Kit (JIS)

### INTERFACE

Standard: RS-232, USB, Ext I/O, Optional(manufacturer installed only): LAN, GPIB+LAN

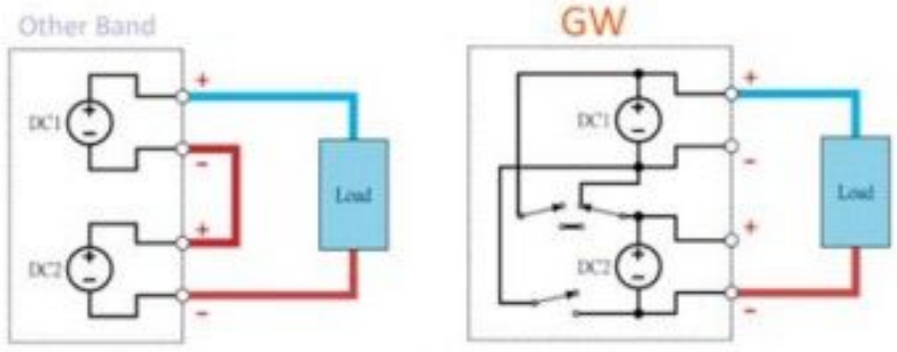
NOTE: Contact local sales if you have issues with Interface purchase.

## A. TRACKING SERIES AND PARALLEL FUNCTION




**Output in Parallel Connections**

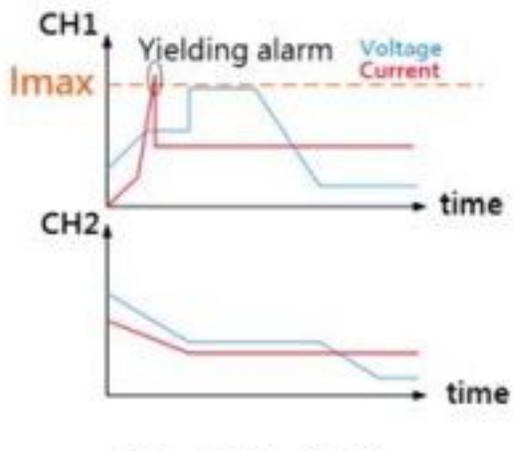
For series and parallel applications of CH1 and CH2, the tracking function of the GPP-Series utilizes the internal circuit to automatically switch the output to serial or parallel output without additional external wiring, providing users with convenience not only in operating procedures but also a more 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**

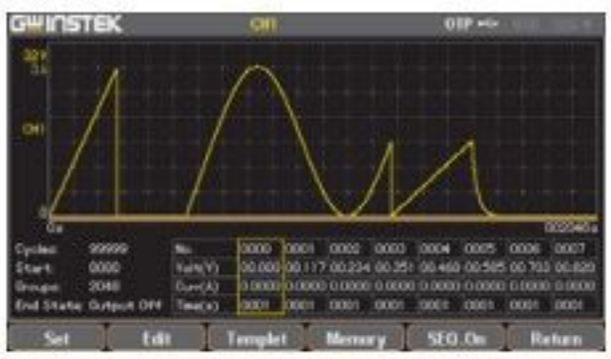
The output monitoring function allows users to set the monitoring conditions according to the requirements, including the voltage, current, and power greater than or less than the setting and the logical relationship of AND, OR. It also allows users to sound alarms or stop the output during the measurement process, stop the measurement, and protect the customer's DUT. Both Channel could be monitored simultaneously as well.




**Monitoring Function Setting**

* Channel 3 does not support the output monitoring function.

## C. SEQUENCE OUTPUT FUNCTION

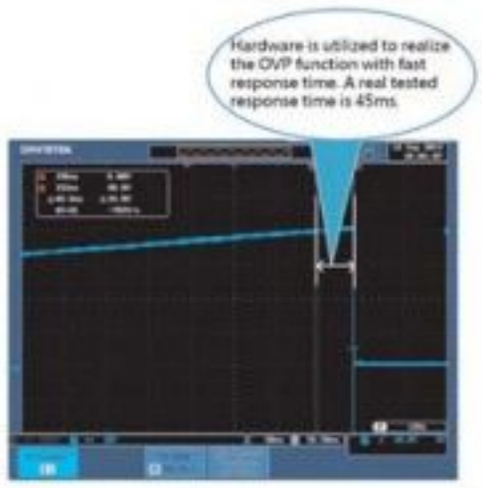



**Output Waveform of the GPP-6030/3060**

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.

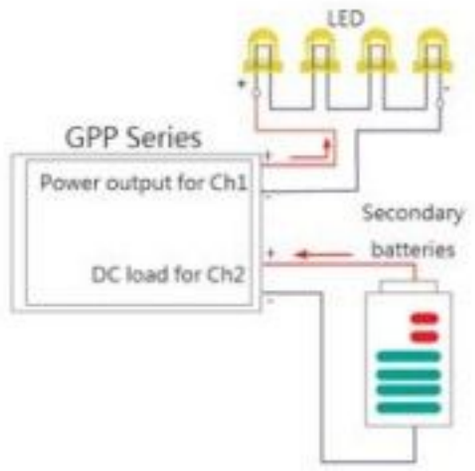
## D. HARDWARE PROTECTION FUNCTION(OVP/OCP/OTP)




**OVP Trigger**

The protection mechanism of OVP/OCP/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.

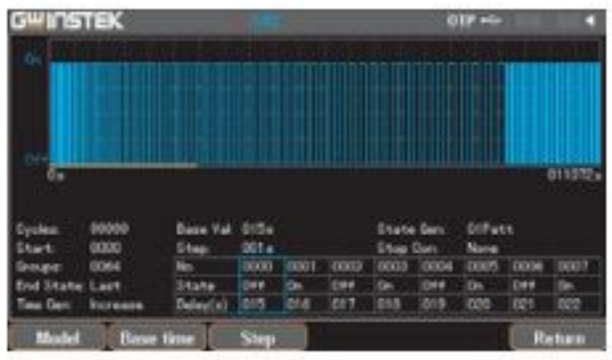
## E. LOAD FUNCTION




**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 power output in channel 1 and channel 2. The rated constant voltage load (CV), rated constant current load (CC) and maximum 1kΩ constant resistance load (CR) function are built-in to allow users to 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.

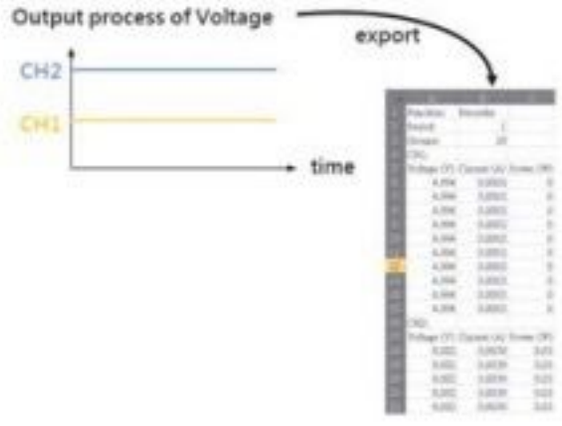
## F. OUTPUT DELAY FUNCTION




**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**




**Recorder Function Setting**




**Save as*.REC**

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 saved in the USB flash drive. The stored *.CSV can be exported into Excel to conduct the future analysis. (*.REC can be saved to 2048 records, *.CSV can be saved to 614400 records)

* Channel 3 does not support the output recorder function

# Multi-output Programmable D.C. Power Supply



## GPP-Series

CE | RS-232 | GPIB | USB | LAN | Ext I/O

## 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: ≦350μVrms/≦2mArms
- ✲ Transient Response Time: ≦50μs
- ✲ 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 ≦350μVrms/≦ 2mArms and output transient recovery capability≦50μs. 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 1kΩ 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 Templet 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/OCP/OPP/OTP, in which the protection mechanism for OVP/OCP/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/OCP 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.

**European Type Jack Terminal**



**Rear Panel (LAN+GPIB)**



**Rear Panel (LAN)**



**Rear Panel**



## OUTPUT FUNCTION LIST

| Model Number | GPP-4323 / GPP-3323 / GPP-2323 / GPP-1326 | | | |
|---|---|---|---|---|
| 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-2323 not supported) | ✓ |
| Output Recorder Function | ✓ | ✓ | ✓ (GPP-2323 not supported) | ✓ |
| Panel Save/Recall | ✓ | ✓ | ✓ | ✓ |

# Multi-output Programmable D.C. Power Supply

## SPECIFICATIONS

| | | GPP-1326 | GPP-2323 | | GPP-3323 | | | GPP-4323 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **OUTPUT MODE** | | | | | | | | | | | |
| Number of Channel | | CH1 | CH1 | CH2 | CH1 | CH2 | CH3 | CH1 | CH2 | CH3 | CH4 |
| Voltage | | 0 – 32.000V | 0 – 32.000V | 0 – 32.000V | 0 – 32.000V | 0 – 32.000V | 1.8V/2.5V/3.3V/5.0V, ±5% | 0 – 32.000V | 0 – 32.000V | 0 – 5.000V | 0 – 15.000V |
| Current | | 0 – 6.0000A | 0 – 3.0000A | 0 – 3.0000A | 0 – 3.0000A | 0 – 3.0000A | 5A (USB Port 3A) | 0 – 3.0000A | 0 – 3.0000A | 0 – 1.0000A | 0 – 1.0000A |
| Tracking Series Voltage/Current | | - | 0 ~ 64.000V / 0 ~ 3.0000A | | 0 ~ 64.000V / 0 ~ 3.0000A | | - | 0 ~ 64.000V / 0 ~ 3.0000A | | - | - |
| Tracking Parallel Voltage/Current | | - | 0 ~ 32.000V / 0 ~ 6.0000A | | 0 ~ 32.000V / 0 ~ 6.0000A | | - | 0 ~ 32.000V / 0 ~ 6.0000A | | - | - |
| Warning : The CH3 of GPP-3323 output current from the 2 terminals should Not exceed 5A. | | | | | | | | | | | |
| **CONSTANT VOLTAGE OPERATION** | | | | | | | | | | | |
| Line Regulation | | ≤ 0.01% + 3mV | ≤ 0.01% + 3mV | | ≤ 0.01% + 3mV | | ≤ 3mV | ≤ 0.01% + 3mV | | | |
| Load Regulation | | ≤ 0.01%+3mV(rating current≤ 3A) | ≤ 0.01%+3mV(rating current≤3A) | | ≤ 0.01%+3mV(rating current≤3A) | | ≤ 5mV | ≤ 0.01%+3mV(rating current≤3A) | | | |
| | | ≤ 0.02%+5mV(rating current>3A) | ≤ 0.02%+5mV(rating current>3A) | | ≤ 0.02%+5mV(rating current>3A) | | | ≤ 0.02%+5mV(rating current>3A) | | | |
| Ripple & Noise (5Hz-1MHz) | | ≤0.5mVrms | ≤0.35mVrms | | ≤0.35mVrms | | ≤2mVrms | ≤0.35mVrms | | ≤1mVrms | |
| Transient Recovery Time | | ≤100μs | ≤50μs | | ≤50μs | | ≤100μs | ≤50μs | | | |
| | | (50% load change，minimum load 0.5A) | | | | | | | | | |
| Temperature Coefficient | | ≤ 300ppm/°C | | | | | | | | | |
| **CONSTANT CURRENT OPERATION** | | | | | | | | | | | |
| Line Regulation | | ≤ 0.2% + 3mA | | | | | | | | | |
| Load Regulation | | ≤ 0.2% + 3mA | | | | | | | | | |
| Ripple & Noise | | ≤4mArms | ≤ 2mArms | | ≤ 2mArms | | | ≤ 2mArms | | | |
| Resolution | | | | | | | | | | | |
| Programming | Voltage/Current | 1mV / 0.2mA | 1mV / 0.1mA | | 1mV / 0.1mA | | - | 1mV / 0.1mA | | | |
| Readback | Voltage/Current | 1mV / 0.2mA | 0.1mV / 0.1mA | | 0.1mV / 0.1mA | | - | 0.1mV / 0.1mA | | | |
| **TRACKING OPERATION(CH1/CH2)** | | | | | | | | | | | |
| Tracking Error | | - | ≤±(0.1%+10mV of Master(0–32V)) (No Load, with load add load regulation≤100mV) | | ≤±(0.1%+10mV of Master(0–32V)) (No Load, with load add load regulation≤100mV) | | - | ≤±(0.1%+10mV of Master(0–32V)) (No Load, with load add load regulation≤100mV) | | - | |
| Parallel Regulation | Line | | ≤ 0.01% + 3mV | | ≤ 0.01% + 3mV | | | ≤ 0.01% + 3mV | | | |
| | Load | | ≤ 0.01%+3mV(rating current≤3A) | | ≤ 0.01%+3mV(rating current≤3A) | | | ≤ 0.01%+3mV(rating current≤3A) | | | |
| | | | ≤ 0.02%+5mV(rating current>3A) | | ≤ 0.02%+5mV(rating current>3A) | | | ≤ 0.02%+5mV(rating current>3A) | | | |
| Series Regulation | Line | | ≤ 0.01% + 5mV | | ≤ 0.01% + 5mV | | | ≤ 0.01% + 5mV | | | |
| | Load | | ≤ 100mV | | ≤ 100mV | | | ≤ 100mV | | | |
| Ripple & Noise | | | ≤1mVrms(5Hz-1MHz) | | ≤1mVrms(5Hz-1MHz) | | | ≤1mVrms(5Hz-1MHz) | | | |
| Note : GPP-1326 does not have Tracking function,and Tracking is not supported in LOAD mode. | | | | | | | | | | | |
| **METER** | | | | | | | | | | | |
| Full Scale | Voltage/Current | 33.0000V / 6.2000A | 33.0000V / 3.2000A | | 33.0000V / 3.2000A | | 1.8V/2.5V/3.3V/5.0V | 33.0000V / 3.2000A | | | |
| Programming Resolution | Voltage/Current | 5 digits / 5 digits | 5 digits / 5 digits | | 5 digits / 5 digits | | - | 5 digits / 5 digits | | | |
| Readback Resolution | Voltage/Current | 6 digits / 5 digits | 6 digits / 5 digits | | 6 digits / 5 digits | | | 5 digits / 6 digits | | | |
| Setting Accuracy | Voltage | ± (0.03% of reading + 10mV) | ± (0.03% of reading + 10mV) | | ± (0.03% of reading + 10mV) | | | ± (0.03% of reading + 10mV) | | | |
| | Current | ± (0.3% of reading + 10mA) | ± (0.3% of reading + 10mA) | | ± (0.3% of reading + 10mA) | | | ± (0.3% of reading + 10mA) | | | |
| Readback Accuracy | Voltage | ± (0.03% of reading + 10mV) | ± (0.03% of reading + 10mV) | | ± (0.03% of reading + 10mV) | | | ± (0.03% of reading + 10mV) | | | |
| | Current | ± (0.3% of reading + 10mA) | ± (0.3% of reading + 10mA) | | ± (0.3% of reading + 10mA) | | | ± (0.3% of reading + 10mA) | | | |
| **DC LOAD MODE** | | | | | | | | | | | |
| Display | Voltage | 1 – 33.00V | 1 ~ 33.00V | | 1 ~ 33.00V | | - | 1 ~ 33.00V | | - | |
| | Current | 0 – 6.200A | 0 ~ 3.200A | | 0 ~ 3.200A | | | 0 ~ 3.200A | | | |
| | Power | 0 – 100.00W | 0 ~ 50.00W | | 0 ~ 50.00W | | | 0 ~ 50.00W | | | |
| CV Mode | CH1/CH2 | 1.500V ~ 33.00V | 1.500V ~ 33.00V | | 1.500V ~ 33.00V | | | 1.500V ~ 33.00V | | | |
| | Setting/Reedback Accuracy | ≤±(0.1% + 30mV) | ≤±(0.1% + 30mV) | | ≤±(0.1% + 30mV) | | | ≤±(0.1% + 30mV) | | | |
| | Resoltion | 10mV | 10mV | | 10mV | | | 10mV | | | |
| CC Mode | CH1/CH2 | 0 ~ 3.200A | 0 – 3.200A | | 0 – 3.200A | | | 0 – 3.200A | | | |
| | Setting/Reedback Accuracy | ≤±(0.3% + 10mA) | ≤±(0.3% + 10mA) | | ≤±(0.3% + 10mA) | | | ≤±(0.3% + 10mA) | | | |
| | Resoltion | 1mA | 1mA | | 1mA | | | 1mA | | | |
| CR Mode | CH1/CH2 | 1Ω~ 1kΩ | 1Ω~ 1kΩ | | 1Ω~ 1kΩ | | | 1Ω~ 1kΩ | | | |
| | Setting/Reedback Accuracy | ≤±(3% + 1Ω) (voltage≥0.1V, and current≥0.1A) | ≤±(3% + 1Ω) (voltage≥0.1V, and current≥0.1A) | | ≤±(3% + 1Ω) (voltage≥0.1V, and current≥0.1A) | | | ≤±(3% + 1Ω) (voltage≥0.1V, and current≥0.1A) | | | |
| | Resoltion | 1Ω | 1Ω | | 1Ω | | | 1Ω | | | |
| **PROTECTION** | | | | | | | | | | | |
| OVP | Power Mode | OFF,ON(0.5V – 35.0V) | OFF,ON(0.5V ~ 35.0V) | | OFF,ON(0.5V ~ 35.0V) | | Fixed 5.5V | OFF,ON(0.5V ~ 35.0V) | | OFF,ON (0.5V~6.0V) | OFF,ON (0.5V~16.5V) |
| | Load Mode | OFF,ON(1.5V ~ 35.0V) | OFF,ON(1.5V – 35.0V) | | OFF,ON(1.5V – 35.0V) | | - | OFF,ON(1.5V – 35.0V) | | - | |
| | Setting Accuracy | ±100mV | | | | | | | | | |
| | Resoltion | 100mV | | | | | | | | | |
| OCP | Power Mode | OFF,ON(0.05A ~ 7.00A) | OFF,ON(0.05A – 3.50A) | | OFF,ON(0.05A – 3.50A) | | 3.1A(USB port) | OFF,ON(0.05A – 3.50A) | | OFF,ON(0.05A – 1.20A) | |
| | Load Mode | OFF,ON(0.05A ~ 7.00A) | OFF,ON(0.05A – 3.50A) | | OFF,ON(0.05A – 3.50A) | | - | OFF,ON(0.05A – 3.50A) | | - | |
| | Setting Accuracy | ±20mA | | | | | | | | | |
| | Resoltion | 10mA | | | | | | | | | |
| Insulation Resistance | | Between chassis and terminal : 20MΩ or above (DC 500V) | | | | | | | | | |
| | | Between chassis and DC power cord : 30MΩ or above (DC 500V) | | | | | | | | | |
| **GENERAL** | | | | | | | | | | | |
| Operation Environment | | Indoor use, Altitude: ≤ 2000m ; Ambient temperature: 0 – 40°C / Relative humidity: ≤ 80% ; Installation category: II / Pollution degree: 2 | | | | | | | | | |
| Storage Environment | | TEMPERATURE: -10°C ~ 70°C / HUMIDITY: ≤70% | | | | | | | | | |
| Power Input | | AC 100V/120V/220V/230V±10%, 50/60Hz | | | | | | | | | |
| Power Consumption | | 360W | 360W | | 420W | | | 420W | | | |
| Dimensions & Weight | | 213 (W) x 145 (H) x 312 (D) mm ; Approx. 7.5kg | | | | | | | | | |

## 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

ACCESSORIES :
User Manual x 1 , Power cord x 1

**GPP-1326** Test Lead GTL-104A x 1, GTL-105A x 1
**GPP-2323** Test Lead GTL-104A x 2
**GPP-3323** Test Lead GTL-104A x 3
**GPP-4323** Test Lead GTL-104A x 2, GTL-105A x 2

European Test Leads :
**GPP-1326** GTL-203A x 1, GTL-204A x 1, GTL-201A x 1
**GPP-2323** GTL-204A x 2, GTL-201A x 1
**GPP-4323** GTL-203A x 2, 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-449-J** Rack Mount Kit (JIS)
**GRA-449-E** Rack Mount Kit (EIA)

### OPTIONS (Manufacturer Installed Only)

LAN Interface; GPIB+LAN Interface

# Multiple Output Programmable Linear D.C. Power Supply



## GPD-2303S/3303S/ 4303S/3303D

CE | USB | PC Software | LabVIEW Driver

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.

## 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

### Rear Panel



### European Type Jack Terminal



**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 | 3A | 0–3A | 0–3A | 0–3A or 0–1A | 0–1A | 0–3A | 0–3A | 3A |

| | | |
|---|---|---|
| **CONSTANT VOLTAGE OPERATION** | | |
| **Regulation** | Line regulation ≤ 0.01%+3mV<br>Load regulation ≤ 0.01%+3mV(rating current≤ 3A); ≤ 0.02%+5mV(rating current >3A) | |
| **Ripple & Noise** | ≤ 1mVrms (5Hz–1MHz) | |
| **Recovery Time** | ≤100 μs (50%Load change, Minimum load 0.5A) | |
| **Temp.Coefficient** | ≤300ppm / ℃ | |
| **CONSTANT CURRENT OPERATION** | | |
| **Regulation** | Line regulation≤ 0.2%+3mA; Load regulation≤ 0.2%+3mA | |
| **Ripple Current** | ≤3mArms | |
| **TRACKING OPERATION** | | |
| **Regulation of PAR.** | Line regulation ≤ 0.01%+3mV<br>Load regulation≤ 0.01%+3mV (rating current≤3A); ≤ 0.02%+5mV (rating current >3A) | |
| **Regulation of SER.** | Line regulation ≤ 0.01%+5mV<br>Load regulation≤ 100mV | |
| **Tracking Error** | ≤ 0.1%±10mV (10 – 30V) no load, with load added load regulation ≤100mV | |
| **METER** | | |
| **Display** | Voltage: 5 digits 0.4" LED Display (full scale:32V)<br>Current: 4 digits 0.4" LED Display (full scale:3.2A) | Voltage:3 digits 0.4"LED Display<br>Current:3 digits 0.4"LED Display |
| **Resolution** | Voltage: 1mV<br>Current: 1mA | Voltage:100mV<br>Current:10mA |
| **Program Accuracy**(25±5℃) | Voltage: ±(0.03% of RDG +10 digits)<br>Current: ±(0.3% of RDG +10 digits) | Voltage:±(0.5% of RDG+2 digits)<br>Current:±(0.5% of RDG+2 digits) |
| **Readback Aaccuracy**(25±5℃) | Voltage: ±(0.03% of RDG +10 digits)<br>Current: ±(0.3% of RDG +10 digits) | Voltage:±(0.5% of RDG+2 digits)<br>Current:±(0.5% of RDG+2 digits) |

| | | | | |
|---|---|---|---|---|
| **CH3 SPECIFICATIONS** | | | | |
| **Output Voltage**<br>**Output Current**<br>**Regulation**<br>**(25±5℃ )**<br><br>**Repple & Noise** | – | ( 2.5V/3.3V/5V )±8%<br>3A<br>Line regulation ≤ 0.01%+3mV<br>Load regulation ≤ 0.01%+3mV<br>≤1mVrms(5Hz–1MHz) | 0–5V / 5–10V<br>0–3A / 0–1A<br>Line regulation ≤ 0.01%+3mV<br>Load regulation ≤ 0.01%+3mV<br>≤2mVrms(5Hz–1MHz) | ( 2.5V/3.3V/5V )±8%<br>3A<br>Line regulation ≤ 0.01%+3mV<br>Load regulation ≤ 0.01%+3mV<br>≤1mVrms(5Hz–1MHz) |

| |
|---|
| **KEY LOCK** |
| Yes |
| **MEMERY SAVE/RECALL** |
| 4 sets |
| **POWER SOURCE** |
| AC100V/120V/220V/230V±10%, 50/60Hz; Power consumption : 490VA max. |
| **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

# Programmable Dual-range Linear D.C. Power Supply



## PSM-2010/3004/6003

CE | RS-232 | GPIB | Front/Rear Output | PC Software | LabVIEW Driver

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.

## FEATURES

* Single Output Dual Range Max. 200W
* High Resolution: 1mV/1mA
* Stable & Clear Power: 0.01% Load/Line Regulation, 350μVrms 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



## SPECIFICATIONS

| | | PSM-2010 | PSM-3004 | PSM-6003 |
|---|---|---|---|---|
| **DC OUTPUT** | | | | |
| **Low Range**<br>**High Range** | | 0 – 8V/20A<br>0 – 20V/10A | 0 – 15V/7A<br>0 – 30V/4A | 0 – 30V/6A<br>0 – 60V/3.3A |
| **CONSTANT VOLTAGE OPERATION** | | | | |
| **Regulation** (% of output + offset) | | Load regulation ≤ 0.01% + 2mV ; Line regulation ≤ 0.01% + 2mV | | |
| **Ripple & Noise** | | < 350 μVrms/3mVpp | < 350 μVrms/2mVpp | ≤50V:<500 μVrms/3mVpp<br>>50V:<1mVrms/3mVpp |
| **CONSTANT CURRENT OPERATION** | | | | |
| **Regulation** (% of output + offset) | | Load regulation ≤ 0.01% + 250μA ; Line regulation ≤ 0.01% + 250μA | | |
| **Ripple & Noise** | | < 2mArms | | |
| **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(<10A),10mA(≥10A) | | |
| 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** | | | | |
| | | < 50μsec ( 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<br>Current | | 0.02% + 1mV<br>0.1% + 1mA | | |
| **MEMORY** | | | | |
| Store/Recall | | 100 sets | | |
| **TEMPERATURE COEFFICIENT PER °C ± (% of Output + Offset)** | | | | |
| Voltage<br>Current | | 0.01% + 3mV<br>0.02% + 3mA | | |
| **POWER SOURCE** | | | | |
| AC 100V/120V/220V±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
**GTL-248** GPIB Cable, Double Shielded, 2000mm
**GRA-407** Rack Mount Kit

**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

CE | RS-232 | GPIB | PC Software | LabVIEW Driver

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.

## 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



| SPECIFICATIONS | PSS-2005 | PSS-3203 |
|---|---|---|
| **OUTPUT** | | |
| Voltage<br>Current<br>OVP | 0 – 20V<br>0 – 5A<br>0 – 21V | 0 – 32V<br>0 – 3A<br>0 – 33V |
| **LOAD REGULATION** | | |
| Voltage<br>Current | ≤ 3mV ( ≤ 5mV, rating current > 3.0A )<br>≤ 3mA ( ≤ 5mA, rating current > 3.0A ) | |
| **LINE REGULATION** | | |
| Voltage<br>Current | ≤ 3mV<br>≤ 3mA | |
| **RESOLUTION** | | |
| Voltage<br>Current<br>OVP | 10mV<br>1mA ( 2mA, rating current > 3.0A )<br>10mV | |
| **PROGRAM ACCURACY (25 ± 5°C)** | | |
| Voltage<br>Current<br>OVP | ≤ 0.05%+20mV<br>≤ 0.1%+5mA ( +10mA, rating current > 3.0A )<br>≤ 0.05%+20mV | |
| **RIPPLE & NOISE (20Hz ~ 20MHz)** | | |
| Voltage<br>Current | Ripple ≤ 1mVrms/3mVp-p ; Noise ≤ 2mVrms/30mVp-p<br>≤ 3mArms ( ≤ 5mArms, rating current > 3.0A) | |
| **TEMPERATURE COEFFICIENT (0 ~ 40°C)** | | |
| Voltage<br>Current | ≤ 100ppm+3mV<br>≤ 100ppm+3mA | |
| **READBACK RESOLUTION** | | |
| Voltage<br>Current | 10mV<br>1mA ( 2mA, rating current > 3.0A ) | |
| **READBACK ACCURACY(25 ±5°C)** | | |
| Voltage<br>Current | ≤ 0.05%+10mV<br>≤ 0.1%+5mA ( 10mA rating current > 3.0A ) | |
| **READBACK TEMPERATURE COEFFICIENT** | | |
| Voltage<br>Current | ≤ 100ppm+10mV<br>≤ 100ppm+5mA ( 10mA rating current > 3.0A ) | |
| **RESPONSE TIME** | | |
| Voltage Up (10%~90%)<br>Voltage Down (90%~10%) | ≤ 100mS<br>≤ 100mS ( ≥10% rating load ) | |
| **DRIFT** | | |
| Voltage<br>Current | ≤ 100ppm+10mV<br>≤ 150ppm+10mA | |
| **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.

# Multiple Output Programmable Linear D.C. Power Supply



## PPE-3323

CE | RS-232 | PC Software

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.

## FEATURES

* Easy Operation with UP/DOWN Key
* High Resolution: 10mV, 1mA
* Over Voltage 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

| | |
|---|---|
| **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<br>Current | ≤6mV<br>≤3mA |
| **LINE REGULATION** | |
| Voltage<br>Current | ≤3mV<br>≤3mA |
| **RESOLUTION** | |
| Voltage<br>Current<br>OVP | 10mV ( 20mV rating voltage > 36V )<br>1mA ( 2mA rating current >3.5A )<br>10mV( 20mV rating voltage > 36V ) |
| **PROGRAM ACCURACY (25±5°C)** | |
| Voltage<br>Current<br>OVP | ≤0.05% + 25mV ( + 50mV rating voltage > 36 V )<br>≤0.2% + 10mA<br>≤2% + 0.6V |
| **RIPPLE & NOISE (20Hz ~ 20MHz)** | |
| Voltage<br><br>Current | Ripple 1mVrms / 3mVp-p<br>Noise 2mVrms / 30mVp-p<br>≤3mA rms (≤ 5mA rms rating current > 3.5A ) |
| **TEMPERATURE COEFFICIENT (0~40°C )** | |
| Voltage<br>Current | ≤100ppm + 3mV<br>≤150ppm + 3mA |
| **READBACK RESOLUTION/ACCURACY (25± 5°C)** | |
| Voltage<br>Current<br>Voltage<br>Current | 10mV ( 20mV rating voltage > 36V )<br>1mA ( 2mA rating current > 3.5A )<br>≤0.05% + 25mV ( + 50mV rating voltage > 36V )<br>≤0.2% + 10mA |
| **RESPONSE TIME** | |
| VOLTAGE UP 10% ~ 90%<br>VOLTAGE DOWN 90% ~ 10% | ≤100mS<br>≤100mS (≥ rating load ) |
| **READBACK TEMPERATURE COEFFICIENT** | |
| Voltage<br>Current | ≤100ppm + 10mV ( + 20mV rating voltage > 36V )<br>≤150ppm + 10mA |
| **DRIFT** | |
| Voltage<br>Current | ≤100ppm + 10mV<br>≤150ppm + 10mA |
| **TRACK OPERATION** | |
| Tracking Error<br>Series Regulation | ≤0.1% + 50mV<br>≤50mV |
| **PARALLEL OPERATION (PPT-Series only)** | |
| Program Accuracy (25±5°C)<br><br>Load Effect<br><br>Source Effect | Voltage ≤0.05% + 25mV ( + 50mV rating voltage > 36V )<br>Current ≤0.2% + 20mA<br>OVP ≤2% + 0.6V<br>Voltage ≤3mV rear output ( ≤6mV front output )<br>Current ≤6mA ( ≤12mA rating current > 3.5A )<br>Voltage ≤3mV; Current ≤6mA |
| **MEMORY** | |
| Store/Recall | 50 sets |
| **TIMER** | |
| Setting Time<br><br>Resolution<br>Function | 1 second – 99 minutes (Max. 99 minutes x 50 sets)<br><br>1 second<br>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 | |

**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

**GRA-401** Rack Mount Kit

**FREE DOWNLOAD**

**PC Software** Remote Control Software

### Rear Panel



# Multiple Output Programmable Linear D.C. Power Supply



## PPT-1830/PPT-3615

CE GPIB LabVIEW Driver

## 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**

| MODEL | 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<br>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

CE | RS-232 | GPIB | PC Software | LabVIEW Driver

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.

## 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



| SPECIFICATIONS | PST-3202 | PST-3201 |
|---|---|---|
| **OUTPUT** | | |
| Voltage<br>Current<br>OVP | 0–32Vx2, 0–6Vx1<br>0–2Ax2, 0–5Ax1<br>0–33Vx2, 0–7Vx1 | 0–32Vx3<br>0–1Ax3<br>0–33Vx3 |
| **LOAD REGULATION** | | |
| Voltage<br>Current | ≤ 3mV (≤ 5mV rating current >3.0A)<br>≤ 3mA (≤ 5mA rating current >3.0A) | |
| **LINE REGULATION** | | |
| Voltage<br>Current | ≤ 3mV<br>≤ 3mA | |
| **RESOLUTION** | | |
| Voltage<br>Current<br>OVP | 10mV<br>1mA (2mA, rating current >3.0A)<br>10mV | |
| **PROGRAM ACCURACY(25 ±5°C)** | | |
| Voltage<br>Current<br>OVP | ≤ 0.05%+20mV<br>≤ 0.1%+5mA (+10mA, rating current>3.0A)<br>≤ 0.05%+20mV | |
| **RIPPLE & NOISE(20Hz~20MHz)** | | |
| Voltage<br>Current | Ripple: ≤ 1mVrms/3mVp-p ; Noise: ≤ 2mVrms/30mVp-p<br>≤ 3mArms (≤ 5mArms, rating current >3.0A) | |
| **TEMPERATURE COEFFICIENT (0 ~ 40 °C)** | | |
| Voltage<br>Current | ≤ 100ppm+3mV<br>≤ 100ppm+3mA | |
| **READBACK RESOLUTION** | | |
| Voltage<br>Current | 10mV(20mV, rating voltage >36V)<br>1mA(2mA, rating current >3.0A) | |
| **READBACK ACCURACY(25 ± 5 °C)** | | |
| Voltage<br>Current | ≤ 0.05%+10mV(+20mV, rating voltage >36V)<br>≤ 0.1%+5mA(+10mA, rating current>3.0A) | |
| **READBACK TEMPERATURE COEFFICIENT** | | |
| Voltage<br>Current | ≤ 100ppm+10mV(+20mV, rating voltage >36V)<br>≤ 150ppm+10mA(+20mA, rating current >3.0A) | |
| **RESPONSE TIME** | | |
| Voltage Up (10%–90%)<br>Voltage Down (90%–10%) | ≤ 100mS<br>≤ 100mS (≥ 10% rating load) | |
| **DRIFT** | | |
| Voltage<br>Current | ≤ 100ppm+10mV(+20mV, rating voltage >36V)<br>≤ 150ppm+10mA | |
| **TRACK OPERATION** | | |
| Tracking Error<br>Series(Load Effect) | ≤ 0.1%+20mV<br>≤ 20mV | |
| **PARALLEL OPERATION** | | |
| Program Accuracy(25±5° C)<br>Load Effect<br>Source Effect | Voltage ≤ 0.05%+20mV,Current ≤ 0.1%+10mA, OVP ≤ 0.05%+20mV<br>Voltage ≤ 3mV(≤ 5mV, rating current>3.0A); Current≤ 6mA<br>Voltage ≤ 3mV;Current ≤ 6mA | |
| **MEMORY** | | |
| Store/Recall | 100 Sets | |
| **TIMER** | | |
| Setting Time<br>Resolution<br>Function | 0.1 second–99 Minutes 59 second (Max. 99 Minutes 59 second x 100)<br>0.1 second<br>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 Linear D.C. Power Supply



## GPE-X323 Series

CE Remote I/O

## 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
* Optional European Jack Type Terminal

European Type Jack Terminal



Rear Panel



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)<br>≦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 | ≦3mArms | | | | | | | | | |
| **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<br>Load : ≦0.01%+3mV(rating current≦3A)<br>≦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 | | | | | | | | | |

## 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.

# Multiple Output Linear D.C. Power Supply



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.

## GPS-2303/3303/4303

CE

## 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

**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)<br>≤ 0.02% + 5mV (rating current > 3A) | | | | | | | | |
| Ripple & Noise | ≤ 1mVrms , 5Hz – 1MHz | | | | | | | | |
| Recovery Time | ≤ 100 μS (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<br>GPS-4303/3303 Out ON Accuracy ± (0.5% of rdg + 2 digits)<br>GPS-4303/3303 Out OFF Accuracy ± (0.5% of rdg + 8 digits)<br>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

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.

## 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

## SPECIFICATIONS

| | |
|---|---|
| **OPERATION MODE** | |
| **Independent** | Two independent outputs and 5V fixed output<br>Output from 0 to rating volts and 0 to rating amperes |
| **Series** | Output from 0 to ±rating volts at rating amperes each<br>Output from 0 to double rating volts at rating amperes |
| **Parallel** | Output from 0 to double rating amperes at rating volts |
| **CONSTANT VOLTAGE OPERATION** | |
| **Regulation** | Line regulation ≤ 0.01% + 3mV<br>Load regulation ≤ 0.01% + 3mV (rating current ≤ 3A)<br>≤ 0.01% + 5mV (rating current ≤ 10A)<br>≤ 0.02% + 5mV (rating current ≥ 10A) |
| **Ripple & Noise** | ≤ 1mVrms 5Hz – 1MHz |
| **Recovery Time** | ≤ 100μS (50% Load change, Minimum load 0.5A) |
| **CONSTANT CURRENT OPERATION** | |
| **Regulation** | Line regulation ≤ 0.2% + 3mA<br>Load regulation ≤ 0.2% + 5mA |
| **Ripple Current** | ≤ 3mArms |
| **5V FIXED OUTPUT** | |
| **Regulation** | Line regulation ≤ 5mV<br>Load regulation ≤ 10mV |
| **Ripple & Noise** | ≤ 2mVrms |
| **Voltage Accuracy** | 5V ± 0.25V |
| **Output Current** | 3A |
| **TRACKING OPERATION** | |
| **Tracking Error** | ≤ 0.5% + 10mV of the master |
| **Series Regulation** | ≤ 300mV |
| **METER** | |
| **Digital** | 3 1/2 digits 0.5" LED display<br>Accuracy ± (0.5% of rdg + 2 digits) |
| **INSULATION** | |
| **Chassis and Terminal** | 100MΩ or above (DC 1000V) |
| **Chassis and AC Cord** | 100MΩ or above (DC 1000V) |
| **POWER SOURCE** | |
| AC 100V/120V/220V/240V ± 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 (≤ 3A ) or GTL-104A x 2 (≤ 10A )

**OPTIONAL ACCESSORIES**

**GRA-401** Rack Mount Kit

# Linear D.C. Power Supply



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 impropriate 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.

## GPR-H Series

CE Rear-Panel Output



## 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)

### Rear Panel



| SPECIFICATIONS | |
|---|---|
| **CONSTANT VOLTAGE OPERATION** | |
| Regulation | Line regulation ≤ 0.01% + 3mV<br>Load regulation ≤ 0.01% + 5mV (<10A)<br>≤ 0.02% + 5mV (≥10A) |
| Ripple & Noise | ≤ 1mVrms 5Hz – 1MHz |
| Recovery Time | ≤ 100μS ( 50% load change, minimum load 0.5A ) |
| Output Range | 0 to rating voltage continuously adjustable |
| **CONSTANT CURRENT OPERATION** | |
| Regulation | Line regulation ≤ 0.2% + 3mA<br>Load regulation ≤ 0.2% + 5mA |
| Ripple Current | ≤ 5mArms (≤20A), ≤ 10mArms (≤30A)<br>≤ 20mArms (≤50A) |
| Output Range | 0 to rating current continuoulsy adjustable |
| **METER** | |
| Type | 3 1/2 Digit 0.5" LED display |
| Accuracy | ± ( 0.5% of rdg + 2 digits ) |
| **INSULATION** | |
| Chassis and Terminal | 100MΩ or above ( DC 1000V ) |
| Chassis and AC Cord | 100MΩ or above ( DC 1000V ) |
| **POWER SOURCE** | |
| AC 100V/120V/220V/240V ±10%, 50/60Hz | |
| **DIMENSIONS** | |
| 254(W) x 152(H) x 456(D) mm | |

## 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 ( ≤ 3A ) or GTL-104A x 1 ( ≤ 10A ) or Not Available (>10A)

**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



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.

## GPR-M Series

CE

## 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

| SPECIFICATIONS | |
|---|---|
| **CONSTANT VOLTAGE OPERATION** | |
| **Regulation** | Line regulation ≤0.01% + 3mV<br>Load regulation ≤0.01% + 5mV (<10A)<br>Load regulation ≤ 0.02% + 5mV (≥10A) |
| **Ripple & Noise** | ≤1mVrms 5Hz – 1MHz |
| **Recovery Time** | ≤100μS( 50% load change, minimum load 0.5A ) |
| **Output Range** | 0 to rating voltage continuously adjustable |
| **CONSTANT CURRENT OPERATION** | |
| **Regulation** | Line regulation≤0.2% + 3mA<br>Load regulation≤0.2% + 3mA |
| **Ripple Current** | ≤3mArms |
| **Output Range** | 0 to rating current continuoulsy adjustable |
| **METER** | |
| **Digital** | 3 1/2 Digits 0.5" LED display<br>Accuracy±( 0.5% of rdg + 2 digits ) |
| **INSULATION** | |
| **Chassis and Terminal** | 20MΩ or above ( DC 500V ) |
| **Chassis and AC Cord** | 30MΩ or above ( DC 500V ) |
| **POWER SOURCE** | |
| AC 100V/120V/220V/240V±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



The GPS-Series is a single output, 54W to 90W, linear DC power supply. The GPS-Series has 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.

## GPS-1830D/1850D/3030D

CE



## GPS-3030DD

CE



### 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-3030D/GPS-3030DD

### European Type Jack Terminal



| SPECIFICATIONS | |
|---|---|
| **CONSTANT VOLTAGE OPERATION** | |
| **Regulation** | Line regulation ≤ 0.01% + 3mV<br>Load regulation ≤ 0.01% + 3mV (rating current ≤ 3A)<br>≤ 0.01% + 5mV (rating current > 3A) |
| **Ripple & Noise** | ≤ 0.5mVrms 5Hz ~ 1MHz (rating current ≤ 3A)<br>≤ 1mVrms 5Hz ~ 1MHz (rating current > 3A) |
| **Recovery Time** | ≤ 100μS (50% load change, minimum load 0.5A) |
| **Temp. Coefficient** | ≤ 300 ppm /°C |
| **Output Range** | 0 to rating voltage continuously adjustable |
| **CONSTANT CURRENT OPERATION** | |
| **Regulation** | Line regulation ≤ 0.2% + 3mA<br>Load regulation ≤ 0.2% + 3mA |
| **Ripple Current** | ≤ 3mArms |
| **Output Range** | 0 to rating current continuously adjustable<br>(Hi/Lo range switchable) |
| **METER** | |
| **Digital** | 3½ digits 0.5" LED display (GPS-1830D/1850D/3030D)<br>3½ digits 0.39" LED display (GPS-3030DD)<br>Accuracy ±(0.5% of rdg + 2 digits) |
| **INSULATION** | |
| **Chassis and Terminal** | 20MΩ or above (DC 500V) |
| **Chassis and AC Cord** | 30MΩ or above (DC 500V) |
| **POWER SOURCE** | |
| AC 100V/120V/220V/240V ±10%, 50/60Hz | |
| **DIMENSIONS** | |
| 128(W) x 145(H) x 285(D) mm | |

## ORDERING INFORMATION

| Model | | Output Volts(V) | Output Amps(A) | Weight (kg) |
|---|---|---|---|---|
| **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 ( ≤ 3A ) or GTL-104A x 1 ( ≤ 10A )
European test lead GTL-203A x 1 ( ≤ 3A )or GTL-204A x 1 ( ≤ 10A )

## NOTE









# 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-3000/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.

### 2K~4KVA PROGRAMMABLE SWITCHING AC/DC POWER SOURCE

| Model | Output Capacity | Output Freq. | Output Voltage | Max. Current | Display Type | Weight(kg) | Page |
|---|---|---|---|---|---|---|---|
| ASR-3200 | 2KVA | 1~999.9Hz | AC 100V Range 0.0V~200.0V<br>AC 200V Range 0.0V~400.0V<br>DC 100V Range -285V~+285V<br>DC 200V Range -570V~+570V | AC 100V Range 20A<br>AC 200V Range 10A<br>DC 100V Range 20A<br>DC 200V Range 10A | LCD | 25 | D73-78 |
| ASR-3300 | 3KVA | 1~999.9Hz | AC 100V Range 0.0V~200.0V<br>AC 200V Range 0.0V~400.0V<br>DC 100V Range -285V~+285V<br>DC 200V Range -570V~+570V | AC 100V Range 30A<br>AC 200V Range 15A<br>DC 100V Range 30A<br>DC 200V Range 15A | LCD | 25 | |
| ASR-3400 | 4KVA | 1~999.9Hz | AC 100V Range 0.0V~200.0V<br>AC 200V Range 0.0V~400.0V<br>DC 100V Range -285V~+285V<br>DC 200V Range -570V~+570V | AC 100V Range 40A<br>AC 200V Range 20A<br>DC 100V Range 40A<br>DC 200V Range 20A | LCD | 25 | |
| ASR-3400HF | 4KVA | 1~5000Hz | AC 100V Range 0.0V~200.0V<br>AC 200V Range 0.0V~400.0V<br>DC 100V Range -285V~+285V<br>DC 200V Range -570V~+570V | AC 100V Range 40A<br>AC 200V Range 20A<br>DC 100V Range 40A<br>DC 200V Range 20A | LCD | 25 | |

### PROGRAMMABLE SWITCHING AC/DC POWER SOURCE

| Model | Output Capacity | Output Freq. | Output Voltage | Max. Current | Display Type | Weight(kg) | Page |
|---|---|---|---|---|---|---|---|
| ASR-2050/<br>ASR-2050R | 500VA | 1~999.9Hz | AC 100V Range 0.0V~175.0V<br>AC 200V Range 0.0V~350.0V<br>DC 100V Range -250.0V~+250.0V<br>DC 200V Range -500.0V~+500.0V | AC 100V Range 5A<br>AC 200V Range 2.5A<br>DC 100V Range 5A<br>DC 200V Range 2.5A | LCD | 11.5 ASR-2000 Series<br>10.5 ASR-2000R Series | D79-82 |
| ASR-2100/<br>ASR-2100R | 1000VA | 1~999.9Hz | AC 100V Range 0.0V~175.0V<br>AC 200V Range 0.0V~350.0V<br>DC 100V Range -250.0V~+250.0V<br>DC 200V Range -500.0V~+500.0V | AC 100V Range 10A<br>AC 200V Range 5A<br>DC 100V Range 10A<br>DC 200V Range 5A | LCD | 11.5 ASR-2000 Series<br>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<br>Option: 45~999.9Hz | 0~310V, 0~155V<br>Option: 0~600V | 2.1A, 4.2A | LCD | 24 | D83-86 |
| APS-7100 | 1000 VA | 45~500Hz<br>Option: 45~999.9Hz | 0~310V, 0~155V<br>Option: 0~600V | 4.2A, 8.4A | LCD | 38 | |
| APS-7200 | 2000 VA | 45~500Hz<br>Option: 45~999.9Hz | 0~310V, 0~155V<br>Option: 0~600V | 8.4A, 16.8A | LCD | 90 | |
| APS-7300 | 3000 VA | 45~500Hz<br>Option: 45~999.9Hz | 0~310V, 0~155V<br>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 | D87-88 |
| APS-7100E | 1K VA | 45~500Hz | 0~310V, 0~155V | 4.2A, 8.4A | LCD | 38 | |

# Programmable AC/DC Power Source



NEW

## ASR-3000 Series

CE | RS-232 | GPIB | USB | LAN | Ext I/O

The ASR-3000 Series is an AC+DC power source, featuring high-speed DC voltage rising and falling time (≦100us). There are four models of the series: ASR-3200(2kVA), ASR-3300(3kVA) and ASR-3400/3400HF (4kVA). The series can provide rated power output during AC output and DC output. Ten ASR-3000 Series 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)10) External DC voltage control of AC output mode(AC-VCA).

ASR-3000 Series is ideal for the development of On-board Chargers, Server Powers, LED modules, AC Motors, AC Fans, UPS and various electronic components, as well as for testing applications of automotive electrical equipment and home appliances.

The ASR-3000 Series provides users with waveform output capabilities 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-3000 Series power source outputs, it can also measure Vrms, Vavg, Vpeak, Irms, Iavg, Ipeak, IpkH, P, S, Q, PF, CF, 100th-order Voltage Harmonic and Current Harmonic. In addition, the remote sensing function ensures accurate voltage output, and the Customized Phase Angle for Output On/Off function can set the start and end angles of the voltage output according to the test requirements. The protection limits of V-Limit, Ipeak-Limit and F-Limit can be set according to user requirements. Over voltage limit, OCP, OPP will protect the DUT during the output process. The Fan Fail Alarm function and the AC fail alarm function are also designed in the ASR-3000 Series.

The front panel of the ASR-3000 Series provides a universal socket or a European socket, which allows users to plug and use so as to save wiring time. Since the power socket specification has a maximum current of 15A, the rear panel of ASR-3000 Series is designed with a current circuit breaker. When the socket current is greater than 15A, it will automatically open the circuit to protect users. The ASR-3000 Series supports I/O interface and is standardly equipped with USB, LAN, External I/O, RS-232C and GPIB.

### FEATURES

- ☆ **Output Rating: AC 0 ~ 400 Vrms, DC 0 ~ ± 570 V**
- ☆ **Output Frequency up to 999.9 Hz (5kHz for ASR-3400HF only)**
- ☆ **DC Output (100% of Rated Power)**
- ☆ **Measurement Items: Vrms, Vavg, Vpeak, Irms, IpkH, Iavg, Ipeak, P, S, Q, PF, CF**
- ☆ **Voltage and Current Harmonic Analysis (THDv, THDi)**
- ☆ **Remote Sensing Capability**
- ☆ **OCP, OPP, OTP, AC Fail Detection and Fan Fail Alarm**
- ☆ **Support Arbitrary Waveform Function**
- ☆ **Output Capacity: 2kVA/3kVA/4kVA**
- ☆ **Customized Phase Angle for Output On/Off**
- ☆ **Sequence and Simulation Function (up to 10 sets)**
- ☆ **Interface(std): USB, LAN, RS-232, GPIB**
- ☆ **Built-in External Control I/O and External Signal Input**
- ☆ **Built-in Output Relay Control**
- ☆ **Memory Function (up to 10 sets)**
- ☆ **Built-in Web Server**

**ASR-002** External three phase control unit



* Basis Requirement of ASR-002 to ASR-Series
1. Must be the three same models of ASR-Series
2. To ASR-2000 Series, the Opt01: RS-232+GPIB interface is required

* Functions of ASR-Series are limited when conducts to ASR-002
1. No DC Output
2. Measurement Items: only current(A), power(W)and PF for each phase
3. No Voltage and Current Harmonic Analysis
4. No Remote Sensing Capability
5. No Arbitrary Waveform Function
6. No Sequence and Simulation Function
7 Not supported External Control I/O
8. No memory Function
9. Only support USB, no LAN port for communication

**GRA-442-J** Rack Mount Adapter(JIS)



**GRA-442-E** Rack Mount Adapter(EIA)



**GTL-137** Output power wire



**APS-008** Air inlet filter



**GPW-005** Power cord



**GPW-006** Power cord



**GPW-007** Power cord



## SPECIFICATIONS

| | | | ASR-3200 | ASR-3300 | ASR-3400 | ASR-3400HF |
|---|---|---|---|---|---|---|
| **INPUT RATING (AC)** | | | | | | |
| **NOMINAL INPUT VOLTAGE** | | | 200 Vac to 240 Vac | | | |
| **INPUT VOLTAGE RANGE** | | | 180 Vac to 264 Vac | | | |
| **PHASE** | | | Single phase, Two-wire | | | |
| **NOMINAL INPUT FREQUENCY** | | | 50 Hz to 60 Hz | | | |
| **INPUT FREQUENCY RANGE** | | | 47 Hz to 63 Hz | | | |
| **MAX. POWER CONSUMPTION** | | | 2500 VA or less | 3750 VA or less | 5000 VA or less | 5000 VA or less |
| **POWER FACTOR** *1 | **200Vac** | | 0.95 (TYP) | | | |
| **MAX. INPUT CURRENT** | **200Vac** | | 15 A | 22.5 A | 30 A | 30 A |
| *1. For an output voltage of 100 V / 200 V (100V / 200V range), maximum current, and a load power factor of 1. | | | | | | |
| **AC MODE OUTPUT RATINGS (AC rms)** | | | | | | |
| **VOLTAGE** | **Setting Range** *1 | | 0.0 V to 200.0 V / 0.0 V to 400.0 V | | | |
| | **Setting Resolution** | | 0.1 V | | | |
| | **Accuracy** *2 | | ±(1 % of set + 1 V / 2 V) | | | |
| **OUTPUT PHASE** | | | Single phase, Two-wire | | | |
| **MAXIMUM CURRENT** *3 | **100 V** | | 20 A | 30 A | 40 A | 40 A |
| | **200 V** | | 10 A | 15 A | 20 A | 20 A |
| **MAXIMUM PEAK CURRENT** *4 | **100 V** | | 120 A | 180 A | 240 A | 160 A |
| | **200 V** | | 60 A | 90 A | 120 A | 80 A |
| **LOAD POWER FACTOR** | | | 0 to 1(leading phase or lagging phase) | | | |
| **POWER CAPACITY** | | | 2000 VA | 3000 VA | 4000 VA | 4000 VA |
| **FREQUENCY** | **Setting Range** | | AC Mode: 40.0 Hz to 999.9 Hz,<br>AC+DC Mode: 1 Hz to 999.9 Hz | | | AC Mode: 40.0 Hz to 5000 Hz,<br>AC+DC Mode: 1 Hz to 5000 Hz |
| | **Setting Resolution** | | 0.01 Hz (1.00 to 99.99 Hz),<br>0.1 Hz (100.0 to 999.9 Hz) | | | 0.01 Hz (1.00 to 99.99 Hz),<br>0.1 Hz (100.0 to 999.9 Hz)<br>1 Hz (1000 to 5000 Hz) |
| | **Accuracy** | | 0.02% of set (23 °C ± 5 °C) | | | |
| | **Stability** *5 | | ± 0.005% | | | |
| **OUTPUT ON PHASE** | | | 0° to 359° variable (setting resolution 1°) | | | |
| **DC OFFSET** *6 | | | Within ± 20 mV (TYP) | | | |
| *1. 100 V / 200 V range.<br>*2. For an output voltage of 20 V to 200 V / 40 V to 400 V, an output frequency of 45 Hz to 65 Hz, no load, and 23 °C ± 5°C.<br>*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 200 V / 200 V to 400 V.<br>If there is the DC superimposition, the current of AC+DC mode satisfies the maximum current. In the case of lower than 40 Hz, and the power rating temperature, the maximum current will be decrease.<br>*4. With respect to the capacitor-input rectifying load. Limited by the maximum current.<br>*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.<br>*6. In the case of the AC mode and 23°C ± 5°C. | | | | | | |
| **OUTPUT RATING FOR DC MODE** | | | | | | |
| **VOLTAGE** | **Setting Range** *1 | | -285 V to +285 V / -570 V to +570 V | | | |
| | **Setting Resolution** | | 0.1 V | | | |
| | **Accuracy** *2 | | ±(1 % of set + 1 V / 2 V) | | | |
| **MAXIMUM CURRENT** *3 | **100 V** | | 20 A | 30 A | 40 A | 40 A |
| | **200 V** | | 10 A | 15 A | 20 A | 20 A |
| **MAXIMUM PEAK CURRENT** *4 | **100 V** | | 120 A | 180 A | 240 A | 160 A |
| | **200 V** | | 60 A | 90 A | 120 A | 80 A |
| **POWER CAPACITY** | | | 2000 W | 3000 W | 4000 W | 4000 W |
| *1. 100 V / 200 V range.<br>*2. For an output voltage of -285 V to -28.5 V, +28.5 V to +285 V / -570 V to -57 V, +57 V to +570 V, no load, and 23 °C ± 5°C.<br>*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.<br>*4. Limited by the maximum current. | | | | | | |
| **OUTPUT VOLTAGE STABILITY** | | | | | | |
| **LINE REGULATION** *1 | | | 0.2% or less | | | |
| **LOAD REGULATION** *2 | | | 0.5% or less (0 to 100%, via output terminal) | | | |
| **RIPPLE NOISE** *3 | | | 1 Vrms / 2 Vrms (TYP) | | | |
| *1. Power source input voltage is 200 V, 220 V, or 240 V, no load, rated output.<br>*2. For an output voltage of 100 V to 200 V / 200 V to 400 V, 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.<br>*3. For 5 Hz to 1 MHz components in DC mode using the output terminal on the rear panel. | | | | | | |
| **OUTPUT VOLTAGE WAVEFORM DISTORTION RATIO, OUTPUT VOLTAGE RESPONSE TIME, EFFICIENCY** | | | | | | |
| **TOTAL HARMONIC DISTORTION(THD)** *1 | | | < 0.2% @50/60Hz<br>< 0.3% @<500Hz<br>< 0.5% @500.1Hz~999.9Hz | | | < 0.2% @50/60Hz<br>< 0.5% @<500Hz<br>< 1.0% @500.1Hz~2000Hz<br>< 2.0% @2100Hz~5000Hz |
| **OUTPUT VOLTAGE RESPONSE TIME** *2 | | | 100 µs (TYP) | | | |
| **EFFICIENCY** *3 | | | 80 % or more | | | |
| *1. At an output voltage of 50 V to 200 V / 100 V to 400 V, a load power factor of 1, and in AC mode.<br>*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).<br>*3. For AC mode, at an output voltage of 100 V / 200 V, maximum current, and load power factor of 1. | | | | | | |
| **MEASURED VALUE DISPLAY** | | | | | | |
| **VOLTAGE** | **RMS, AVG Value** *1 | **Resolution** | 0.1 V | | | |
| | | **Accuracy** *2 | For 45 Hz to 65 Hz and DC: ±(0.5 % of reading + 0.5 V / 1 V)<br>For all other frequencies: ±(0.7 % of reading + 1 V / 2 V) | | | |
| | **PEAK Value** | **Resolution** | 0.1 V | | | |
| | | **Accuracy** | For 45 Hz to 65 Hz and DC: ±(\|2 % of reading\| + 1 V / 2 V) | | | |
| **CURRENT** | **RMS, AVG Value** | **Resolution** | 0.01 A | | | |
| | | **Accuracy** *3 | For 45 Hz to 65 Hz and DC:<br>±(0.5 % of reading+0.1 A/0.05 A)<br>For all other frequencies:<br>±(0.7 % of reading+0.2 A/0.1 A) | For 45 Hz to 65 Hz and DC:<br>±(0.5 % of reading+0.15 A/0.08 A)<br>For all other frequencies:<br>±(0.7 % of reading+0.3 A/0.15 A) | For 45 Hz to 65 Hz and DC:<br>±(0.5 % of reading+0.2 A/0.1 A)<br>For all other frequencies:<br>±(0.7 % of reading+0.4 A/0.2 A) | |
| | **PEAK Value** | **Resolution** | 0.1 A | | | |
| | | **Accuracy** *4 | For 45 Hz to 65 Hz and DC:<br>±(\|2 % of reading\| + 0.5 A/0.25 A) | For 45 Hz to 65 Hz and DC:<br>±(\|2 % of reading\| + 0.8 A/0.4 A) | For 45 Hz to 65 Hz and DC:<br>±(\|2 % of reading\| + 1 A/0.5 A) | |
| **POWER** | **Active (W)** | **Resolution** | 1 W | | | |
| | | **Accuracy** *3 | ±(2 % of reading +2 W) | ±(2 % of reading +3 W) | ±(2 % of reading +4 W) | |
| | **Apparent (VA)** | **Resolution** | 1 VA | | | |
| | | **Accuracy** *3*5 | ±(2 % of reading +2 VA) | ±(2 % of reading +3 VA) | ±(2 % of reading +4 VA) | |
| | **Reactive (VAR)** | **Resolution** | 1 VAR | | | |
| | | **Accuracy** *3*7 | ±(2 % of reading +2 VAR) | ±(2 % of reading +3 VAR) | ±(2 % of reading +4 VAR) | |
| **LOAD POWER FACTOR** | | **Range** | 0.000 to 1.000 | | | |
| | | **Resolution** | 0.001 | | | |
| **LOAD CREST FACTOR** | | **Range** | 0.00 to 50.00 | | | |
| | | **Resolution** | 0.01 | | | |
| **HARMONIC VOLTAGE EFFECTIVE VALUE (RMS) PERCENT (%) (AC-INT and 50/60 Hz only)** | | **Range** | Up to 100th order of the fundamental wave | | | |
| | | **Full Scale** | 200 V / 400 V, 100% | | | |
| | | **Resolution** | 0.1 V, 0.1% | | | |
| | | **Accuracy** *4 | Up to 20th : ±(0.2 % of reading + 0.5 V / 1 V)<br>20th to 100th : ±(0.3 % of reading + 0.5 V / 1 V) | | | |

# Programmable AC/DC Power Source





Rear Panel



## ASR-3000 Series

## SPECIFICATIONS

| | | ASR-3200 | ASR-3300 | ASR-3400 | ASR-3400HF |
|---|---|---|---|---|---|
| HARMONIC CURRENT EFFECTIVE VALUE (RMS) PERCENT (%) (AC-INT and 50/60 Hz only) | Range | Up to 100th order of the fundamental wave | | | |
| | Full Scale | 20 A / 10 A, 100% | 30 A / 15 A, 100% | 40 A / 20 A, 100% | |
| | Resolution | 0.01 A, 0.1% | | | |
| | Accuracy *9 | Up to 20th<br>±(1 % of reading+0.4 A/0.2 A)<br>20th to 100th<br>±(1.5 % of reading+0.4 A/0.2 A) | Up to 20th<br>±(1 % of reading+0.6 A/0.3 A)<br>20th to 100th<br>±(1.5 % of reading+0.6 A/0.3 A) | Up to 20th<br>±(1 % of reading+0.8 A/0.4 A)<br>20th to 100th<br>±(1.5 % of reading+0.8 A/0.4 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 20 V to 200 V / 40 V to 400 V and 23 °C ± 5 °C. DC mode: For an output voltage of 28.5 V to 285 V / 57 V to 570 V 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 50 V or greater, an output current in the range of 10 % to 100 % of the maximum current, DC or an output frequency of 45 Hz to 65 Hz, 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 20 V to 200 V / 40 V to 400 V and 23 °C ± 5 °C.

| OTHERS | | | |
|---|---|---|---|
| PROTECTIONS | | | UVP, OCP, OTP, OPP, Fan Fail |
| DISPLAY | | | TFT-LCD, 4.3 inch |
| MEMORY FUNCTION | | | Store and recall settings, Basic settings: 10 (0–9 numeric keys) |
| ARBITRARY WAVE | Number of Memories | | 16 (nonvolatile) |
| | Waveform Length | | 4096 words |
| INTERFACE | Standard | USB | Type A: Host, Type B: Slave, Speed: 1.1/2.0, USB-CDC, USB-TMC |
| | | LAN | MAC Address, DNS IP Address, User Password, Gateway IP Address, Instrument IP Address, Subnet Mask |
| | | RS-232C | Complies with the EIA-RS-232 specifications |
| | | EXT Control | External Signal Input; External Control I/O |
| | | GPIB | SCPI-1993, IEEE 488.2 compliant interface |
| INSULATION RESISTANCE Between input and chassis, output and chassis, input and output | | | 500 Vdc, 30 MΩ or more |
| WITHSTAND VOLTAGE Between input and chassis, output and chassis, input and output | | | 1500 Vac, 1 minute |
| EMC | | | EN 61326-1, EN 61326-2-1, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12<br>EN 61000-4-2/-4-3/-4-4/-4-5/-4-6/-4-8/-4-11/-4-34, EN 55011 (Class A), EN 55032 |
| SAFETY | | | EN 61010-1 |
| ENVIRONMENT | Operating Environment | | Indoor use, Overvoltage Category II |
| | Operating Temperature Range | | 0 °C to 40 °C |
| | Storage Temperature Range | | -10 °C to 70 °C |
| | Operating Humidity Range | | 20 % to 80 % RH (no condensation) |
| | Storage Humidity Range | | 90 % RH or less (no condensation) |
| | Altitude | | Up to 2000 m |
| DIMENSIONS & WEIGHT | | | 430(W)×176(H)×530(D) mm (not including protrusions); Approx. 25kg |

## ORDERING INFORMATION

**ASR-3200** 2kVA Programmable AC/DC Power Source
**ASR-3300** 3kVA Programmable AC/DC Power Source
**ASR-3400** 4kVA Programmable AC/DC Power Source
**ASR-3400HF** 4kVA Programmable AC/DC Power Source

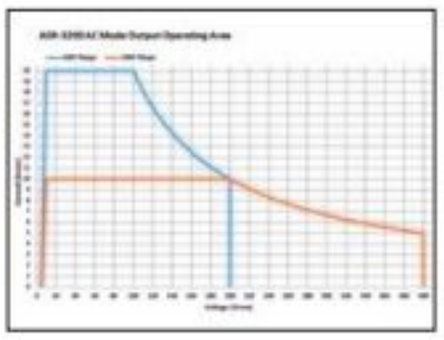
ACCESSORIES :
CD (User manual/Programming manual), Safety guide, Input Terminal Cover, Output terminal cover include remote sensing, GRA-442-E Rack mount adapter(EIA), GTL-246 USB Cable

**OPTIONAL ACCESSORIES**

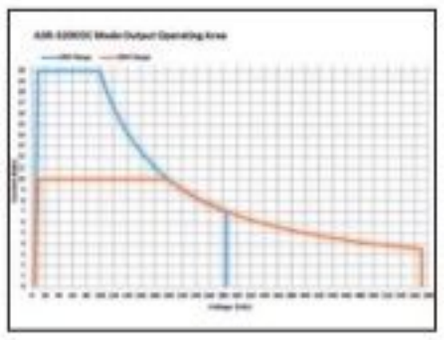
**GPW-005** Power cord, 3m, 105°C, UL/CSA type
**GPW-006** Power cord, 3m, 105°C, VDE type
**GPW-007** Power cord, 3m, 105°C, PSE type
**GRA-442-J** Rack mount adapter(JIS)
**GRA-442-E** Rack mount adapter(EIA)
**GTL-137** Output power wire(load wire_10AWG:50A, 600V/sense wire_16AWG:20A, 600V)
**GTL-232** RS232C Cable, approx. 2m
**GTL-248** GPIB Cable, approx. 2m
**ASR-002** External three phase control unit for IP2W, IP3W, 3P4W output
**APS-008** Air inlet filter

* European output outlet(factory installed)

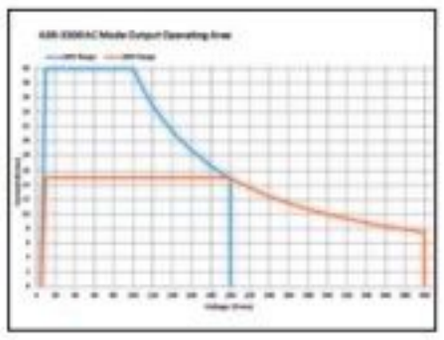
## A. OPERATING AREA FOR ASR-3000 SERIES



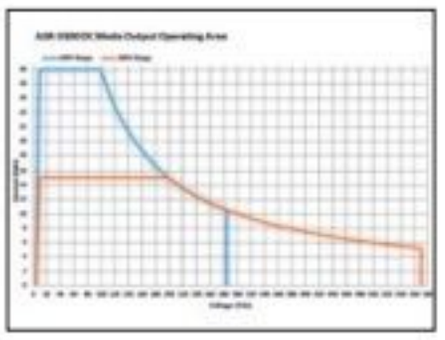
AC Output for ASR-3200



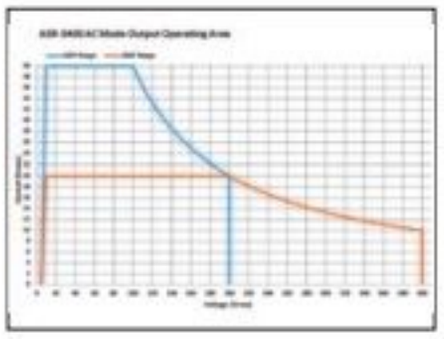
DC Output for ASR-3200



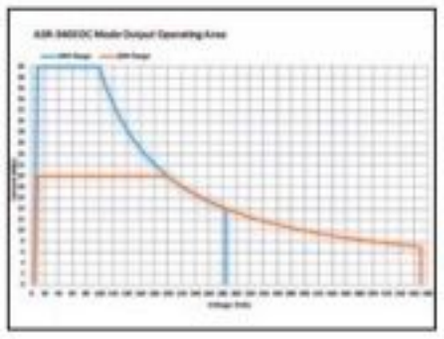
AC Output for ASR-3300



DC Output for ASR-3300



AC Output for ASR-3400



DC Output for ASR-3400

| Model Name | Power Rating | Max. Output Current | Max. Output Voltage |
|---|---|---|---|
| ASR-3200 | 2k VA | 20 / 10 A | 400 Vrms / ±570 Vdc |
| ASR-3300 | 3k VA | 30 / 15 A | 400 Vrms / ±570 Vdc |
| ASR-3400 | 4k VA | 40 / 20 A | 400 Vrms / ±570 Vdc |

The ASR-3000 series is an AC + DC power source that provides not only rated power output for AC output, but also rated power output for DC output.

## B. MEASUREMENT ITEMS FOR ASR-3000 SERIES



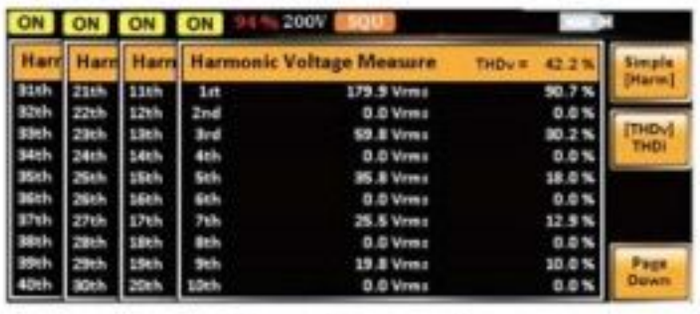

RMS Meas Display




AVG Meas Display




Peak Meas Display




Voltage Harmonic




Current Harmonic

The ASR-3000 Series provides users with measurement capabilities including Vrms, Vavg, Vpeak, Irms, Iavg, Ipeak, IpkH, P, S, Q, PF, CF, 100th-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 BUILT-IN ISO-16750-2 WAVEFORMS



SEQ6: Momentary Drop in Supply Voltage



SEQ7: Reset Behavior at Voltage Drop with 12V System



SEQ8: Starting Profile Waveform

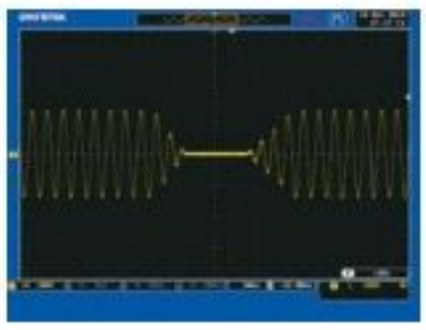


SEQ9: Load Dump with Tr_10ms, Td_40ms

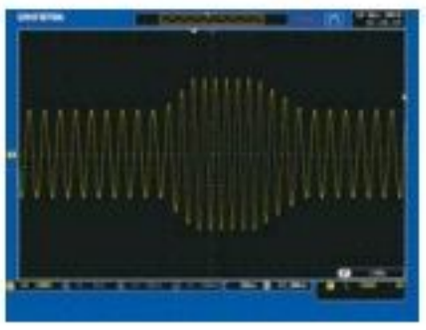
The sequence mode provides editable 10 sets of SEQ0~SEQ9, each set has 0~999 steps, each step time setting range is 0.0001~999.9999 seconds. Users can combine multiple sets of steps to generate the required waveforms, including waveform falling, surges, sags and other abnormal power line conditions to meet the needs of the test applications.

In addition, ASR-3000 Series also built in common ISO-16750-2 test waveforms in the Sequence Mode preset waveforms, including Momentary Drop in Supply Voltage built in at SEQ6, Reset Behavior at Voltage Drop with 12V system built in at SEQ7, Starting Profile Waveform built in at SEQ8 and Load Dump with Tr_10ms, and Td_40ms built in at SEQ9.

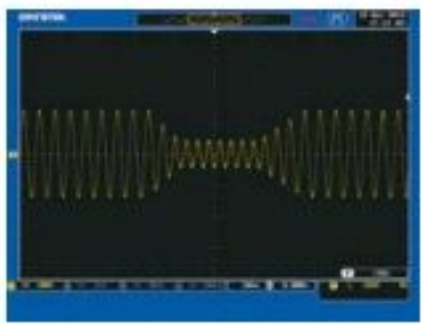
## D. SIMULATE MODE



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. FUNCTION WAVEFORM (ARBITRARY EDIT) MODE



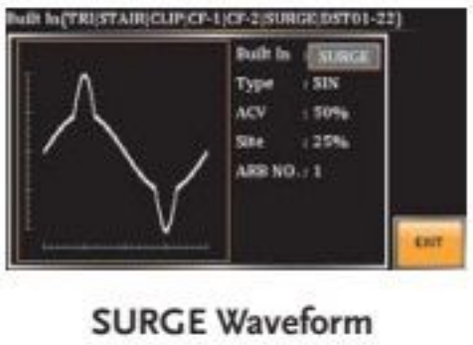

TRI Waveform



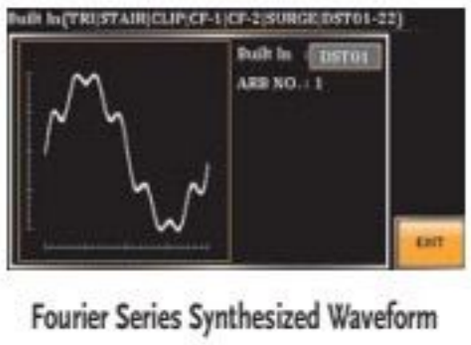

STAIR Waveform




CLIP Waveform




SURGE Waveform




Fourier Series Synthesized Waveform

ASR-3000 Series provides more than 20,000 waveform combinations in seven categories, allowing users to quickly simulate different AC voltage waveforms. Adjust the desired waveform type directly through the panel (displayed synchronously on the screen), then the waveform is loaded into the ARB 1~16 waveform register through the access procedures, and return to the main menu output mode to perform ARB Waveform output.

## F. PC SOFTWARE



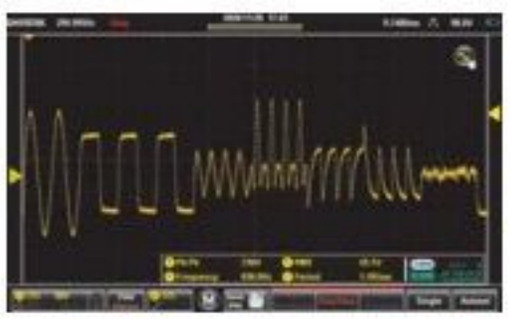
Basic Controller



Sequence Mode



ARB Waveform Edit



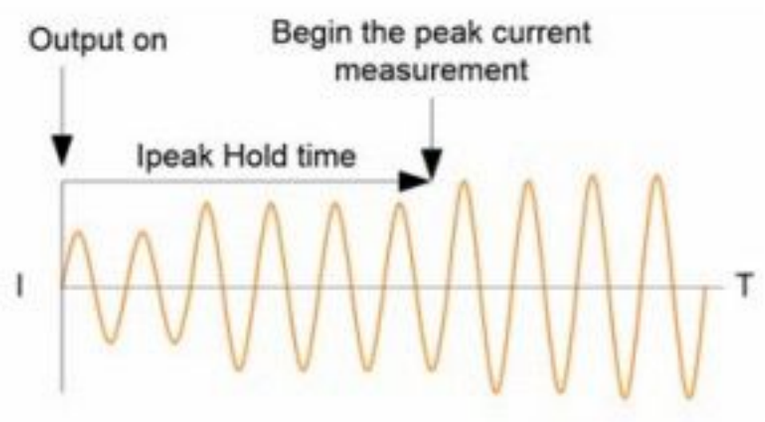
The Waveform is Observed with DSO

The ASR-3000 Series software includes basic settings, the Simulate Mode, the Sequence Mode, Data Log and the arbitrary waveform editing function. Users can directly set output voltage, frequency, start/stop phase on ASR-3000 Series through the software.
The Simulate Mode can quickly simulate different transient waveforms such as power outage, voltage rise, voltage fall... etc.

The Sequence Mode can edit the editing parameters read back from ASR-3000 Series, or directly edit the parameters and control ASR-3000 Series to output waveforms according to the set sequence.

The arbitrary waveform editing function not only combines various waveforms, including sine waves, square waves, triangle waves, and noise waveforms, but also allows uses to draw arbitrary waveforms and output them.

## G. 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.

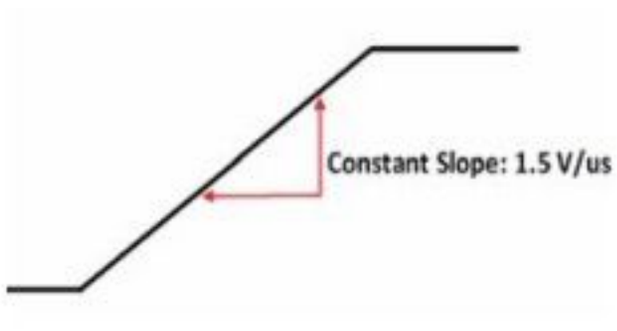
Ipk Hold can be used to measure the transient surge current of the DUT at power on without using an oscilloscope and a current probe.

## H. SLEW RATE MODE




**Time Mode**

The ASR-3000 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-3000 Series can increase output to 10~90% of the set voltage within 100μs; and when selecting "Slope" mode, ASR-3000 Series increases output voltage by a fixed rising slope of 1.5V/μs until reaching the set voltage value.




**Slope Mode**

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-3000 Series voltage by editing the Sequence mode.

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



## ASR-2050/2100 Series



## ASR-2050R/2100R Series

CE | RS-232 | GPIB | USB | LAN | Ext I/O

## 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,RS-232(std.); 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

**GET-003** Universal Extended Terminal Box
(ASR-2000R only)



**GET-004** Euro Extended Terminal Box
(ASR-2000R only)



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. Ten 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), 10) External DC voltage control of AC output mode(AC-VCA).

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, 100th-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, PS-232C External I/O and optional GPIB.

## SPECIFICATIONS

| | | ASR-2050/ASR-2050R | ASR-2100/ASR-2100R |
|---|---|---|---|
| **INPUT RATING (AC)** | | | |
| NOMINAL 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*1 | 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 |
| *1. For an output voltage of 100 V/200 V (100V/200V range), maximum current, and a load power factor of 1. | | | |
| **AC MODE OUTPUT RATINGS (AC rms)** | | | |
| VOLTAGE | Setting Range*1 | 0.0 V to 175.0 V / 0.0 V to 350.0 V | |
| | Setting Resolution | 0.1 V | |
| | Accuracy*2 | ±(0.5 % of set + 0.6 V / 1.2 V) | |
| OUTPUT PHASE | | Single phase, Two-wire | |
| MAXIMUM CURRENT*3 | 100 V | 5 A | 10 A |
| | 200 V | 2.5 A | 5 A |
| MAXIMUM PEAK CURRENT*4 | 100 V | 20 A | 40 A |
| | 200 V | 10 A | 20 A |
| POWER CAPACITY | | 500 VA | 1000 VA |
| FREQUENCY | Setting Range | AC Mode: 40.00 Hz to 999.9 Hz, AC+DC Mode: 1.00 Hz to 999.9 Hz | |
| | Setting Resolution | 0.01 Hz (1.00 to 99.99 Hz), 0.1 Hz (100.0 to 999.9 Hz) | |
| | Accuracy | For 45 Hz to 65 Hz: 0.01% of set, For 40 Hz to 999.9 Hz: 0.02% of set | |
| | Stability*5 | ± 0.005% | |
| OUTPUT ON PHASE | | 0.0° to 359.9° variable (setting resolution 0.1°) | |
| DC OFFSET*6 | | Within ± 20 mV (TYP) | |
| *1. 100 V / 200 V range<br>*2. For an output voltage of 17.5 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<br>*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.<br>*4. With respect to the capacitor-input rectifying load. Limited by the maximum current.<br>*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.<br>*6. In the case of the AC mode and output voltage setting to 0 V. | | | |
| **OUTPUT RATING FOR DC MODE** | | | |
| VOLTAGE | Setting Range*1 | -250 V to +250 V / -500 V to +500 V | |
| | Setting Resolution | 0.1 V | |
| | Accuracy*2 | ±(\|0.5 % of set\| + 0.6 V / 1.2 V) | |
| MAXIMUM CURRENT*3 | 100 V | 5 A | 10 A |
| | 200 V | 2.5 A | 5 A |
| MAXIMUM PEAK CURRENT*4 | 100 V | 20 A | 40 A |
| | 200 V | 10 A | 20 A |
| POWER CAPACITY | | 500 W | 1000 W |
| *1. 100 V / 200 V range<br>*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 volatge setting 0V (AC+DC mode) and 23℃ ± 5℃<br>*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.<br>*4. Within 5 ms, Limited by the maximum current. | | | |
| **OUTPUT VOLTAGE STABILITY** | | | |
| LINE REGULATION*1 | | ±0.2% or less | |
| LOAD REGULATION*2 | | ±0.15%@45-65Hz;±0.5%@DC,all other frequencies(0~100%, via output terminal) | |
| RIPPLE NOISE*3 | | 0.7 Vrms / 1.4 Vrms (TYP) | |
| *1. Power source input voltage is 100 V, 120 V, or 230 V, no load, rated output.<br>*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.<br>*3. For 5 Hz to 1 MHz components in DC mode using the output terminal on the rear panel. | | | |
| **OUTPUT VOLTAGE WAVEFORM DISTORTION RATIO, OUTPUT VOLTAGE RESPONSE TIME, EFFICIENCY** | | | |
| TOTAL HARMONIC DISTORTION(THD)*1 | | ≦ 0.2% @50/60Hz, ≦ 0.3% @<500Hz, ≦ 0.5% @500.1Hz~999.9Hz | |
| OUTPUT VOLTAGE RESPONSE TIME*2 | | 100 µs (TYP) | |
| EFFICIENCY*3 | | 70 % or more | |
| *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.<br>*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<br>*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. | | | |
| **MEASURED VALUE DISPLAY** | | | |
| VOLTAGE RMS, AVG Value*1 | Resolution | 0.1 V | |
| | Accuracy*2 | 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 | 0.1 V | |
| | Accuracy | For 45 Hz to 65 Hz and DC: ±(\|2 % of reading\| + 1 V / 2 V) | |
| CURRENT RMS, AVG Value | Resolution | 0.01 A | 0.01 A |
| | Accuracy*3 | 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) | For 45 Hz to 65 Hz and DC: ±(0.5 % of reading+0.04 A/0.02 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 | 0.01 A | 0.01 A |
| | | Accuracy*4 | 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*5 | ±(2 % of reading + 0.5 W) | ±(2 % of reading + 1 W) |
| | Apparent (VA) | Resolution | 0.1 / 1 VA | 0.1 / 1 VA |
| | | Accuracy*5*6 | ±(2 % of reading + 0.5 VA) | ±(2 % of reading + 1 VA) |
| | Reactive (VAR) | Resolution | 0.1 / 1 VAR | 0.1 / 1 VAR |
| | | Accuracy*5*7 | ±(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 | | Range | Up to 100th order of the fundamental wave | Up to 100th order of the fundamental wave |
| EFFECTIVE VALUE (RMS) | | Full Scale | 175 V / 350 V, 100% | 175 V / 350 V, 100% |
| PERCENT (%) | | Resolution | 0.1 V, 0.1% | 0.1 V, 0.1% |
| (AC-INT and 50/60 Hz only) | | Accuracy*8 | Up to 20th±(0.2% of reading + 0.5V/1V); 20th to 100th±(0.3% of reading + 0.5V/1V) | Up to 20th±(0.2% of reading + 0.5V/1V); 20th to 100th±(0.3% of reading + 0.5V/1V) |
| HARMONIC CURRENT | | Range | Up to 100th order of the fundamental wave | Up to 100th order of the fundamental wave |
| EFFECTIVE VALUE (RMS) | | Full Scale | 5 A / 2.5 A, 100% | 10 A / 5 A, 100% |
| PERCENT (%) | | Resolution | 0.01 A, 0.1% | 0.01 A, 0.1% |
| (AC-INT and 50/60 Hz only) | | Accuracy*8 | Up to 20th±(1% of reading + 0.1A/0.05 A); 20th to 100th±(1.5% of reading + 0.1A/0.05A) | Up to 20th±(1% of reading + 0.2A/0.1A); 20th to 100th±(1.5% of reading + 0.2A/0.1A) |

*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 | USB | Type A: Host, Type B: Slave, Speed: 1.1/2.0, USB-CDC |
| | | LAN | MAC Address, DNS IP Address, User Password, Gateway IP Address, Instrument IP Address, Subnet Mask |
| | | RS-232C | Complies with the EIA-RS-232 specifications |
| | | EXT Control | External Signal Input; External Control I/O |
| | Optional | GPIB | SCPI-1993, IEEE 488.2 compliant interface |
| INSULATION RESISTANCE | | | 500 Vdc, 30 MΩ or more |
| Between input and chassis, output and chassis, input and output | | | |
| WITHSTAND VOLTAGE | | | 1500 Vac, 1 minute |
| Between input and chassis, output and chassis, input and output | | | |
| EMC | | | 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, Group1);EN 61010-1 |
| Safety Environment | Operating Environment | | Indoor use, Overvoltage Category II |
| | Operating Temperature Range | | 0 °C to 40 °C |
| | Storage Temperature Range | | -10 °C to 70 °C |
| | Operating Humidity Range | | 20 % RH to 80 % RH (no condensation) |
| | 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<br>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

**ASR-GPIB-2K** Optional GPIB Interface for ASR-2000 (Factory installed)
**ASR-EU-2K** European Output Outlet only for ASR-2000 (Factory installed)
**GET-003** Extended Universal Power Socket(ASR-2000R only)
**GET-004** Extended European Power Socket(ASR-2000R only)
**ASR-001** Air inlet filter
**ASR-002** External three phase control unit for IP2W, IP3W, 3P4W output
**GRA-439-E** Rack Mount Kit (EIA)
**GRA-439-J** Rack Mount Kit (JIS)
**GTL-232** RS-232C Cable, approx. 2M
**GTL-258** GPIB Cable, approx. 2M, including 25 pins Micro-D connector

## 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



### GTL-258 GPIB Cable, 2000mm



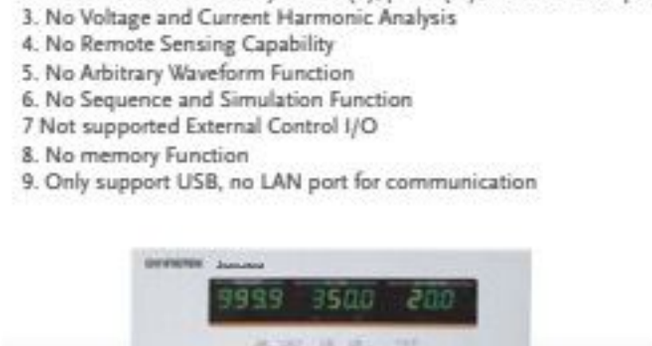
### ASR-001 Air Inlet Filter



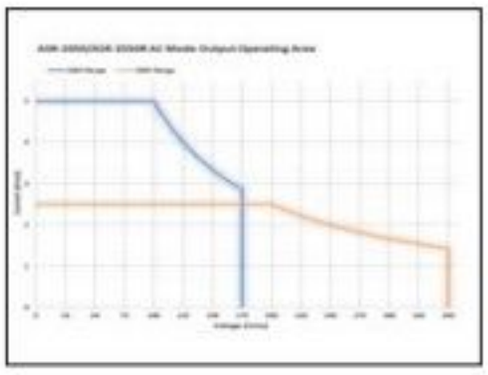
### ASR-002 External three phase control unit

* Basis Requirement of ASR-002 to ASR-Series
1. Must be the three same models of ASR-Series
2. To ASR-2000 Series, the ASR-GPIB-2K: GPIB interface is required

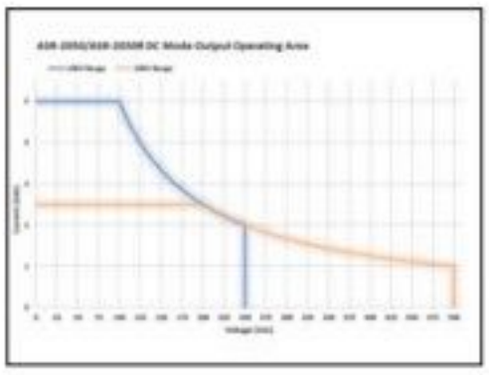
* Functions of ASR-Series are limited when conducts to ASR-002
1. No DC Output
2. Measurement Items: only current(A), power(W)and PF for each phase
3. No Voltage and Current Harmonic Analysis
4. No Remote Sensing Capability
5. No Arbitrary Waveform Function
6. No Sequence and Simulation Function
7 Not supported External Control I/O
8. No memory Function
9. Only support USB, no LAN port for communication



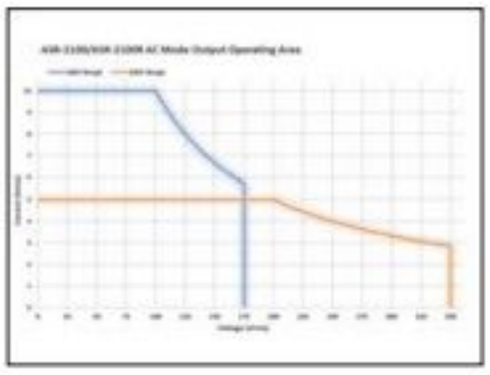
## A. OPERATING AREA FOR ASR-2000 SERIES



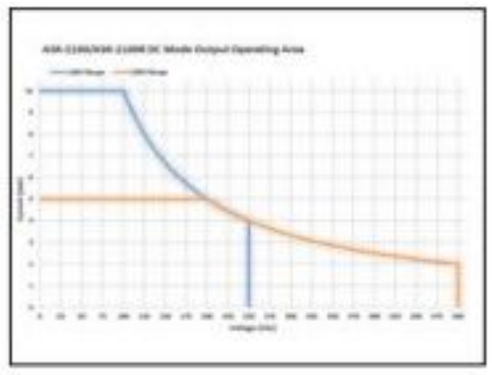
AC Output for ASR-2050/ASR-2050R



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



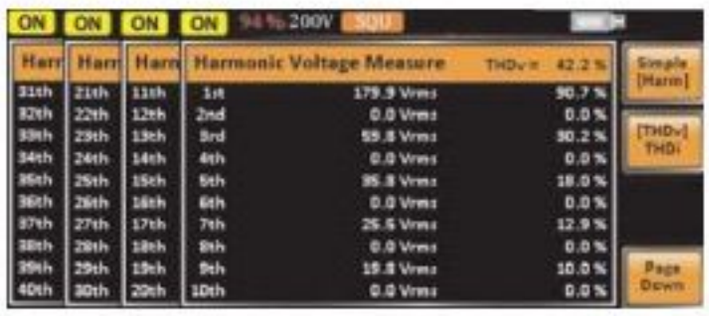

RMS Meas Display



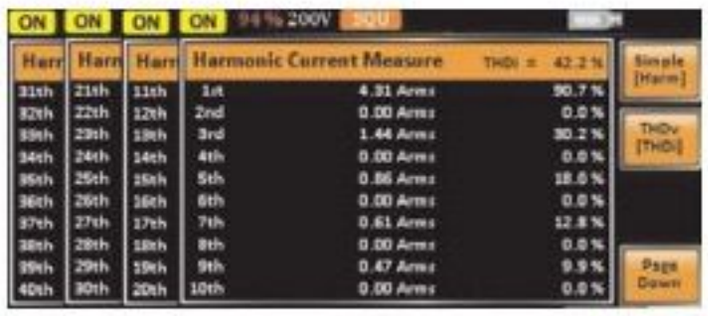

AVG Meas Display




Peak Meas Display



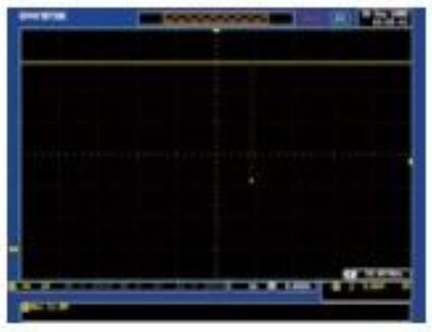

Voltage Harmonic



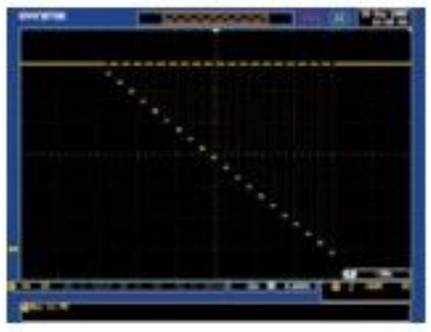

Current Harmonic

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.

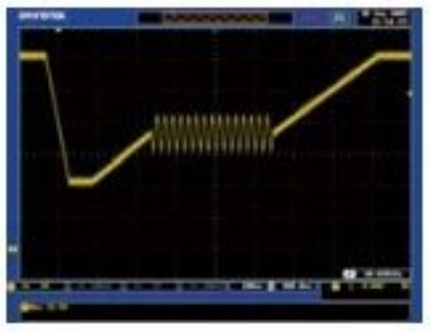
## C. SEQUENCE MODE AND APPLICATIONS



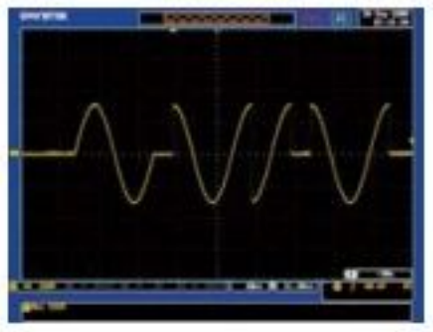
Momentary Drop in Supply Voltage



Reset Behavior at Voltage Drop



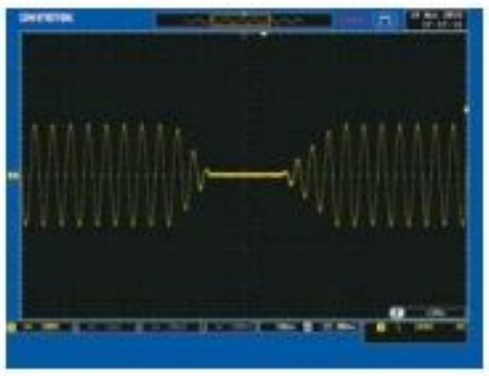
Starting Profile Waveform



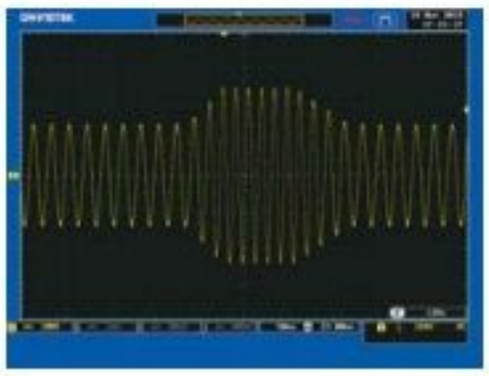
Instantaneous Power Failure

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.

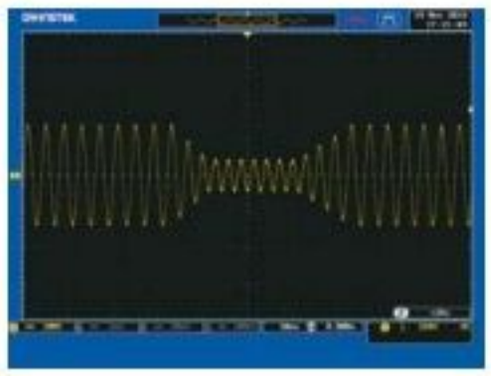
## D. SIMULATE MODE



Power Outage



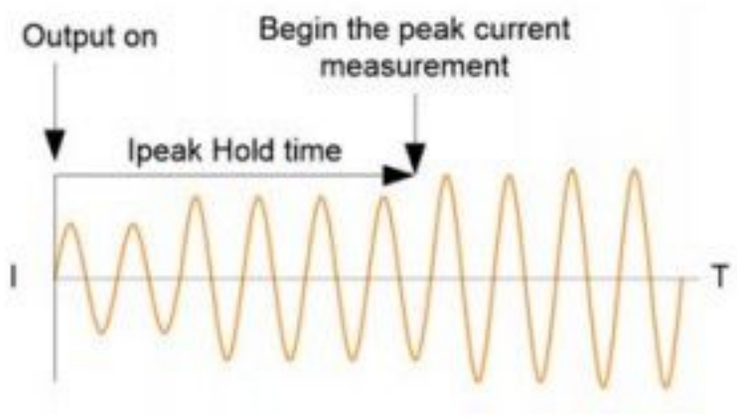
Voltage Rise



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

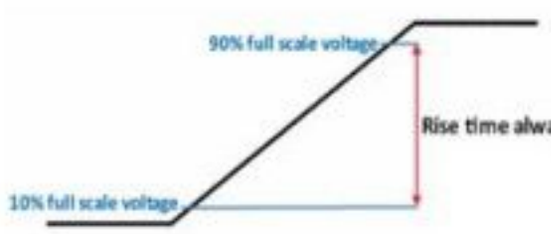



T, Ipk Measurement

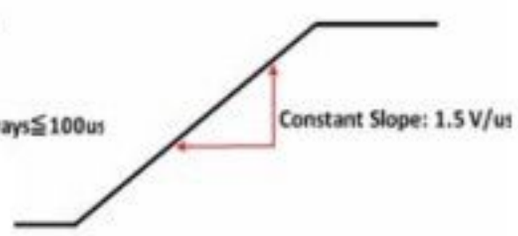
T, Ipk Hold is used to set the delay time after the output (1ms ~ 60,000ms) to capture the Ipeak value and keep the maximum value. The update only functions when the measurement value is greater than the original value. The T, Ipk Hold delay time setting can be used to measure surge current at the power 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

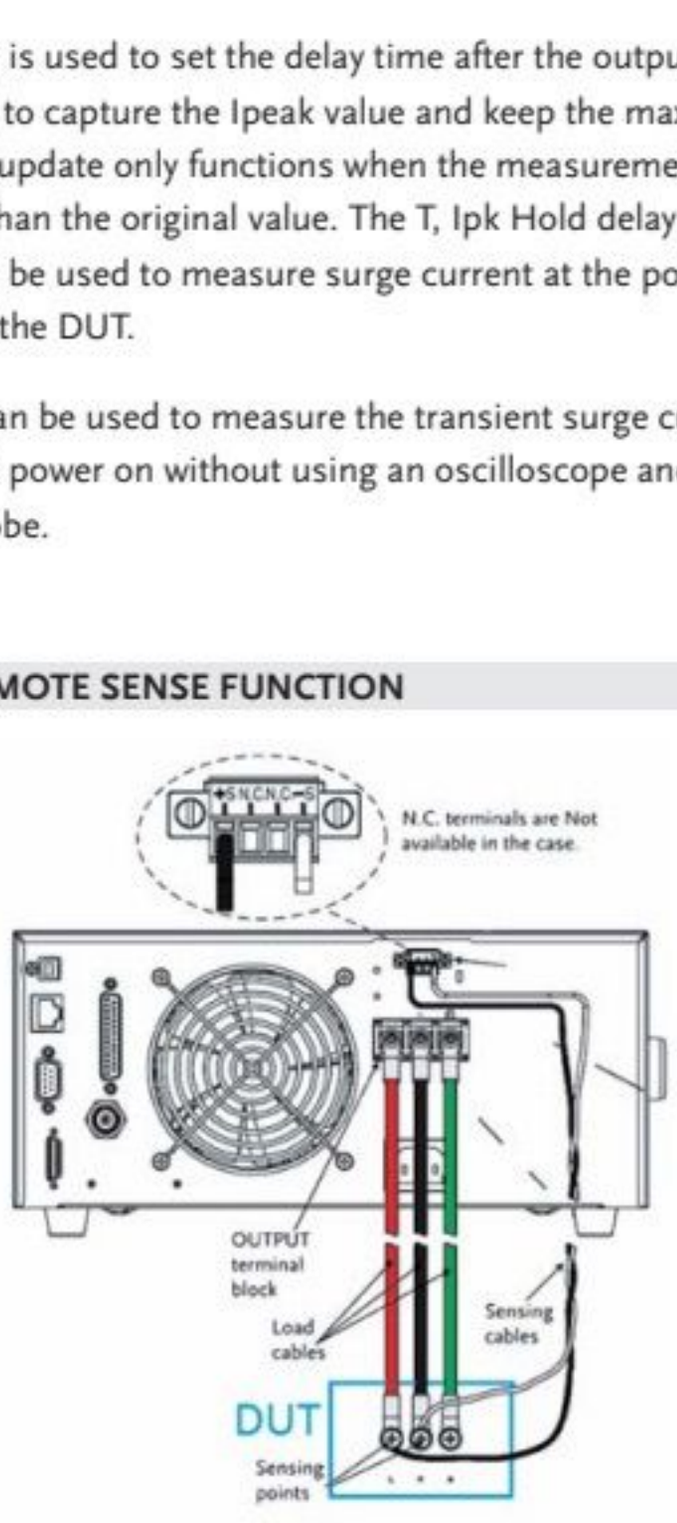



Slope Mode

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 100μs; and when selecting "Slope" mode, ASR-2000 increases output voltage by a fixed rising slope of 1.5V/μs 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

CE | USB HOST | USB Device | GPIB | LAN | RS-232

## 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. Rresolution 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/APS-002 Interface Card




### APS-003
Output Voltage Capacity

### APS-004
Output Frequency Capacity



### APS-007 RS-232 Interface Card
For: APS-7200 Series, APS-7300 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 | 4.2A | 8.4A | 16.8A | 25.2A |
| | 0–310Vrms | 2.1A | 4.2A | 8.4A | 12.6A |
| Maximum Current(peak) | 0–155Vrms | 16.8A | 33.6A | 67.2A | 100.8A |
| | 0–310Vrms | 8.4A | 16.8A | 33.6A | 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 | | 0.3% (% of full scale) | | | |
| Response Time | | <100μs | | | |
| 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 | | | |
| OPT. APS-004 | Range | 45–999.9Hz | | | |
| | Resolution | 0.01Hz at 45.00 – 99.99Hz; 0.1Hz at 100.0 – 999.9Hz | | | |
| Power On/Off Phase Angle | Range | 0 – 359° | | | |
| | 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 | |
| | Accuracy | ±0.1Hz | | ±0.1Hz | |
| Current(RMS) | 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

APS-7300 Rear Panel



APS-7200 Rear Panel



APS-7100 Rear Panel



APS-7050 Rear Panel



APS-7000 Series
Europe Type Output Outlet



## SPECIFICATIONS

| Model | | APS-7050 | APS-7100 | APS-7200 | APS-7300 |
|---|---|---|---|---|---|
| Current(Peak) | Range | 0.0 – 70.0A | | 0.0 – 140.0A | |
| | Resolution | 0.1A | | 0.1A | |
| | Accuracy | ±(1% of reading+1 count) | | ± 1% of reading+1 count) | |
| Power(W) | Resolution | 0.01W, 0.1W, 1W | | 0.1W, 1W | |
| | Accuracy | ±(0.6% of reading+5 counts),0.20–99.99W;<br>±(0.6% of reading+5 counts),100.0–999.9W;<br>±(0.6% of reading+2 counts),1000–9999W | | ±(0.6% of reading+5counts),0.2–999.9W;<br>±(0.6% of reading+2counts),1000–9999W | |
| Apparent(VA) | Resolution | 0.01VA, 0.1VA, 1VA | | 0.1VA, 1VA | |
| | Accuracy | ±(1% of reading+7 counts),0.20–99.99VA;<br>±(1% of reading+7 counts),100.0–999.9VA;<br>±(1% of reading+5 counts),1000–9999VA | | ±(1% of reading+7 counts),0.2–999.9VA;<br>±(1% of reading+5 counts),1000–9999VA | |
| Power Factor | Resolution | 0.001 | | 0.001 | |
| | Accuracy | ±(2% of reading + 2 counts) | | ±(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 | | OCP, 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 | | Constant, Keep, Linear Sweep | | | |
| Parameters | | Output Range, Frequency, Waveform (sine wave only); On Phase, Off Phase, Term | | | |
| | | Jump Count (0 – 255) jump-to, Branch 1, Branch 2, Trigger Output | | | |
| Sequence Control | | Start, Stop, Hold, Continue, Branch 1, Branch 2 | | | |
| **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 | | 0.7Typ. | 0.7Typ. | 0.7Typ. | 0.7Typ. |
| Power Consumption | | 1.8kVA or less | 3.6kVA or less | 7.2kVA or less | 10.8kVA or less |
| **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 | | GPIB (APS-001)<br>RS232 / USB CDC (APS-002) | | GPIB (APS-001)<br>RS232 (APS-007) | |
| **DIMENSIONS & WEICHT** | | | | | |
| | | 430(W) x 88(H) x 400(D) mm; Approx. 24kg | 430(W) x 88(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 |

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

## ORDERING INFORMATION

**APS-7050** 500VA Programmable AC Power Source
**APS-7100** 1000VA Programmable AC Power Source
**APS-7200** 2000VA 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** GPIB interface card
**APS-002** RS-232/USB interface card(APS-7050, APS-7100)
**APS-007** RS-232 interface card(APS-7200, APS-7300)
**APS-003** Output Voltage Capacity(0–600Vrms)
**APS-004** Output Frequency Capacity(45–999.9Hz)
**GRA-423** APS-7050, APS-7100 rack mount kit
**GRA-429** Rack mount kit (APS-7200)
**GRA-430** Rack mount kit (APS-7300)

Note : 1. APS-7200/APS-7300 are not CE approved.
2. The minimum time settings of sequence mode or simulate mode must be greater than 1 cycle of the waveform itself.

## Mains Terminal Cover Set

For: APS-7100/7100E Series

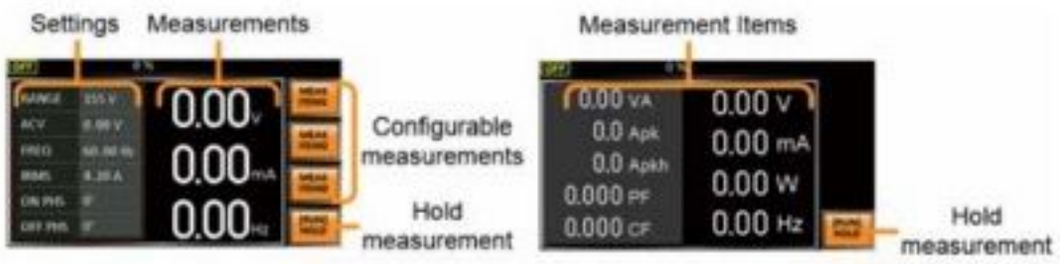


For: APS-7050/7050E Series



# 500/1000/2000/3000 VA Programmable Linear AC Power Source

## A. CONTROL PANEL CHARACTERISTICS




**Standard Mode** **Simple 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.

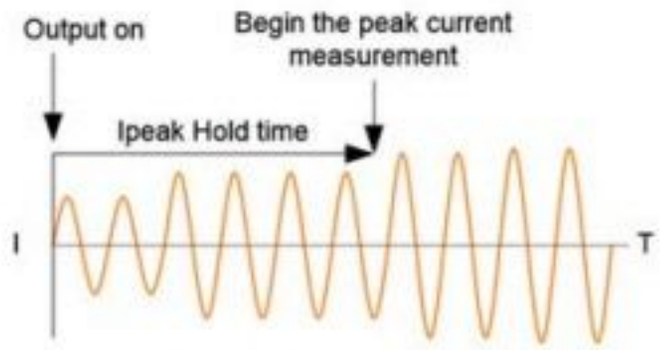
## B REVERSE CURRENT DISPLAY




**Standard Mode** **Simple 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.

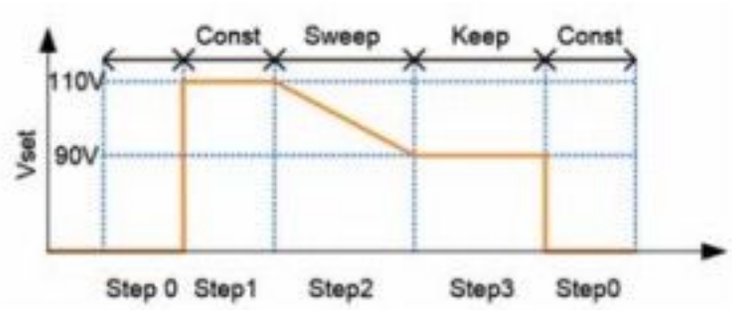
## C T IPEAK, HOLD FUNCTION




**Ipeak Measurement**

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.

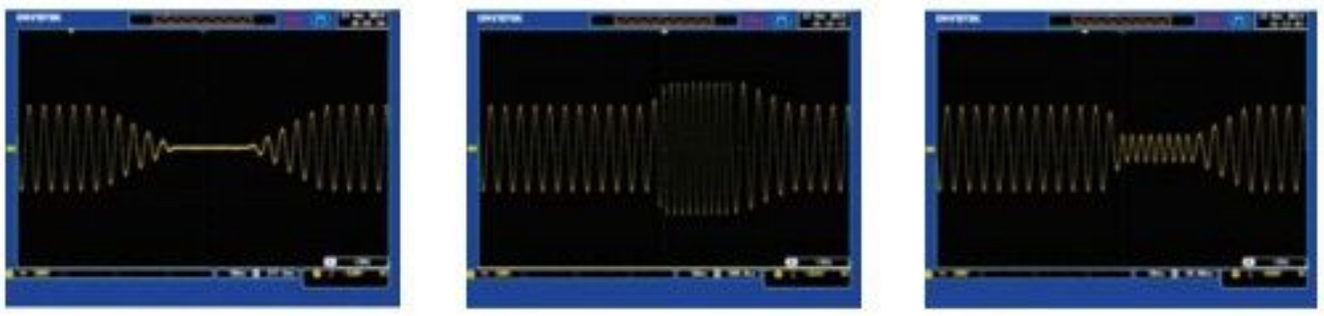
## D SEQUENCE MODE




**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

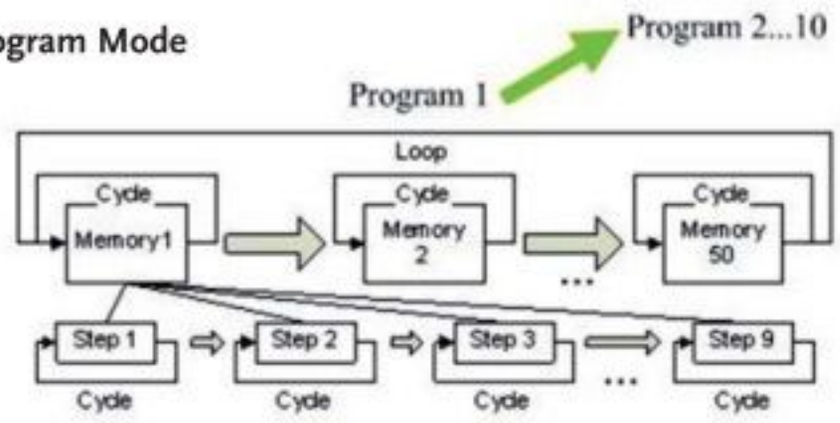


**Power Outage** **Voltage Rise** **Voltage Fall**

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

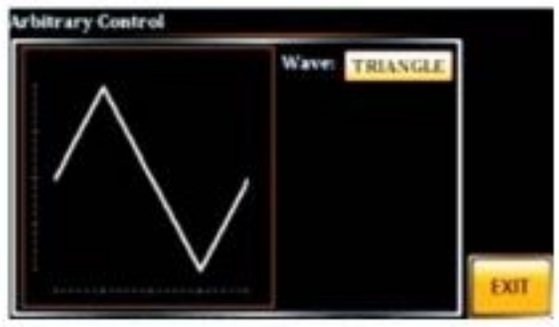
Overlapping a Surge/Dip voltage on a normal voltage as the input power for DUT allows users to simulate Surge/Dip situation and evaluate DUT characteristics.

## 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**



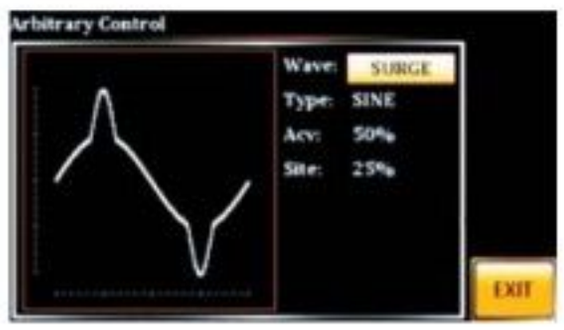

**Staircase Waveform**
**Simulate Square Waveform And Staircase Waveform For Commercial Ups**



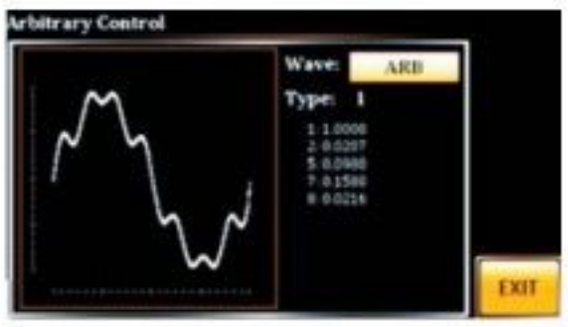

**Clipped Sinewave**
**Simulate Grid Power Supply Heavy Load Waveform**




**Crest Factor Waveform**
**Simulate Rectified Filter Current Waveform By Capacitor Input**



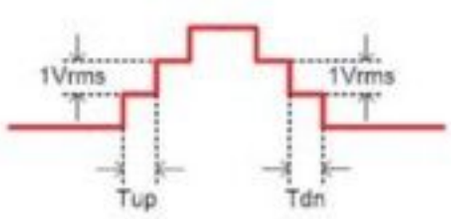

**Surge Waveform**
**Simulate Grid Power Supply's Peak Over-voltage**



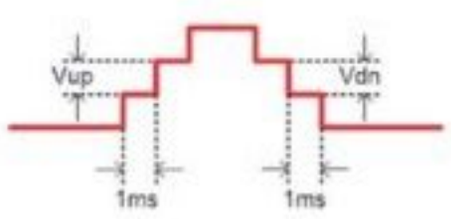

**Fourier Series Synthesized Waveform**

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.

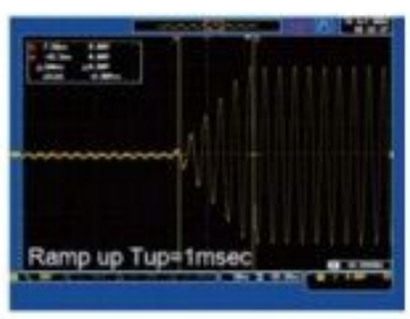
## I. RAMP CONTROL



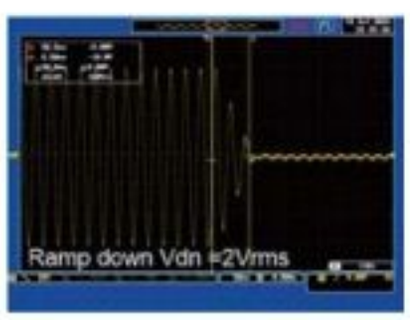

**Tup → 0.1 ~ 999.9ms**
**Tdn → 0.1 ~ 999.9ms**




**Vup → 0.01 ~ 99.99 Vrms**
**Vdn → 0.01 ~ 99.99 Vrms**




**Mode=Time, Tup=1msec, VAC=100V, Freq=50Hz, Ramp output=on.**




**Mode=Voltage, Vdn=2Vrms, VAC=100V, Freq=50Hz, 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

CE USB HOST

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.

## 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

**SPECIFICATIONS**

| Model | | APS-7050E | APS-7100E |
|---|---|---|---|
| Power Rating | | 500VA | 1000VA |
| Output Voltage | | 0 – 155Vrms/0 – 310.0 Vrms | 0 – 155Vrms/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 Distoration (THD) | | ≦0.5% at 45 – 500Hz (Resistive Load) | |
| Crest Factor | | ≦4 | |
| Line Regulation | | 0.1% (% of full scale) | |
| Load Regulation | | 0.3% (% of full scale) | |
| Response Time | | <100μs | |
| 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 | |
| **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 | |
| | Accuracy | ±(0.5% of reading + 2 counts) | |
| Frequency | 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















# ELECTRONIC LOADS

GW Instek provides DC electronic loads, AC/DC electronic loads, which allow users to flexibly test various batteries, energy storage systems, and power supply devices. DC electronic load can simulate load characteristics, including static, dynamic, constant current, constant resistance, constant voltage, constant power and short circuit. AC/DC electronic load can simulate sine wave current load in the CC mode, non-sine wave current load in the linear CC mode, and AC rectified load in the rectifier mode.

Electronic loads can be simply divided into multi-channel electronic loads and single-channel electronic loads according to application requirements. The multi-channel electronic load can test and measure multiple sets of low-power and different specifications of power output devices at the same time; and the single-channel electronic load can, based on the characteristics of a single load, choose high power, high voltage, high precision, high resolution or fast dynamic response to conduct test and measurement.

Electric vehicles, solar energy, energy storage systems, server power supplies, and power electronics, etc., can use the built-in dedicated test modes of GW Instek electronic loads to simplify user's operating procedures and shorten the test time. For example: using the CC+CV, CP+CV, CC+UVP, CP+UVP battery discharge modes to discharge electric vehicle battery can avoid over-discharge and protect the battery at the same time. The MPPT mode can quickly obtain the maximum power point of the solar panel.

## PRODUCTS

- **Multi-channel Electronic Loads**
- **High Power DC Electronic Load**
- **DC Electronic Load**
- **AC & DC Electronic Load**

## MULTI-CHANNEL DC ELECTRONIC LOAD MODULES

| Model | Operation Voltage | Operation Current | Power | Channel | Weight(kg) | Page |
|---|---|---|---|---|---|---|
| PEL-2020A(B) | 0 ~ 80V | 20A | 100/100W | 2 | 3.8 | D105-108 |
| PEL-2030A(B) | 0 ~ 80V | 5/40A | 30/250W | 2 | 3.8 | |
| PEL-2040A(B) | 0 ~ 80V | 70A | 350W | 1 | 3.8 | |
| PEL-2041A(B) | 0 ~ 500V | 10A | 350W | 1 | 3.8 | |

## DC ELECTRONIC LOADS

| Model | Operation Voltage | Operation Current | Power | Channel | Weight(kg) | Page |
|---|---|---|---|---|---|---|
| PEL-503-80-50 | 0 ~ 80V | 50A | 250W | 1 | 5.3 | D117-118 |
| PEL-504-80-70 | 0 ~ 80V | 70A | 350W | 1 | 5.3 | |
| PEL-507-80-140 | 0 ~ 80V | 140A | 700W | 1 | 10.3 | |
| PEL-3021 | 0 ~ 150V | 35A | 175W | 1 | 6 | D93-98 |
| PEL-3031E | 0 ~ 150V | 60A | 300W | 1 | 7.5 | D99-104 |
| PEL-3041 | 0 ~ 150V | 70A | 350W | 1 | 7 | D93-98 |
| 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-3032E | 0 ~ 500V | 15A | 300W | 1 | 7.5 | D99-104 |
| PEL-504-500-15 | 0 ~ 500V | 15A | 350W | 1 | 5.3 | D117-118 |
| PEL-507-500-30 | 0 ~ 500V | 30A | 700W | 1 | 10.3 | |
| PEL-3021H | 0 ~ 800V | 8.75A | 175W | 1 | 6 | D93-98 |
| 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 | |
| PEL3424H | 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 | |

## HIGH POWER DC ELECTRONIC LOADS

| Model | Operation Voltage | Operation Current | Power | Channel | Weight(kg) | Page |
|---|---|---|---|---|---|---|
| PEL-5006C-150-600 | 150V | 600A | 6kW | 1 | 62 | D109-116 |
| PEL-5008C-150-800 | 150V | 800A | 8kW | 1 | 77.5 | |
| PEL-5010C-150-1000 | 150V | 1000A | 10kW | 1 | 84.8 | |
| PEL-5012C-150-1200 | 150V | 1200A | 12kW | 1 | 92 | |
| PEL-5015C-150-1500 | 150V | 1500A | 15kW | 1 | 116.5 | |
| PEL-5018C-150-1800 | 150V | 1800A | 18kW | 1 | 124 | |
| PEL-5020C-150-2000 | 150V | 2000A | 20kW | 1 | 140.5 | |
| PEL-5024C-150-2000 | 150V | 2000A | 24kW | 1 | 155 | |
| PEL-5006C-600-420 | 600V | 420A | 6kW | 1 | 62 | |
| PEL-5008C-600-560 | 600V | 560A | 8kW | 1 | 77.5 | |
| PEL-5010C-600-700 | 600V | 700A | 10kW | 1 | 84.8 | |
| PEL-5012C-600-840 | 600V | 840A | 12kW | 1 | 92 | |
| PEL-5015C-600-1050 | 600V | 1050A | 15kW | 1 | 116.5 | |
| PEL-5018C-600-1260 | 600V | 1260A | 18kW | 1 | 124 | |
| PEL-5020C-600-1400 | 600V | 1400A | 20kW | 1 | 140.5 | |
| PEL-5024C-600-1680 | 600V | 1680A | 24kW | 1 | 155 | |
| PEL-5006C-1200-240 | 1200V | 240A | 6kW | 1 | 62 | |
| PEL-5008C-1200-320 | 1200V | 320A | 8kW | 1 | 77.5 | |
| PEL-5010C-1200-400 | 1200V | 400A | 10kW | 1 | 84.8 | |
| PEL-5012C-1200-480 | 1200V | 480A | 12kW | 1 | 92 | |
| PEL-5015C-1200-600 | 1200V | 600A | 15kW | 1 | 116.5 | |
| PEL-5018C-1200-720 | 1200V | 720A | 18kW | 1 | 124 | |
| PEL-5020C-1200-800 | 1200V | 800A | 20kW | 1 | 140.5 | |
| PEL-5024C-1200-960 | 1200V | 960A | 24kW | 1 | 155 | |
| PEL-5004G-150-400 | 150V | 400A | 4kW | 1 | 28 | D125-128 |
| PEL-5005G-150-500 | 150V | 500A | 5kW | 1 | 28 | |
| PEL-5006G-150-600 | 150V | 600A | 6kW | 1 | 28 | |
| PEL-5004G-600-280 | 600V | 280A | 4kW | 1 | 29 | |
| PEL-5005G-600-350 | 600V | 350A | 5kW | 1 | 29 | |
| PEL-5006G-600-420 | 600V | 420A | 6kW | 1 | 29 | |
| PEL-5004G-1200-160 | 1200V | 160A | 4kW | 1 | 29 | |
| PEL-5005G-1200-200 | 1200V | 200A | 5kW | 1 | 29 | |
| PEL-5006G-1200-240 | 1200V | 240A | 6kW | 1 | 29 | |

## AC/DC ELECTRONIC LOADS

| Model | Operation Voltage | Operation Current | Power | Channel | Weight(kg) | Page |
|---|---|---|---|---|---|---|
| AEL-5002-350-18.75 | 350V | 18.75A | 1875W | 1 | 21.5 | |
| AEL-5003-350-28 | 350V | 28A | 2800W | 1 | 27.5 | |
| AEL-5004-350-37.5 | 350V | 37.5A | 3750W | 1 | 33.5 | |
| AEL-5006-350-56 | 350V | 56A | 5600W | 1 | 58 | |
| AEL-5008-350-75 | 350V | 75A | 7500W | 1 | 70 | |
| AEL-5012-350-112.5 | 350V | 112.5A | 11250W | 1 | 105 | |
| AEL-5015-350-112.5 | 350V | 112.5A | 15000W | 1 | 140 | |
| AEL-5019-350-112.5 | 350V | 112.5A | 18750W | 1 | 260 | |
| AEL-5023-350-112.5 | 350V | 112.5A | 22500W | 1 | 295 | |
| AEL-5002-425-18.75 | 425V | 18.75A | 1875W | 1 | 21.5 | D119-124 |
| AEL-5003-425-28 | 425V | 28A | 2800W | 1 | 27.5 | |
| AEL-5004-425-37.5 | 425V | 37.5A | 3750W | 1 | 33.5 | |
| AEL-5006-425-56 | 425V | 56A | 5600W | 1 | 58 | |
| AEL-5008-425-75 | 425V | 75A | 7500W | 1 | 70 | |
| AEL-5012-425-112.5 | 425V | 112.5A | 11250W | 1 | 105 | |
| AEL-5015-425-112.5 | 425V | 112.5A | 15000W | 1 | 140 | |
| AEL-5019-425-112.5 | 425V | 112.5A | 18750W | 1 | 260 | |
| AEL-5023-425-112.5 | 425V | 112.5A | 22500W | 1 | 295 | |
| AEL-5003-480-18.75 | 480V | 18.75A | 2800W | 1 | 27.5 | |
| AEL-5004-480-28 | 480V | 28A | 3750W | 1 | 33.5 | |

# Programmable D.C. Electronic Load



## PEL-3111/3111H



## PEL-3041/3041H/3021/3021H

CE | USB | GPIB | Analog Control | RS-232 | LAN

### 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/μs (PEL-3000)/0.84A/μs (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, RS-232 (Std.)/ GPIB, LAN (Opt.)**

### 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<br>Parallel with the maximum of four PEL-3211(H)s | Parallel with PEL-3111(H) |
| 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. Siemens[S] = Input current[A] / Input voltage[V] = 1/resistance[Ω]
*5. Converted value at the input current. At the input current. It is not applied for the condition of the parallel operation.
*6. set = Vin/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 x ( Number of units in parallel [PEL-3211] )

## SPECIFICATIONS

| Model | | | PEL-3021 | | | PEL-3041 | | | PEL-3111 | | | PEL-3211 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage<br>Current<br>Power<br>Input Resistance<br>Min. Operating Voltage(DC)(Typ.) | | | 0V–150V<br>35A<br>175W<br>500 kΩ<br>0.75V@17.5A<br>1.5V@35A | | | 0V–150V<br>70A<br>350W<br>500 kΩ<br>0.75V@35A<br>1.5V@70A | | | 0V–150V<br>210A<br>1050W<br>500 kΩ<br>0.75V@105A<br>1.5V@210A | | | 0V–150V<br>420A<br>2100W<br>500 kΩ<br>0.75V@210A<br>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[*3]) + Vin[*2]/500 kΩ | | | | | | | | | ±(1.2% of set+1.1% of f.s) |
| Accuracy of Setting | L | | ±(0.2 % of set + 0.1 % of f.s[*3]) + Vin[*2]/500 kΩ | | | | | | | | | N/A |
| Accuracy of Setting(Parallel) | | | ±(1.2% of set +1.1% of f.s.[*3]) | | | | | | | | | ±(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<br>(42.857mΩ–2.5kΩ) | | | 46.6672S–800μS<br>(21.428mΩ–1.25kΩ) | | | 140.0016S–2.4mS<br>(7.1427mΩ–416.6667Ω) | | | 280.0032S–4.8mS<br>(3.5714mΩ–208.3334Ω) |
| | | M | 2.33336S–40μS<br>(428.566mΩ–25kΩ) | | | 4.6667S–80μS<br>(214.28mΩ–12.5kΩ) | | | 14.0001S–242.4μS<br>(71.427mΩ–4.16667kΩ) | | | 28.0032S–484.8μS<br>(35.7135mΩ–2.083334Ω) |
| | | L | 0.233336S–4μS<br>(4.28566Ω~250kΩ) | | | 0.46667S–8μS<br>(2.1428Ω–125kΩ) | | | 1.40001S–24.24μS<br>(714.27mΩ–41.6667kΩ) | | | N/A |
| Accuracy of Setting | H, M | | ±(0.5 % of set[*6] + 0.5 % of f.s[*1]) + Vin[*2]/500kΩ | | | | | | | | | ±(1.2% of set[*6] +1.1% of f.s[*1]) |
| Accuracy of Setting | L | | ±(0.5 % of set[*6] + 0.5 % of f.s[*1]) + Vin[*2]/500kΩ | | | | | | | | | N/A |
| Parallel | | | ±(1.2 % of set + 1.1 % of f.s[*3]) | | | | | | | | | ±(1.2% of set +1.1% of f.s[*3]) |
| 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 | | | | | | | | | |
| **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 [*5] + 1.4 % of f.s[*3]) + Vin[*2]/500kΩ | | | | | | | | | N/A |
| Resolution | H, M, L | | 10mW | 1mW | 0.1mW | 10mW | 1mW | 0.1mW | 100mW | 10mW | 1mW | |
| **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[*10] mA/μs–2.5A/μs | | | 5 x N[*10] mA/μs–5A/μs | | | 16 x N[*11] mA/μs–16A/μs | | | N/A |
| | | M | 250 x N[*10] μA/μs–250mA/μs | | | 500 x N[*10] μA/μs–500mA/μs | | | 1.6 x N[*11] mA/μs–1.6A/μs | | | |
| | | L | 25 x N[*10] μA/μs–25mA/μs | | | 50 x N[*10] μA/μs–50mA/μs | | | 160 x N[*11] μA/μs–160mA/μs | | | |
| Setting Range (CR Mode) | Range | H | 250 x N[*10] μA/μs–250mA/μs | | | 500 x N[*10] μA/μs–500mA/μs | | | 1.6 x N[*11] mA/μs–1.6A/μs | | | N/A |
| | | M | 25 x N[*10] μA/μs–25mA/μs | | | 50 x N[*10] μA/μs–50mA/μs | | | 160 x N[*11] μA/μs–160mA/μs | | | |
| | | L | 2.5 x N[*10] μA/μs–2.5mA/μs | | | 5 x N[*10] μA/μs–5mA/μs | | | 16 x N[*11] μA/μs–16mA/μs | | | |
| Accuracy of Setting | H, M, L | | ±(10 % of set[*9] + 5μs) | | | | | | | | | N/A |
| Resolution (Setting Range) | | | 1 x N[*10]mA<br>250 x N[*10]mA/μs~2.5A/μs<br>100 x N[*10]μA<br>25 x N[*10]mA/μs~250 x N[*10]mA/μs<br>10 x N[*10]μA<br>2.5 x N[*10]mA/μs~25 x N[*10]mA/μs<br>1 x N[*10]μA<br>250 x N[*10]μA/μs~2.5 x N[*10]mA/μs<br>100 x N[*10]nA<br>25 x N[*10]μA/μs~250 x N[*10]μA/μs<br>10 x N[*10]nA<br>2.5 x N[*10]μA/μs~25 x N[*10]μA/μs | | | 2 x N[*10]mA<br>500 x N[*10]mA/μs~5A/μs<br>200 x N[*10]μA<br>50 x N[*10]mA/μs~500 x N[*10]mA/μs<br>20 x N[*10]μA<br>5 x N[*10]mA/μs~50 x N[*10]mA/μs<br>2 x N[*10]μA<br>500 x N[*10]μA/μs~5 x N[*10]mA/μs<br>200 x N[*10]nA<br>50 x N[*10]μA/μs~500 x N[*10]μA/μs<br>20 x N[*10]nA<br>5 x N[*10]μA/μs~50 x N[*10]μA/μs | | | 6 x N[*11]mA<br>1.6 x N[*11]A/μs~16A/μs<br>600 x N[*11]μA<br>160 x N[*11]mA/μs~1.6 x N[*11]A/μs<br>60 x N[*11]μA<br>16 x N[*11]mA/μs~160 x N[*11]mA/μs<br>6 x N[*11]μA<br>1.6 x N[*11]mA/μs~16 x N[*11]mA/μs<br>600 x N[*11]nA<br>160 x N[*11]μA/μs~1.6 x N[*11]μA/μs<br>60 x N[*11]nA<br>16 x N[*11]μA/μs~160 x N[*11]μA/μs | | | N/A |
| **METER** | | | | | | | | | | | | |
| Voltmeter<br>Ammeter<br>Ammeter(Parallel Operation) | Accuracy<br>Accuracy<br>Accuracy | | ±(0.1 % of rdg + 0.1 % of f.s)<br>±(0.2 % of rdg + 0.3 % of f.s)<br>±(1.2% of rdg +1.1% of f.s.) | | | | | | | | | N/A |
| **DYNAMIC MODE** | | | | | | | | | | | | |
| Operation Mode<br>T1 & T2<br>Accuracy | | | CC , CR and CP<br>0.025ms–10ms/Res : 1μs ; 1ms–60s/Res : 1ms<br>±100ppm of setting | | | | | | | | | |
| 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 | | | |
| | | L | 25μA/μs–25mA/μs | | | 50μA/μs–50mA/μs | | | 160μA/μs–160mA/μs | | | |
| 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 | | | |
| | | L | 2.5μA/μs–2.5mA/μs | | | 5μA/μs–5mA/μs | | | 16μA/μs–16mA/μs | | | |
| 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-3323 | | | 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<br>1.5V@420A | | | 0.75V@315A<br>1.5V@630A | | | 0.75V@420A<br>1.5V@840A | | | 0.75V@525A<br>1.5V@1050A | | | 0.75V@315A<br>1.5V@630A | | | 0.75V@525A<br>1.5V@1050A | | | 0.75V@735A<br>1.5V@1470A | | | 0.75V@945A<br>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[*5]) + Vin[*2]/(500/N[*10] 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[*4] + 0.5 % of f.s[*5]) + Vin[*2]/(500/N[*10] 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[*5]) + Vin x Vin /(500/N[*10] 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 | | | 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 | | | 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 | | |
| 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[*9] + 5μs) | | | | | | | | | | | | | | | | | | | | | | | |
| Resolution (Setting Range) | | | 12mA<br>1.6A/μs~16A/μs<br>1.2mA<br>160mA/μs~1.6A/μs<br>120μA<br>16mA/μs~160mA/μs<br>12μA<br>1.6mA/μs~16mA/μs<br>1.2μA<br>160μA/μs~1.6mA/μs<br>120nA<br>16μA/μs~160μA/μs | | | 18mA<br>1.6A/μs~16A/μs<br>1.8mA<br>160mA/μs~1.6A/μs<br>180μA<br>16mA/μs~160mA/μs<br>18μA<br>1.6mA/μs~16mA/μs<br>1.8μA<br>160μA/μs~1.6mA/μs<br>180nA<br>16μA/μs~160μA/μs | | | 24mA<br>1.6A/μs~16A/μs<br>2.4mA<br>160mA/μs~1.6A/μs<br>240μA<br>16mA/μs~160mA/μs<br>24μA<br>1.6mA/μs~16mA/μs<br>2.4μA<br>160μA/μs~1.6mA/μs<br>240nA<br>16μA/μs~160μA/μs | | | 30mA<br>1.6A/μs~16A/μs<br>3mA<br>160mA/μs~1.6A/μs<br>300μA<br>16mA/μs~160mA/μs<br>30μA<br>1.6mA/μs~16mA/μs<br>3μA<br>160μA/μs~1.6mA/μs<br>300nA<br>16μA/μs~160μA/μs | | | 18mA<br>1.6A/μs~16A/μs<br>1.8mA<br>160mA/μs~1.6A/μs<br>180μA<br>16mA/μs~160mA/μs<br>18μA<br>1.6mA/μs~16mA/μs<br>1.8μA<br>160μA/μs~1.6mA/μs<br>N/A | | | 30mA<br>1.6A/μs~16A/μs<br>3mA<br>160mA/μs~1.6A/μs<br>300μA<br>16mA/μs~160mA/μs<br>30μA<br>1.6mA/μs~16mA/μs<br>3μA<br>160μA/μs~1.6mA/μs<br>N/A | | | 42mA<br>1.6A/μs~16A/μs<br>4.2mA<br>160mA/μs~1.6A/μs<br>420μA<br>16mA/μs~160mA/μs<br>42μA<br>1.6mA/μs~16mA/μs<br>4.2μA<br>160μA/μs~1.6mA/μs<br>N/A | | | 54mA<br>1.6A/μs~16A/μs<br>5.4mA<br>160mA/μs~1.6A/μs<br>540μA<br>16mA/μs~160mA/μs<br>54μA<br>1.6mA/μs~16mA/μs<br>5.4μA<br>160μA/μs~1.6mA/μs<br>N/A | | |
| **METER** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Voltmeter | Accuracy | | ±(0.1 % of rdg + 0.1 % of f.s) | | | | | | | | | | | | | | | | | | | | | | | |
| Ammeter | Accuracy | | ±(0.2 % of rdg + 0.3 % of f.s) | | | | | | | | | | | | | | | | | | | | | | | |
| **DYNAMIC MODE** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Operation Mode T1 & T2 Accuracy | | | CC and CR<br>0.025ms–10ms/Res : 1μs ; 1ms–30s/Res : 1ms<br>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. | | | ±0.4%F.S. | | | ±0.4%F.S. | | | ±0.4%F.S. | | | ±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.) | | | 380VA | | | 570VA | | | 760VA | | | 950VA | | | 420VA | | | 650VA | | | 880VA | | | 1110VA | | |
| Interface | | | USB/RS232/Analog Control (Standard) ; GPIB/LAN(Option) | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | |

## SPECIFICATIONS

| Model | | | PEL-3021H | | | PEL-3041H | | | PEL-3111H | | | PEL-3211H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Voltage<br>Current<br>Power<br>Input Resistance<br>Min. Operating Voltage(DC)(Typ.) | | | 0V–800V<br>8.75A<br>175W<br>3.24MΩ<br>5V@8.75A<br>2.5V@4.375A | | | 0V–800V<br>17.5A<br>350W<br>3.24MΩ<br>5V@17.5A<br>2.5V@8.75A | | | 0V–800V<br>52.5A<br>1050W<br>3.24MΩ<br>5V@52.5A<br>2.5V@26.25A | | | 0V–800V<br>105A<br>2100W<br>3.24MΩ<br>5V@105A<br>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[*1]) + Vin[*2]/3.24MΩ | | | | | | | | | ±(1.2% of set+1.1% of f.s) | | |
| Accuracy of Setting | L | | ±(0.2 % of set + 0.1 % of f.s[*1]) + Vin[*2]/3.24MΩ | | | | | | | | | N/A | | |
| Accuracy of Setting(Parallel) | | | ±(1.2% of set +1.1% of f.s.[*3]) | | | | | | | | | 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<br>(571mΩ–33.3kΩ) | | | 3.5S–60µS<br>(285mΩ–16.6kΩ) | | | 10.5S–180µS<br>(95.2mΩ–5.55kΩ) | | | 21S–360µS<br>(47.6mΩ–2.777kΩ) | | |
| | | M | 175mS–3µS<br>(5.71Ω–333kΩ) | | | 350mS–6µS<br>(2.85Ω–166kΩ) | | | 1.05S–18µS<br>(952mΩ–55.5kΩ) | | | 2.1S–36µS<br>(476mΩ–27.77kΩ) | | |
| | | L | 17.5mS–0.3µS<br>(57.1Ω~3.33MΩ) | | | 35mS–0.6µS<br>(28.5Ω–1.66MΩ) | | | 105mS–1.8µS<br>(9.52Ω–555kΩ) | | | 210mS–3.6µS<br>(4.762Ω–277.7kΩ) | | |
| Accuracy of Setting | H, M | | ±(0.5% set + 0.5% f.S[*1]) + Vin[*2]/3.24MΩ | | | | | | | | | ±(1.2% of set +1.1% of f.s)TYP | | |
| Accuracy of Setting | L | | ±(0.5% set + 0.5% f.S[*1]) + Vin[*2]/3.24MΩ | | | | | | | | | N/A | | |
| Parallel | | | ±(1.2 % of set + 1.1 % of f.s[*3]) | | | | | | | | | 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[*10]mA/µs~140mA/µs | | | 0.280 x N[*10]mA/µs~280.0mA/µs | | | 0.840 x N[*11]mA/µs~840mA/µs | | | N/A | | |
| | | M | 0.014 x N[*10]mA/µs~14mA/µs | | | 0.0280 x N[*10]mA/µs~28.00mA/µs | | | 0.0840 x N[*11]mA/µs~84.00mA/µs | | | | | |
| | | L | 1.4 x N[*10]µA/µs~1400µA/µs | | | 2.80 x N[*10]µA/µs~2800µA/µs | | | 0.00840 x N[*11]mA/µs~8.400mA/µs | | | | | |
| Setting Range (CR Mode) | Range | H | 0.014 x N[*10]mA/µs~14mA/µs | | | 0.0280 x N[*10]mA/µs~28.00mA/µs | | | 0.0840 x N[*11]mA/µs~84.00mA/µs | | | N/A | | |
| | | M | 0.0014 x N[*10]mA/µs~1.4mA/µs | | | 0.00280 x N[*10]mA/µs~2.800mA/µs | | | 0.00840 x N[*11]mA/µs~8.400mA/µs | | | | | |
| | | L | 0.14 x N[*10]µA/µs~140µA/µs | | | 0.280 x N[*10]µA/µs~280.0µA/µs | | | 0.000840 x N[*11]mA/µs~0.8400mA/µs | | | | | |
| Accuracy of Setting | H, M, L | | ±(10 % of set + 25µs) | | | | | | | | | N/A | | |
| Resolution (Setting Range) | | | 50 x N[*10]µA<br>14 x N[*10]mA/µs~140mA/µs<br>5 x N[*10]µA<br>1.4 x N[*10]mA/µs~14 x N[*10]mA/µs<br>0.5 x N[*10]µA<br>140 x N[*10]µA/µs~1.4 x N[*10]mA/µs<br>50 x N[*10]nA<br>14 x N[*10]µA/µs~140 x N[*10]µA/µs<br>5 x N[*10]nA<br>1.4 x N[*10]µA/µs~14 x N[*10]µA/µs<br>0.5 x N[*10]nA<br>0.14 x N[*10]µA/µs~1.4 x N[*10]µA/µs | | | 100 x N[*10]µA<br>28 x N[*10]mA/µs~280mA/µs<br>10 x N[*10]µA<br>2.8 x N[*10]mA/µs~28 x N[*10]mA/µs<br>1 x N[*10]µA<br>280 x N[*10]µA/µs~2.8 x N[*10]mA/µs<br>0.1 x N[*10]µA<br>28 x N[*10]µA/µs~280 x N[*10]µA/µs<br>10 x N[*10]nA<br>2.8 x N[*10]µA/µs~28 x N[*10]µA/µs<br>1 x N[*10]nA<br>0.28 x N[*10]µA/µs~2.8 x N[*10]µA/µs | | | 300 x N[*11]µA<br>84 x N[*11]mA/µs~840mA/µs<br>30 x N[*11]µA<br>8.4 x N[*11]mA/µs~84 x N[*11]mA/µs<br>3 x N[*11]µA<br>840 x N[*11]µA/µs~8.4 x N[*11]mA/µs<br>0.3 x N[*11]µA<br>84 x N[*11]µA/µs~840 x N[*11]µA/µs<br>30 x N[*11]nA<br>8.4 x N[*11]µA/µs~84 x N[*11]µA/µs<br>3 x N[*11]nA<br>0.84 x N[*11]µA/µs~8.4 x N[*11]µA/µs | | | N/A | | |
| **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<br>2.5V@52.5A | 5V@157.5A<br>2.5V@78.75A | 5V@210A<br>2.5V@105A | 5V@262.5A<br>2.5V@131.25A | 5V@157.5A<br>2.5V@78.75A | 5V@262.5A<br>2.5V@131.25A | 5V@367.5A<br>2.5V@183.75A | 5V@472.5A<br>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 | | ±(0.2 % of set + 0.1 % of f.s[*3]) + Vin[*2]/(3.24/N[*10]) MΩ[*2] | | | | | | | |
| 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[*4] | Range | H | 21S–360μS (47.619mΩ–2.778kΩ) | 31.5S–540μS (31.746mΩ–1.85185kΩ) | 42S–0.72mS (23.8095mΩ–1.3889kΩ) | 52.5S–0.9mS (19.0476mΩ–1.11111kΩ) | 31.5S–540μS (31.746mΩ–1.85185kΩ) | 52.5S–0.9mS (19.0476mΩ–1.11111kΩ) | 73.5S–1.26mS (13.6054mΩ–793.651Ω) | 94.5S–1.62mS (10.582mΩ–617.284Ω) |
| | | M | 2.1S–36μS (476.19mΩ–27.778kΩ) | 3.15S–54μS (317.46mΩ–18.5185kΩ) | 4.2S–72μS (238.095mΩ–13.8889kΩ) | 5.25S–90μS (190.476mΩ–11.1111kΩ) | 3.15S–54μS (317.46mΩ–18.5185kΩ) | 5.25S–90μS (190.476mΩ–11.1111kΩ) | 7.35S–126μS (136.054mΩ–7.93651kΩ) | 9.45S–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[*5] | H,M,L | | ±(0.5 % of set[*6] + 0.5 % of f.s[*3]) + Vin[*2]/(3.24/N[*10] MΩ) : 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[*7] | Range | H,L | ±(0.2 % of set + 0.2 % 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[*8] | H,M,L | | ±(0.6 % of set + 1.4 % of f.s[*3]) + Vin x Vin[*3]/(3.24/N[*10] MΩ) : 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 | 2.52mA/μs~839.7mA/μs | 3.36mA/μs~840mA/μs | 4.2mA/μs~840mA/μs | 2.52mA/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 | 252μA/μs~83.97mA/μs | 336μA/μs~84mA/μs | 420μA/μs~84mA/μs | 252μA/μs~83.97mA/μs | 420μA/μs~84mA/μs | 588μA/μs~84mA/μs | 756μA/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 | 252μA/μs~83.97mA/μs | 336μA/μs~84mA/μs | 420μA/μs~84mA/μs | 252μA/μs~83.97mA/μs | 420μA/μs~84mA/μs | 588μA/μs~84mA/μs | 756μA/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[*9] | H,M,L | | ±(10 % of set + 25μs) | | | | | | | |
| Resolution (Setting Range) | | | 600μA<br>168mA/μs~840mA/μs<br>60μA<br>16.8mA/μs~168mA/μs<br>6μA<br>1.68mA/μs~16.8mA/μs<br>600nA<br>0.168mA/μs~1.68mA/μs<br>60nA<br>0.0168mA/μs~0.168mA/μs<br>6nA<br>0.00168mA/μs~0.0168mA/μs | 900μA<br>252mA/μs~842.4mA/μs<br>90μA<br>25.2mA/μs~252mA/μs<br>9μA<br>2.52mA/μs~25.2mA/μs<br>900nA<br>0.252mA/μs~2.52mA/μs<br>90nA<br>0.0252mA/μs~0.252mA/μs<br>9nA<br>0.00252mA/μs~0.0252mA/μs | 1.2mA<br>336mA/μs~840mA/μs<br>120μA<br>33.6mA/μs~336mA/μs<br>12μA<br>3.36mA/μs~33.6mA/μs<br>1.2μA<br>0.336A/μs~3.36mA/μs<br>120nA<br>0.0336mA/μs~0.336mA/μs<br>12nA<br>0.00336mA/μs~0.0336mA/μs | 1.5mA<br>420mA/μs~840mA/μs<br>150μA<br>42mA/μs~420mA/μs<br>15μA<br>4.2mA/μs~42mA/μs<br>1.5μA<br>0.42mA/μs~4.2mA/μs<br>150nA<br>0.042mA/μs~0.42mA/μs<br>15nA<br>0.0042mA/μs~0.042mA/μs | 900μA<br>252mA/μs~842.4mA/μs<br>90μA<br>25.2mA/μs~252mA/μs<br>9μA<br>2.52mA/μs~25.2mA/μs<br>900nA<br>0.252mA/μs~2.52mA/μs<br>90nA<br>0.0252mA/μs~0.252mA/μs<br>9nA<br>0.00252mA/μs~0.0252mA/μs | 1.5mA<br>420mA/μs~840mA/μs<br>150μA<br>42mA/μs~420mA/μs<br>15μA<br>4.2mA/μs~42mA/μs<br>1.5μA<br>0.42mA/μs~4.2mA/μs<br>150nA<br>0.042mA/μs~0.42mA/μs<br>15nA<br>0.0042mA/μs~0.042mA/μs | 2.1mA<br>588mA/μs~840mA/μs<br>210μA<br>58.8mA/μs~588mA/μs<br>21μA<br>5.88mA/μs~58.8mA/μs<br>2.1μA<br>0.588mA/μs~5.88mA/μs<br>210nA<br>0.0588mA/μs~0.588mA/μs<br>21nA<br>0.00588mA/μs~0.0588mA/μs | 2.7mA<br>756mA/μs~842.4mA/μs<br>270μA<br>75.6mA/μs~756mA/μs<br>27μA<br>7.56mA/μs~75.6mA/μs<br>2.7μA<br>0.756mA/μs~7.56mA/μs<br>270nA<br>0.0756mA/μs~0.756mA/μs<br>27nA<br>0.00756mA/μs~0.0756mA/μs |
| **METER** | | | | | | | | | | |
| Voltmeter<br>Ammeter | Accuracy<br>Accuracy | | ±(0.1 % of rdg + 0.1 % of f.s)<br>±(1.2 % of rdg + 1.1 % of f.s) | | | | | | | |
| **DYNAMIC MODE** | | | | | | | | | | |
| Operation Mode<br>T1 & T2 Accuracy | | | CC and CR<br>0.025ms–10ms/Res : 1μs ; 10ms–30s/Res : 1ms<br>1μs/1ms ± 100ppm | | | | | | | |
| Slew Rate (CC Mode) | Range | H | 1.68mA/μs~840mA/μs | 2.52mA/μs~839.7mA/μs | 3.36mA/μs~840mA/μs | 4.2mA/μs~840mA/μs | 2.52mA/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 | 252μA/μs~83.97mA/μs | 336μA/μs~84mA/μs | 420μA/μs~84mA/μs | 252μA/μs~83.97mA/μs | 420μA/μs~84mA/μs | 588μA/μs~84mA/μs | 756μA/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 | 252μA/μs~83.97mA/μs | 336μA/μs~84mA/μs | 420μA/μs~84mA/μs | 252μA/μs~83.97mA/μs | 420μA/μs~84mA/μs | 588μA/μs~84mA/μs | 756μA/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 | | | ±0.4%F.S. | ±0.4%F.S. | ±0.4%F.S. | ±0.4%F.S. | ±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.) | | | 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) 2100W Booster for PEL-3111 only
**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) 2100W Booster for PEL-3111H only
**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-004**



**PEL-005**



**PEL-006**



**PEL-007**



**PEL-008**



**PEL-009**



**PEL-018**



**PEL-010**



**PEL-011**



**PEL-012**



**PEL-013**



**PEL-014**



**GTL-255**



**GTL-120**





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



NEW

## PEL-3031AE



NEW

## PEL-3032AE

### FEATURES

- 0~150V(PEL-3031AE)Min. Operating Voltage(dc) : 1V at 60A, 0.5V at 30A
  0~500V(PEL-3032AE)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)Pass Sequence Function: Max Steps:1000 steps/Step Time:25us~60hrs
- Soft Start
- BATT Test Automation:Max Test Time:999h 59min 59s(3599940 sec)Max Test AH:9999.9Ah
- OCP, OPP Test Automation
- Max. Slew Rate : 2.5A/μs
- 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
- Interfaces : LAN/USB/RS-232 & RS-485(Std.), GPIB(Opt.)

GW Instek launches new PEL-3000AE Series programmable single-channel electronic load. In the series, PEL-3031AE provides 300W (1V~150V/60A) and PEL-3032AE provides 600W(2.5V~500V/15A) current sink capability. Inherited from the PEL-3000A Series, PEL-3000AE 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-3000AE 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-3000AE Series 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 maintain 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 Pass Sequence. Normal Sequence is the most flexible means 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). Pass 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-3000AE'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-3000AE Series 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-3000AE provides users with analog control terminal to control PEL-3000AE Series from external voltage, external resistance and switch. Analog control terminal can also route the electronic load's status and display protective alarms.

**SPECIFICATIONS**

| Model | PEL-3031AE | | PEL-3032AE | |
|---|---|---|---|---|
| Power | 300W | 180W | 600W | 600W |
| Range | Low | High | Low | High |
| Voltage | 0 ~ 150V | 0 ~ 150V | 0 ~ 500V | 0 ~ 500V |
| Current | 0 ~ 60A | 0 ~ 60A | 0 ~ 15A | 0 ~ 15A |
| Min. Operating Voltage(dc) | 1V ~ 6A | 1V ~ 6A | 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 ~ 6.03A | 0 ~ 61.2A | 0 ~ 1.53A | 0 ~ 15.3A |
| Resolution | 0.2mA | 2mA | 0.05mA | 0.5mA |
| Accuracy | (T*)±(0.1% of set +0.1% of FS)+ Vin/100kΩ (full scale of High range) | (T*)±(0.1% of set +0.1% of FS)+ Vin/100kΩ (full scale of High range) | (T*)±(0.1% of set +0.1% of FS)+ Vin/100kΩ (full scale of High range) | (T*)±(0.1% of set +0.1% of FS)+ Vin/100kΩ (full scale of High range) |
| Constant Resistance Mode | | | | |
| Range | 60S~0.0833Ω(0.016666Ω~30Ω)(300V/10V) 6S~8.333Ω(0.16666Ω~3kΩ)(300V/100V) 60S~0.0833Ω(0.016666Ω~30Ω)(300V/10V) 6S~8.333Ω(0.16666Ω~3kΩ)(300V/100V) | | 8S~0.0083Ω(0.166660Ω~3kΩ)(180V/10V) 0.8S~0.8333Ω(1.66660Ω~0kΩ)(180V/100V) 8S~0.0083Ω(0.166660Ω~3kΩ)(180V/10V) 0.8S~0.8333Ω(1.66660Ω~0kΩ)(180V/100V) | |
| Setting Range | | | | |
| Resolution(4000 steps) | 0.002Ω(15V) ; 0.0002Ω(150V) | | 0.0002Ω(1.8V) ; 0.00002Ω(18V) | |
| Accuracy | (T*)±(0.3% of set + 0.5Ω) + 0.083mS | | (T*)±(0.3% of set + 8.0Ω) + 0.083mS | |
| 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 | 0.1mV | 1mV | 1mV | 10mV |
| Accuracy | (T*)±(0.1% of set+ 0.1% of FS) (full scale of High range) | (T*)±(0.1% of set+ 0.1% of FS) (full scale of High range) | (T*)±(0.1% of set+ 0.1% of FS) (full scale of High range) | (T*)±(0.1% of set+ 0.1% of FS) (full scale of High range) |
| Constant Power Mode | | | | |
| Range | 0W ~ 300W(6A) | 0W ~ 180W(60A) | 0W ~ 300W(1.5A) | 0W ~ 300W(15A) |
| Setting Range | 0W ~ 30.6W | 0W ~ 306W | 0W ~ 30.6W | 0W ~ 306W |
| Resolution | 1mW | 10mW | 1mW | 10mW |
| Accuracy | (T*)±(0.6 %-of set + 1.4 % of FS (full scale of H range) + Vin/2)(380 kΩ) | | | |



## PEL-3032AE

### Rear Panel



### PEL-010 Dust Filter



### PEL-004 GPIB Option



### GRA-414-J Rack Mount Kit (JIS)



### GRA-414-E Rack Mount Kit (EIA)





GTL-259



GTL-260



GTL-261



GTL-262

| SPECIFICATIONS | | | | |
|---|---|---|---|---|
| Model | PEL-3031AE | | PEL-3032AE | |
| **DYNAMIC MODE** | | | | |
| Current T1& T2 | 0.05ms~30ms/Res 1μs;30ms~300s/Res 1ms | | 0.05ms~30ms/Res 1μs;30ms~300s/Res 1ms | |
| Accuracy | 1μs/1ms±200ppm | 1μs/1ms±200ppm | 1μs/1ms±200ppm | 1μs/1ms±200ppm |
| Slew Rate(Accuracy 10%) | 0.001 ~ 0.25A/μs | 0.01 ~ 2.5A/μs | 0.25 ~ 62.5mA/μs | 2.5 ~ 625mA/μs |
| Slew Rate Resolution | 0.001A/μs | 0.01A/μs | 0.25mA/μs | 2.5mA/μs |
| Slew Rate Accuracy of Setting | ±(10% + 15μs) *1 Time to reach from 10% to 90% when the current is varied from 0 % to 100 % (10 % to 100 % in L range) of the rated current | | | |
| **Constant Current Mode** | | | | |
| 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~8.0025Ω(0.0166Ω~60Ω)(180W/15V)<br>6S~0.80025Ω(0.1666Ω~6kΩ) (360W/150V) | | 6S~0.800025Ω(0.1666Ω~6kΩ) (360W/150V)<br>0.6S~0.080025Ω(1.666Ω~60kΩ) (360W/500V) | |
| Setting Range | 60S~8.0025Ω(0.0166Ω~60Ω)(180W/15V)<br>6S~8.0002Ω (0.1666Ω~6kΩ) (360W/150V) | | 6S~0.800025Ω(0.1666Ω~6kΩ) (360W/150V)<br>0.6S~0.080025Ω(1.666Ω~60kΩ) (360W/500V) | |
| Resistance Resolution | 30000 steps | | 30000 steps | |
| Resistance Accuracy | (1/Y)±(1%set + 0.05) + 0.600mΩ | | (1/Y)±(1%set + 0.065) + 0.083mΩ | |
| **MEASUREMENT** | | | | |
| **Voltage Readback** | | | | |
| Range | 0 ~ 15V | 0 ~ 150V | 0 ~ 50V | 0 ~ 500V |
| Resolution | 0.1mV | 1mV | 2mV | 20mV |
| Accuracy | (T°) ±(0.1% of rdg+0.1% of FS) (Full scale of Low range) | (T°) ±(0.1% of rdg+0.1% of FS) (Full scale of High range) | (T°) ±(0.1% of rdg+0.1% of FS) (Full scale of Low range) | (T°) ±(0.1% of rdg+0.1% of FS) (Full scale of High range) |
| **Current Readback** | | | | |
| Range | 0 ~ 6A | 0 ~ 60A | 0 ~ 1.5A | 0 ~ 15A |
| Resolution | 0.2mA | 2mA | 0.05mA | 0.5mA |
| Accuracy | (T°) ±(0.1% of rdg+0.1% of FS) (Full scale of High range) | (T°) ±(0.1% of rdg+0.1% of FS) (Full scale of High range) | (T°) ±(0.1% of rdg+0.1% of FS) (Full scale of High range) | (T°) ±(0.1% of rdg+0.1% of FS) (Full scale of High range) |
| Power Readback (CC, CR) Range | 0 ~ 300W | 0 ~ 300W | 0 ~ 300W | 0 ~ 300W |
| CP Mode (CV) Range | 0 ~ 90W | 0 ~ 90W | 0 ~ 90W | 0 ~ 90W |
| **FUNCTION** | | | | |
| Sequence(Normal)(Fast) | Normal sequence function: Max steps: 1000 steps/Step time: 1ms ~ 9999.59hrs/59s(3599940 sec)<br>Fast sequence function: Max steps: 1000 steps/Step time: 25us ~ 65ms | | | |
| BATT Test Automation | Max test time: 9999.59hr. 59s(3599940sec) ; Max test AH: 9999.99AH | | | |
| Test Function | OCP Autotest function, OPP Autotest Function | | | |
| 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 | LAN/USB(HS 2.0 & RS-485(Std.), GPIB(Opt.) | | | |
| Dimensions & Weight | 213.5(W) x 124.5(H) x 408.5(D)mm, Approx. 7.5Kg | | | |

Note : *1 : If the ambient temperature is over 30 °C or below 26 °C, then T = Δ | 1 - (5 °C) | x 100ppm/°C x Set
If the ambient temperature is in the range of 20°C~30°C, then T = 0 (Δ is the ambient temperature)

## ORDERING INFORMATION

**PEL-3031AE** 150V/60A/300W Programmable Single-channel D.C. Electronic Load
**PEL-3032AE** 500V/15A/300W Programmable Single-channel D.C. Electronic Load

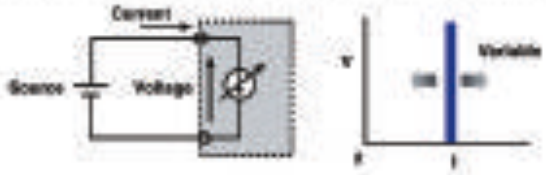
ACCESSORIES :
Quick Start Guide, CD-ROM (User Manual, Programming Manual(ps), Power Cord (Regional dependent), Front Terminal Shutter(Hex-head Allen), GTL-185A Remote Sense Cables (Red x 1, Black x 1)

**OPTIONAL ACCESSORIES**

| | | | |
|---|---|---|---|
| GTL-246 | USB cable, Type A – Type B | GTL-262 | RS-485 Slave cable |
| GTL-248 | GPIB cable, 2.0m | GRA-414-J | Rack Mount Kit(JIS) |
| GTL-259 | RS-232 Cable with DB9 connector to RJ45 | GRA-414-E | Rack Mount Kit(EIA) |
| GTL-260 | RS-485 Cable with DB9 connector to RJ45 | PEL-010 | Dust Filter |
| GTL-261 | Serial Master Cable+Terminator, 0.5M | PEL-004 | GPIB option |

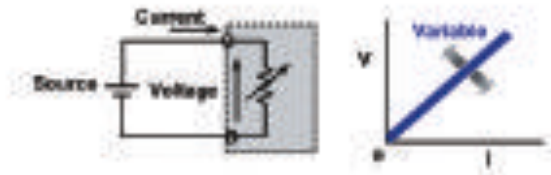
## A. OPERATING MODE

The PEL-3000AE 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.



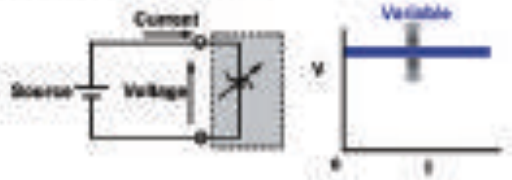

**CC Mode**

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 rate test.



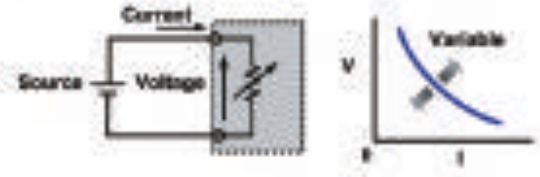

**C.R Mode**

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.



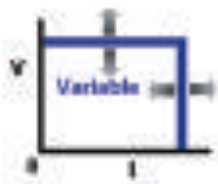

**C.V Mode**

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.

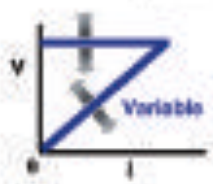



**C.P Mode**

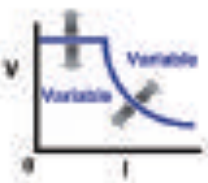
Under constant power mode, electronic load will sink load current, which is indirect proportion to input voltage to reach preset constant power requirement. Hence, the changes of input voltage will have indirect proportion effect on current sinking so as to reach constant power control.




**CC+CV Mode**




**CR+CV Mode**




**CP+CV Mode**

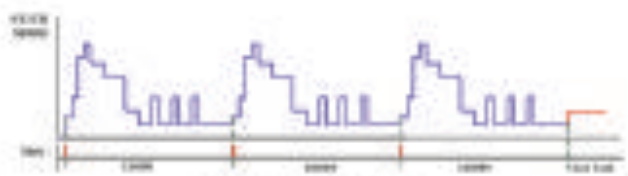
+CV mode can be selected under CC, CR or CP mode. When +CV mode function is turned on and electronic load sinks more current than the maximum current of power supply under test, electronic load will automatically switch to CV mode. It is because that the current sunk is the maximum current of power device. Therefore, power supply will switch to CC mode and PEL-3008AE 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.

## B. STATIC/DYNAMIC/SEQUENCE MODE

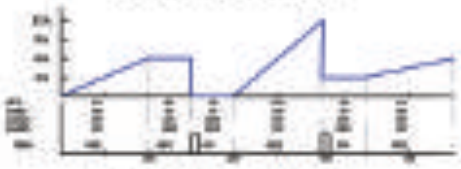
| Operation / Function | Static | Dynamic | Sequence | |
|---|---|---|---|---|
| | | | Fast | Manual |
| Operating Condition Selection | Single fixed condition | Selection between two conditions | Selection from more than two conditions | Selection from more than two conditions |
| Operating Modes | All modes | • Two conditions using same mode<br>• Support CC or CR mode | • Each condition must use same mode<br>• Support CC or CR mode | • Each condition is able to be used in different mode<br>• All modes |
| Adjustable Condition Setting | • Value A/ Value B<br>• Slew Rate | • Level 1/Level 2<br>• Timer 1/Timer 2<br>• Slew Rate 1/Slew Rate 2 | • Level • Others...<br>• Timer<br>• Slew Rate | • Level • Others...<br>• Timer<br>• Slew Rate |
| Sequence Step Combination | N/A | N/A | • 1 Sequence • 255 steps<br>• 1,000 steps | • 10 Sequence • 1 step/step<br>• 1,000 steps |
| Other Functions | N/A | Trigger Out function | Trigger Out function | • Trigger out function<br>• Ramp function |

The PEL-3008AE Series, according to different test conditions, step or continuous changes, test speeds, and selectable modes, has three operating functions: Static, Dynamic and Sequence.

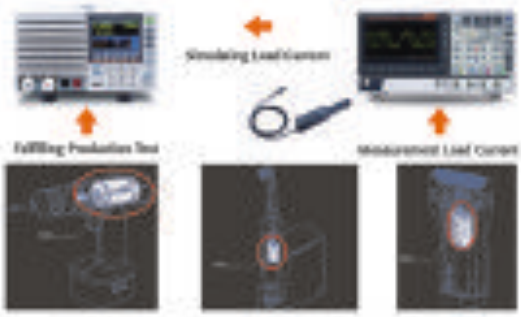
## C. FAST SEQUENCE & NORMAL SEQUENCE



Fast Sequence Diagram

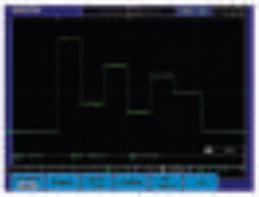


Normal Sequence Diagram

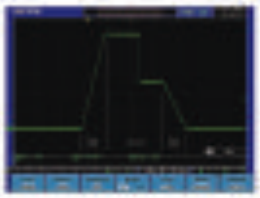



Power-driven Tools Simulation Test

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.



When operating the Sequence Function, PEL-3000AE Series follows the time and load settings of step1, step2, step3, etc. so as to realize different load current variation.



Ramp Function of PEL-3000AE 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

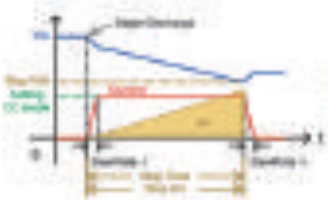



The Soft Start function of PEL-3000AE Series allows users to determine the rise time of current sink that is to decide how much time is required to reach electronic load's set current, resistance or power value. PEL-3000AE's soft start function prevents inrush current and surge voltage from happening on DUT.

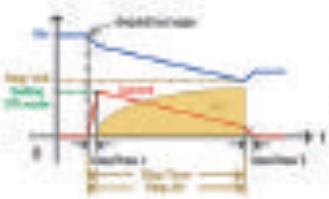



For instance, test applications using a power supply, LED and a DC load (activate the soft start function) can prevent inrush current and surge voltage from causing damages on LED.

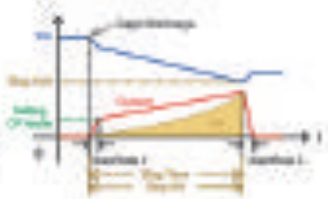
## E. BATT TEST AUTOMATION



CC Mode



CR Mode



CP Mode



BATT Test Automation Editing

The built-in BATT Test Automation of PEL-3000AE provides battery discharge applications with more flexible discharge stop time 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.

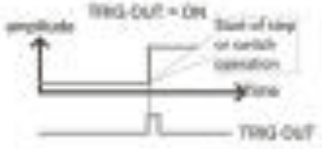
## G. OPP TEST AUTOMATION

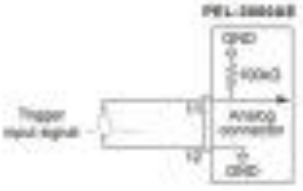


OPP test Automation for DUT(Power Supply). Provide users with high resolution OPP measurement values to verify DUT's OPP activation point. Provide users with measurement results so as to help them determine whether DUT's actual OPP activation point meets the regulations. Test the value of OPP by setting 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-3000AE Series. 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 560ohm. The common potential is connected to the chassis potential. The signal threshold level is TTL.

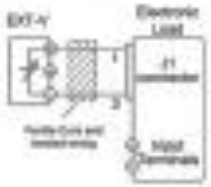
The TRIG IN BNC on the rear panel is used to resume a sequence after a pause. This action is useful to synchronize the execution of a sequence with another device. To resume a pause sequence, apply a high signal for 10us or more. The TRIG IN BNC is pulled down to earth internally using a 100Kohm resistor.

## I. PROTECTION MODES

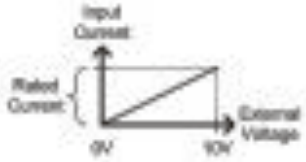
| Protection / Function | OCP | OVP | OPP | OTP | UVP |
|---|---|---|---|---|---|
| Adjustable Thresholds | ✓ | ✓ | ✓ | N/A | ✓ |
| Load Off | ✓ | ✓ | ✓ | Fixed | ✓ |
| Limit Function | ✓ | N/A | ✓ | N/A | N/A |

The PEL-3000AE 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

## J. ANALOG EXTERNAL CONTROL

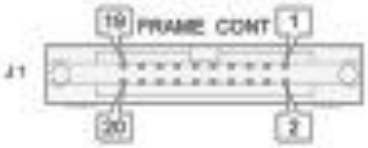



External Voltage Control

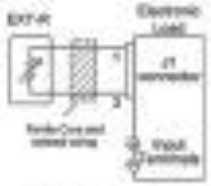



CC Mode

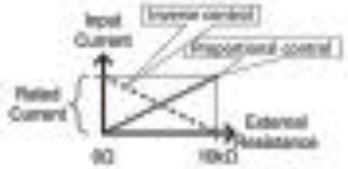
Input current = rated current x (external voltage/10)




J1 Connector




External Resistance Control



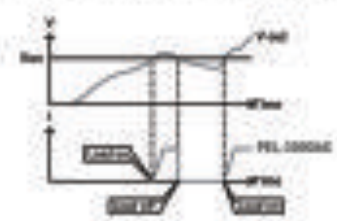

CC Mode

Proportional Control:Input current = rated current x (external resistance/10K ohm)

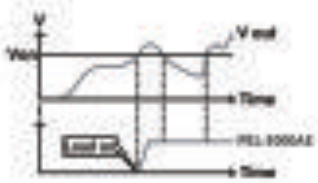
Inverse Control:Input current = rated current x (1- external resistance/10k ohm)

The PEL-3000AE 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 systems and utilize signals generated from the test system to control PEL-3000AE Series.

## K. VonN VOLTAGE AND Von LATCH FUNCTION




Von Latch = OFF




Von Latch = ON

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 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




Voltage at Cut Off Time

The PEL-3000AE 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 99h 59min 59s. When electronic load is activated 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(B)

NEW



## PEL-2002A(B)

NEW

CE | RS-232 | GPIB | USB | LabVIEW Driver | LAN

## 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/OCP/OVP/OTP/RVP/UVP Protections**
- ☆ **External Channel Control/Monitoring via Analog Control Connector**
- ☆ **Multi Interface :**
  **PEL-2000A Series : (Standard) USB and RS-232; (Option) LAN and GPIB**
  **PEL-2000B Series : (Standard) USB, RS-232C/ RS485 and LAN; (Option) GPIB**

The PEL-2004A(B) and PEL-2002A(B) are multiple channel, programmable DC electronic loads with a modularized structure. The PEL-2000A(B) 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(B) 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(B) is a 4-slot mainframe with a master control unit to hold 4 load modules, while PEL-2002A(B) is a 2-slot mainframe with master control unit to hold 2 load modules. When PEL-2004A(B) is configured with 4 load modules rated at 350W each, the PEL-2000A(B) 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(B) 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 100μs 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(B) 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 25μs 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(B) 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(B) 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 RS-232 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.

**PEL-001 GPIB Card**



**PEL-002 Rack Mount Kit**



**PEL-003 Panel Cover**



**PEL-016 LAN Card**
(for PEL-2000A Main Frame)



**GTL-249 Frame Link Cable**



**GTL-120 Test Lead**



**GTL-121 Sense Lead**



## SPECIFICATIONS

| | | PEL-2020A(B) | | PEL-2030A(B) | | | PEL-2040A(B) | | PEL-2041A(B) | |
|---|---|---|---|---|---|---|---|---|---|---|
| CHANNEL | | L/R | L/R | Left | Right | Right | one channel | one channel | one channel | one channel |
| RANGE | | LOW | HIGH | N/A | LOW | HIGH | LOW | HIGH | LOW | HIGH |
| POWER | | 100W | 100W | 30W | 250W | 250W | 350W | | 350W | |
| CURRENT | | 0~2A | 0~20A | 0~5A | 0~4A | 0~40A | 0~7A | 0~70A | 0~1A | 0~10A |
| VOLTAGE | | 0~80V | | 0~80V | | | 0~80V | | 0~500V | |
| MIN.OPERATING VOLTAGE(dc)(Typ.) | | 0.4V at 2A | 0.8V at 20A | 0.8V at 5A | 0.4V at 4A | 0.8V at 40A | 0.4V at 7A | 0.8V at 70A | 1V at 1A | 2V at 10A |
| | | 0.2V at 1A | 0.4V at 10A | 0.4V at 2.5A | 0.2V at 2A | 0.4V at 20A | 0.2V at 3.5A | 0.4V at 35A | 0.5V at 0.5A | 1V at 5A |
| **STATIC MODE** | | | | | | | | | | |
| **CONSTANT CURRENT MODE** | | | | | | | | | | |
| | Operating Range | 0~2A | 0~20A | 0~5A | 0~4A | 0~40A | 0~7A | 0~70A | 0~1A | 0~10A |
| | Setting Range | 0~2.04A | 0~20.4A | 0~5.1A | 0~4.08A | 0~40.8A | 0~7.14A | 0~71.4A | 0~1.02A | 0~10.2A |
| | Resolution | 0.1mA | 1mA | 0.125mA | 0.1mA | 1mA | 0.2mA | 2mA | 0.05mA | 0.5mA |
| | Accuracy | ±(0.1%set + 0.1%F.S.*1) | ±(0.1%set + 0.2%F.S.) | ±(0.1%set + 0.1%F.S) | ±(0.1%set + 0.1%F.S*1) | ±(0.1%set + 0.2%F.S) | ±(0.1%set + 0.1%F.S*1) | ±(0.1%set + 0.2%F.S) | ±(0.1%set + 0.1%F.S*1) | ±(0.1%set + 0.2%F.S) |
| **CONSTANT RESISTANCE MODE** | | | | | | | | | | |
| | Operating Range | 0.075Ω~300Ω(100W/16V) | | 0.3Ω~1.2kΩ(30W/16V) | 0.0375Ω~150Ω(250W/16V) | | 0.025Ω~100Ω(350W/16V) | | 1.25Ω~5kΩ(350W/125V) | |
| | | 3.75Ω~15kΩ(100W/80V) | | 15Ω~60kΩ(30W/80V) | 1.875Ω~7.5kΩ(250W/80V) | | 1.25Ω~5kΩ(350W/80V) | | 50Ω~200kΩ(350W/500V) | |
| | Setting Range | 0.075Ω~300Ω(100W/16V) | | 0.3Ω~1.2kΩ(30W/16V) | 0.0375Ω~150Ω(250W/16V) | | 0.025Ω~100Ω(350W/16V) | | 1.25Ω~5kΩ(350W/125V) | |
| | | 3.75Ω~15kΩ(100W/80V) | | 15Ω~60kΩ(30W/80V) | 1.875Ω~7.5kΩ(250W/80V) | | 1.25Ω~5kΩ(350W/80V) | | 50Ω~200kΩ(350W/500V) | |
| | Resolution*1 | 0.333mS(100W/16V) | | 83.333μS(30W/16V) | 0.666mS(250W/16V) | | 1mS(350W/16V) | | 20μS(350W/125V) | |
| | | 6.667μS(100W/80V) | | 1.666μS(30W/80V) | 13.333μS(250W/80V) | | 20μS(350W/80V) | | 0.5μS(350W/500V) | |
| | Accuracy*2 | 300Ω : ±(0.2%set + 0.1S) | | 1.2kΩ : ±(0.2%set + 0.1S) | 150Ω : ±(0.2%set + 0.1S) | | 100Ω : ±(0.2%set + 0.1S) | | 5kΩ : ±(0.2%set + 0.02S) | |
| | With≧2.5V at input | 15kΩ: ±(0.1%set + 0.01S) | | 60kΩ: ±(0.1%set + 0.01S) | 7.5kΩ: ±(0.1%set + 0.01S) | | 5kΩ: ±(0.1%set + 0.01S) | | 200kΩ: ±(0.1%set + 0.005S) | |
| NOTE : *1 : S (siemens) is the unit of conductance, equal to one reciprocal ohm. *2 : Accuracy must be calculated in conductivity units. | | | | | | | | | | |
| **CONSTANT VOLTAGE + CONSTANT CURRENT MODE** | | | | | | | | | | |
| | Operating Range | 1~80V | 1~16V | 1~80V | 1~16V | 1~80V | 1~16V | 1~80V | 1~16V | 2.5~500V | 2.5~125V |
| | Setting Range | 0~81.6V | 0~16.32V | 0~81.6V | 0~16.32V | 0~81.6V | 0~16.32V | 0~81.6V | 0~16.32V | 0~510V | 0~127.5V |
| | Resolution | 2mV | 0.4mV | 2mV | 0.4mV | 2mV | 0.4mV | 2mV | 0.4mV | 10mV | 2.5mV |
| | 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.) | | ±(0.05%set + 0.1%F.S.) | |
| | Current Setting Range | 0~2.04A | 0~20.4A | 0~5.1A | | 0~4.08A | 0~40.8A | 0~7.14A | 0~71.4A | 0~1.02A | 0~10.2A |
| | Resolution | 0.1mA | 1mA | 0.125mA | | 0.1mA | 1mA | 0.2mA | 2mA | 0.05mA | 0.5mA |
| | Accuracy | ±(0.1%set + 0.1%F.S.*1) | ±(0.1%set + 0.2%F.S.) | ±(0.1%set + 0.2%F.S.) | | ±(0.1%set + 0.1%F.S*1) | ±(0.1%set + 0.2%F.S) | ±(0.1%set + 0.1%F.S*1) | ±(0.1%set + 0.2%F.S) | ±(0.1%set + 0.1%F.S*1) | ±(0.1%set + 0.2%F.S) |
| **CONSTANT POWER MODE + CONSTANT CURRENT MODE** | | | | | | | | | | |
| | Operating Range | 1~10W | 1~100W | 1~30W | | 1~25W | 1~250W | 1~35W | 1~350W | 1~35W | 1~350W |
| | Setting Range | 0~10.2W | 0~102W | 0~30.6W | | 0~25.5W | 0~255W | 0~35.7W | 0~357W | 0~35.7W | 0~357W |
| | Resolution | 1mW | 10mW | 1mW | | 1mW | 10mW | 1mW | 10mW | 1mW | 10mW |
| | Accuracy | ±(0.5%set + 0.5%F.S*1) | ±(0.5%set + 0.5%F.S) | ±(0.5%set + 0.5%F.S) | | ±(0.5%set + 0.5%F.S*1) | | ±(0.5%set + 0.5%F.S*1) | ±(0.5%set + 0.5%F.S) | ±(0.5%set + 0.2%F.S*1) | ±(0.5%set + 0.5%F.S) |
| | Current Setting Range | 0~2.04A | 0~20.4A | 0~5.1A | | 0~4.08A | 0~40.8A | 0~7.14A | 0~71.4A | 0~1.02A | 0~10.2A |
| | Resolution | 0.1mA | 1mA | 0.125mA | | 0.1mA | 1mA | 0.2mA | 2mA | 0.05mA | 0.5mA |
| | Accuracy | ±(0.1%set + 0.1%F.S.*1) | ±(0.1%set + 0.2%F.S.) | ±(0.1%set + 0.2%F.S.) | | ±(0.1%set + 0.1%F.S*1) | ±(0.1%set + 0.2%F.S) | ±(0.1%set + 0.1%F.S*1) | ±(0.1%set + 0.2%F.S) | ±(0.1%set + 0.1%F.S*1) | ±(0.1%set + 0.2%F.S) |
| NOTE : *1 : F.S. = Full scale of H Range | | | | | | | | | | | |
| **DYNAMIC MODE** | | | | | | | | | | | |
| | T1&T2 | 0.025ms ~ 10ms / Res : 1μs | | 0.025ms ~ 10ms / Res : 1μs | | | 0.025ms ~ 10ms / Res : 1μs | | 0.025ms ~ 10ms / Res : 1μs | |
| | | 10ms ~ 30s / Res : 1ms | | 10ms ~ 30s / Res : 1ms | | | 10ms ~ 30s / Res : 1ms | | 10ms ~ 30s / Res : 1ms | |
| | Accuracy | 1μs / 1ms ± 100ppm | | 1μs / 1ms + 100ppm | | | 1μs / 1ms ± 100ppm | | 1μs / 1ms ± 100ppm | |
| **CONSTANT CURRENT MODE** | | | | | | | | | | | |
| | Slew Rate | 0.32 ~ 80mA/μs | 3.2 ~ 800mA/μs | 0.8 ~ 200mA/μs | | 0.64 ~ 160mA/μs | 6.4 ~ 1600mA/μs | 0.001 ~ 0.28A/μs | 0.01 ~ 2.8A/μs | 0.16 ~ 40mA/μs | 1.6 ~ 400mA/μs |
| | Slew Rate Resolution | 0.32mA/μs | 3.2mA/μs | 0.8mA/μs | | 0.64mA/μs | 6.4mA/μs | 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) | ±(10% + 15μs) | ±(10% + 15μs) | ±(10% + 15μs) | ±(10% + 15μs) | ±(10% + 15μs) |
| | Current Setting Range | 0~2.04A | 0~20.4A | 0~5.1A | | 0~4.08A | 0~40.8A | 0~7.14A | 0~71.4A | 0~1.02A | 0~10.2A |
| | Current Resolution | 0.1mA | 1mA | 0.125mA | | 0.1mA | 1mA | 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 | 3.2 ~ 800mA/μs | | 0.8 ~ 200mA/μs | | 6.4 ~ 1600mA/μs | | 0.01 ~ 2.8A/μs | | 1.6 ~ 400mA/μs | |
| | Slew Rate Resolution | 3.2mA/μs | | 0.8mA/μs | | 6.4mA/μs | | 0.01A/μs | | 1.6mA/μs | |
| | Slew Rate Accuracy of Setting | ±(10% + 50μs) | | ±(10% + 50μs) | | | | ±(10% + 50μs) | | ±(10% + 50μs) | |
| | Resistance Setting Range | 0.075Ω~300Ω(100W/16V) | | 0.3Ω~1.2kΩ(30W/16V) | | 0.0375Ω~150Ω(250W/16V) | | 0.025Ω~100Ω(350W/16V) | | 1.25Ω~5kΩ(350W/125V) | |
| | | 3.75Ω~15kΩ(100W/80V) | | 15Ω~60kΩ(30W/80V) | | 1.875Ω~7.5kΩ(250W/80V) | | 1.25Ω~5kΩ(350W/80V) | | 50Ω~200kΩ(350W/500V) | |
| | Resistance Resolution | 0.333mS(100W/16V) | | 83.333μS(30W/16V) | | 0.666mS(250W/16V) | | 1mS(350W/16V) | | 20μS(350W/125V) | |
| | | 6.667μS(100W/80V) | | 1.666μS(30W/80V) | | 13.333μS(250W/80V) | | 20 μS(350W/80V) | | 0.5μS(350W/500V) | |
| | Resistance Accuracy | 300Ω : ±(0.5%set + 0.1S) | | 1.2kΩ : ±(0.5%set + 0.1S) | | 150Ω : ±(0.5%set + 0.1S) | | 100Ω : ±(0.5%set + 0.1S) | | 5kΩ : ±(0.5%set + 0.02S) | |
| | | 15kΩ: ±(0.5%set + 0.01S) | | 60kΩ: ±(0.5%set + 0.01S) | | 7.5kΩ: ±(0.5%set + 0.01S) | | 5kΩ: ±(0.5%set + 0.01S) | | 200kΩ: ±(0.5%set + 0.005S) | |
| **MEASUREMENT** | | | | | | | | | | | |
| **VOLTAGE READBACK** | | | | | | | | | | | |
| | Range | 0~16V | 0~80V | 0~16V | 0~80V | 0~16V | 0~80V | 0~16V | 0~80V | 0~125V | 0~500V |
| | Resolution | 0.32mV | 1.6mV | 0.32mV | 1.6mV | 0.32mV | 1.6mV | 0.32mV | 1.6mV | 2.5mV | 10mV |
| | Accuracy | ±(0.025%set + 0.025% F.S.) | | ±(0.025%set + 0.025% F.S.) | | | | ±(0.025%set + 0.025% F.S.) | | ±(0.025%set + 0.025% F.S.) | |
| **CURRENT READBACK** | | | | | | | | | | | |
| | Range | 0~2A | 0~20A | 0~5A | | 0~4A | 0~40A | 0~7A | 0~70A | 0~1A | 0~10A |
| | Resolution | 0.04mA | 0.4mA | 0.1mA | | 0.08mA | 0.8mA | 0.14mA | 1.4mA | 0.02mA | 0.2mA |
| | Accuracy | ±(0.05%set + 0.05% F.S.*2) | | ±(0.05%set + 0.05% F.S.*2) | | | | ±(0.05%set + 0.05% F.S.*2) | | ±(0.05%set + 0.05% F.S.*2) | |
| **POWER READBACK** | | | | | | | | | | | |
| | Range | 0~10W | 0~100W | 0~30W | | 0~25W | 0~250W | 0~35W | 0~350W | 0~35W | 0~350W |
| | Accuracy | ±(0.1%set + 0.1% F.S.*1) | | ±(0.1%set + 0.1% F.S.*1) | | ±(0.1%set + 0.1% F.S.*1) | | ±(0.1%set + 0.1% F.S.*1) | | ±(0.1%set + 0.1% F.S.*1) | |
| NOTE : *1 : Power F.S. = Vrange F.S. x Irange F.S. *2 : F.S. = Full scale of H Range | | | | | | | | | | | |



PEL-2000A(B) Series

PEL-2004A Rear Panel



PEL-2020A Rear Panel



PEL-2004B Rear Panel



PEL-2020B Rear Panel



## SPECIFICATIONS

| | | PEL-2020A(B) | PEL-2030A(B) | | PEL-2040A(B) | PEL-2041A(B) |
|---|---|---|---|---|---|---|
| **PROTECTIVE** | | | | | | |
| **Over Power Protection** | | | | | | |
| | Range | 1~102W | 0.9~30.6W | 1.25~255W | 1.75~357W | 1.75~357W |
| | Resolution | 0.5W | 0.15W | 1.25W | 1.75W | 1.75W |
| | Accuracy | ±(2%set + 0.25%F.S) | ±(2%set + 0.25%F.S) | ±(2%set + 0.25%F.S) | ±(2%set + 0.25%F.S) | ±(2%set + 0.25%F.S) |
| **Over Current Protection** | | | | | | |
| | Range | 0.25~20.4A | 0.0625~5.1A | 0.5~40.8A | 0.875~71.4A | 0.125~10.2A |
| | Resolution | 0.05A | 0.0125A | 0.1A | 0.175A | 0.025A |
| | Accuracy | ±(2%set + 0.25%F.S) | ±(2%set + 0.25%F.S) | ±(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 | 1~81.6V | 2.5~510V |
| | Resolution | 0.2V | 0.2V | 0.2V | 0.2V | 1.25V |
| | Accuracy | ±(2%set + 0.25%F.S) | ±(2%set + 0.25%F.S) | ±(2%set + 0.25%F.S) | ±(2%set + 0.25%F.S) | ±(2%set + 0.25%F.S) |
| | Over Temperature Protection | ≒85℃ | ≒85℃ | | ≒85℃ | ≒85℃ |
| **Rated Power Protection** | | | | | | |
| | Value | 110W | 33W | 275W | 385W | 385W |
| | Accuracy | ±5%set | ±5%set | ±5%set | ±5%set | ±5%set |
| **GENERAL** | | | | | | |
| **SHORT CIRCUIT** | | | | | | |
| | Current (CC) | ≒2.2/2A | ≒22/20A | ≒5.5/5A | ≒4.4/4A | ≒44/40A | ≒7.7/7A | ≒77/70A | ≒1.1/1A | ≒11/10A |
| | Voltage (CV) | ≒ 0V | ≒ 0V | ≒ 0V | ≒ 0V | ≒ 0V | ≒ 0V | ≒ 0V | ≒ 0V | ≒ 0V |
| | Resistance (CR) | ≒3.75Ω | ≒0.075Ω | ≒15Ω / ≒0.3Ω | ≒1.875Ω | ≒0.0375Ω | ≒1.25Ω | ≒0.025Ω | ≒50Ω | ≒1.25Ω |
| **INPUT RESISTANCE (LOAD OFF)** | | 500kΩ (Typical) | | | | |
| **POWER SOURCE** | | 100-120Vac/ 200-240Vac (90-132Vac/ 180-250Vac), 47 – 63Hz | | | | |
| **WEIGHT** | | Approx. 3.8kg | | | | |
| **DIMENSIONS & WEIGHT** (PEL-2002A(B)) | | 272(W) x 200(H) x 581(D) mm; Approx. 17.1kg (Full modules) | | | | |
| **DIMENSIONS & WEIGHT** (PEL-2004A(B)) | | 435(W) x 200(H) x 581(D) mm; Approx. 28.4kg (Full modules) | | | | |

## ORDERING INFORMATION

**PEL-2020A(B)** Dual Channel Module, (0~80V, 0~20A, 100W) x 2
**PEL-2030A(B)** Dual Channel Module, (1~80V, 0~5A, 30W)+(1~80V, 0~40A, 250W)
**PEL-2040A(B)** Single Channel Module, (0~80V, 0~70A, 350W)
**PEL-2041A(B)** Single Channel Module, (0~500V, 0~10A, 350W)
**PEL-2004A(B)** 4-Slot Programmable D.C. Electronic Load Mainframe
**PEL-2002A(B)** 2-Slot Programmable D.C. Electronic Load Mainframe

Note : Load module cannot be used without a mainframe

ACCESSORIES :

**PEL-2002A(B)/2004A(B)** User Manual x1, Power Cord x1
**PEL-2020A(B)/2030A(B)/2040A(B)/2041A(B)** GTL-120 Test Lead x 1, GTL-121 Sense Lead x 1

* PEL-003 x 3 (PEL-2004A(B)); PEL-003 x 1 (PEL-2002A(B))

**OPTIONAL ACCESSORIES**

| | | | |
|---|---|---|---|
| **PEL-001** | GPIB Card | **GTL-248** | GPIB Cable (2m) |
| **PEL-002** | PEL-2000A(B) Series Rack Mount Kit | **GTL-249** | Frame Link Cable |
| **PEL-003** | Panel Cover | **GTL-246** | USB Cable, USB 2.0 A-B TYPE CABLE, 4P |
| **PEL-016** | LAN Card (for PEL-2000A(B) Main Frame) | **GTL-232** | RS-232C Cable, 9-pin, F-F Type, null modem, 2000mm |

## A. MODULARIZED STRUCTURE/PROGRAM & INTERFACE

### Modularized Structure

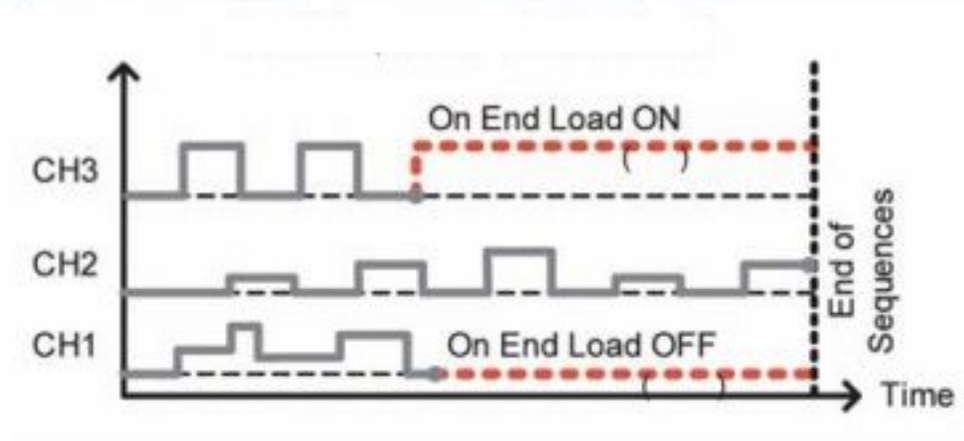
PEL-2004A(B) is a 4-slot mainframe with a master control unit made to hold 4 load modules, and PEL-2002A(B) is a 2-slot mainframe with a master control unit made to hold 2 load modules. The modularized structure of the PEL-2000A(B) Series allows any combination of mainframe and load module (PEL-2020A(B), PEL-2030A(B), PEL-2040A(B), PEL-2041A(B)) to be integrated into a custom-tailored system.

Multiple loads within the same mainframe can be connected in parallel to perform both static and dynamic tests. This flexibility makes the PEL-2000A(B) Series a very cost-effective instrument for testing a broad range of power supply outputs.

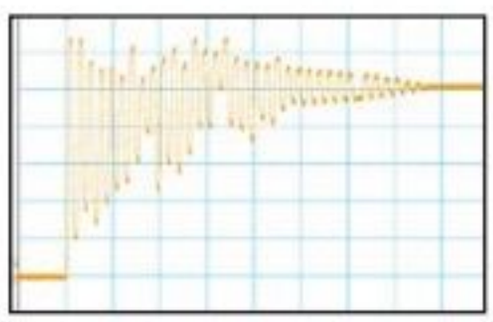
### Program & Interface

The PEL-2000A(B) Series supports a total of 12 different programs and 10 sequences to each program. With a total of up to 120 different configurations. For external control and system configuration, the PEL-Series has USB and RS-232 interfaces as standard and GPIB as an option. The LabView driver and Data Logging PC software are supported for all the interfaces available. Each channel has an analog control/ monitoring connector to externally turn a load on/off and to externally monitor load input current and voltage.

## B. AUTOMATICALLY SEQUENCE FUNCTION




**Sequence - On End Load**

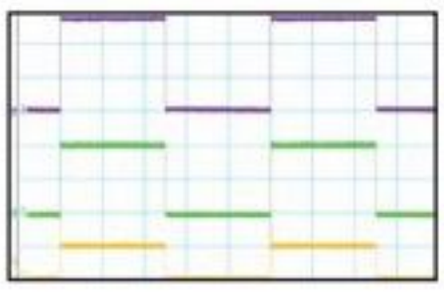


**The figure above shows the current waveform of a simulation using the sequence function.**

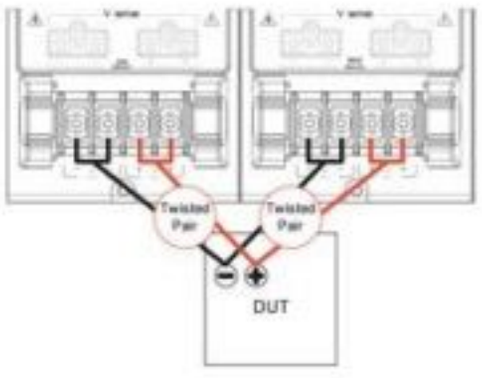
The Sequence function allows each channel to change its load sink according to a predefined sequence at a rate of up to 100μs per step. Each sequence is able to run concurrently, under the control of one clock. This is one of the most powerful features of the PEL-2000B Series as it is able to realistically 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 25μs per step. This is often used as the standard test procedure to verify the response of a power supply to quick load changes.

The picture above is an example of a sequence used as a load profile for a single output switching power supply. A load profile is programmed to simulate the current drawn of a power supply load.
By using a current probe to acquire a current waveform, PEL-2000A(B) Series is able to evaluate the performance of a power supply based on the load sequence that is programmed. An oscilloscope is then used to display the result.

## C. PARALLEL DYNAMIC LOADING



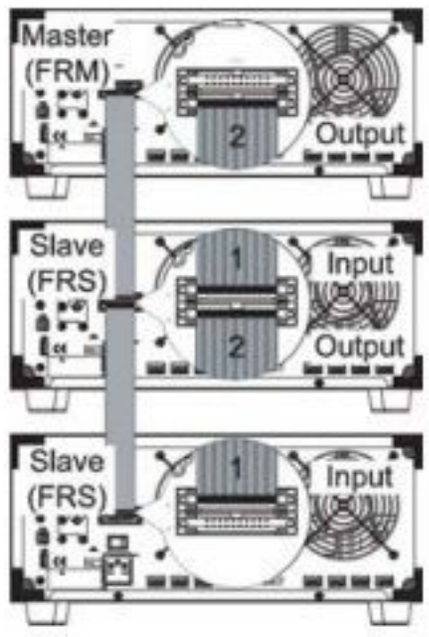
**Dynamic Test**




**Wire Connection**

All the load channels in a PEL-2000A(B) Series mainframe can be connected in parallel to perform any combination of static or dynamic loading. Under Dynamic mode, the load current or load resistance pulses between two preset levels at a predefined speed of up to 25 μs per step. When the channels are connected in parallel, dynamic tests are synchronously clocked. The ability to perform parallel dynamic loading gives you the flexibility to perform dynamic tests to high-power power supplies without the need for a dedicated high power electronic load.

## D. FRAME LINK




The PEL-2000A(B) Series allows multiple mainframes to be linked together with standard MIL 20-pin connectors to provide higher power load capacity. A maximum of 5 mainframes, including one master and 4 slaves, can be chained together to give a 7kW load capacity for high current and high power applications.

# High Power DC Electronic Load



## PEL-5000C Series

NEW

CE | RS-232 | GPIB | USB | LAN

## FEATURES

- ✲ Maximum Power up to 192kW
- ✲ Up to 8 units of Master/Slave Parallel Control
- ✲ 5-digit Digital Voltage, Current and Power Meter
- ✲ Large LCD Display
- ✲ Display Voltage Value, Current Value, Watt Value at the Same Time
- ✲ Suitable for Power Factor Regulator (PFC) Testing (600V, 1200V Models)
- ✲ Automatically Perform OCP, OPP Test
- ✲ The Power-on State Value Can be Set
- ✲ Constant Current, Constant Resistance, Constant Voltage, Constant Power, Constant Current + Constant Voltage, Constant Power + Constant Voltage, Dynamic and Short Circuit Modes
- ✲ Short Circuit Time Can be Set During Short Circuit Test
- ✲ Over Current, Over Power, Over Temperature Protection and Over Voltage Warning
- ✲ Voltage Polarity Display Can be Set to Positive Value ("+") or Negative Value ("-")
- ✲ Support Solar Panel MPPT Test
- ✲ Optional Interface: GPIB, RS232, USB, LAN

GW Instek PEL-5000C series single-channel electronic load provides 150V/ 600V/ 1200V models with a power range of 6kW~24kW. PEL-5000C has a total of 24 models featuring different combinations of power, voltage, and current. It can test and verify the specifications of batteries, electric vehicle chargers/charging stations, electric vehicle batteries and solar panels. PEL-5000C supports parallel connection for same voltage specification and different power models. PEL-5000C can support up to 8 units connected in parallel to provide a maximum power of 192kW.

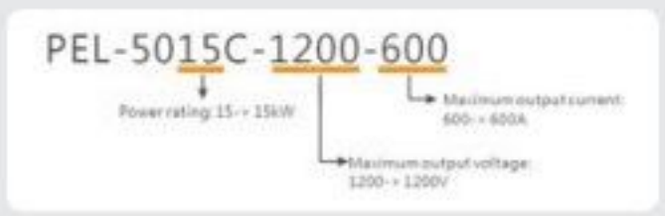
For the scenario of battery testing, PEL-5000C specifically provides four battery discharge modes, namely CC+CV battery discharge test mode, CP+CV battery discharge test mode, CC+ UVP battery discharge test mode, and CP+ UVP battery discharge test mode. Users can choose a suitable test mode according to the test requirements. In addition to the four battery discharge modes, PEL-5000C also provides Time period discharge, Pulse discharge, and RAMP discharge modes. Users can set the discharge time, or discharge in the pulse current mode, or even set the rising/falling slew rate of the discharge current. These functions can be very flexible in the simulation of the battery discharge current waveform when an electric vehicle is running.

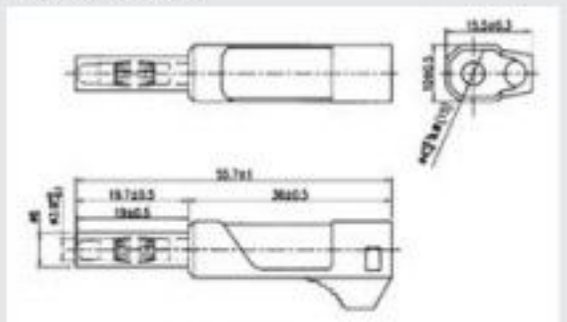
In order to meet the verification requirements of different DUTs, PEL-5000C provides a variety of test functions, including inrush current test mode, solar panel MPPT test mode, automated OCP, OPP test functions and 150 sets of parameter storage function. The 1200V model of PEL-5000C not only provides full power output at 1000V, but also provides 60% power output at 1200V output, which is higher than the 50% power output of other manufacturers of similar electronic loads. High-voltage batteries or chargers directly connected to the electronic load may cause damage to the electronic load. PEL-5000C has a built-in slow starter, which not only protects the DC load, but also saves the user's installation cost and setting time for measurement.

The communication interfaces supported by PEL-5000C include GPIB, RS232, USB, and LAN. The power, voltage and current of each model are shown in the following table:

## ORDERING INFORMATION

| | | |
|---|---|---|
| **PEL-5006C-150-600** | 150V/600A/6kW | High Power DC Electronic Load |
| **PEL-5008C-150-800** | 150V/800A/8kW | High Power DC Electronic Load |
| **PEL-5010C-150-1000** | 150V/1000A/10kW | High Power DC Electronic Load |
| **PEL-5012C-150-1200** | 150V/1200A/12kW | High Power DC Electronic Load |
| **PEL-5015C-150-1500** | 150V/1500A/15kW | High Power DC Electronic Load |
| **PEL-5018C-150-1800** | 150V/1800A/18kW | High Power DC Electronic Load |
| **PEL-5020C-150-2000** | 150V/2000A/20kW | High Power DC Electronic Load |
| **PEL-5024C-150-2000** | 150V/2000A/24kW | High Power DC Electronic Load |
| **PEL-5006C-600-420** | 600V/420A/6kW | High Power DC Electronic Load |
| **PEL-5008C-600-560** | 600V/560A/8kW | High Power DC Electronic Load |
| **PEL-5010C-600-700** | 600V/700A/10kW | High Power DC Electronic Load |
| **PEL-5012C-600-840** | 600V/840A/12kW | High Power DC Electronic Load |
| **PEL-5015C-600-1050** | 600V/1050A/15kW | High Power DC Electronic Load |
| **PEL-5018C-600-1260** | 600V/1260A/18kW | High Power DC Electronic Load |
| **PEL-5020C-600-1400** | 600V/1400A/20kW | High Power DC Electronic Load |
| **PEL-5024C-600-1680** | 600V/1680A/24kW | High Power DC Electronic Load |
| **PEL-5006C-1200-240** | 1200V/240A/6kW | High Power DC Electronic Load |
| **PEL-5008C-1200-320** | 1200V/320A/8kW | High Power DC Electronic Load |
| **PEL-5010C-1200-400** | 1200V/400A/10kW | High Power DC Electronic Load |
| **PEL-5012C-1200-480** | 1200V/480A/12kW | High Power DC Electronic Load |
| **PEL-5015C-1200-600** | 1200V/600A/15kW | High Power DC Electronic Load |
| **PEL-5018C-1200-720** | 1200V/720A/18kW | High Power DC Electronic Load |
| **PEL-5020C-1200-800** | 1200V/800A/20kW | High Power DC Electronic Load |
| **PEL-5024C-1200-960** | 1200V/960A/24kW | High Power DC Electronic Load |



**STANDARD ACCESSORIES**

PEL-5000C Series operation manual
BANANA PLUGS : Please refer to Fig.1 x 1
BNC – BNC CABLE : BNC to BNC CABLE, 1m x 1
HD-DSUB : 15PIN Parallel wire Parallel Wire x 1

**OPTIONAL ACCESSORIES**

| | | | |
|---|---|---|---|
| **PEL-022** | GPIB Card | **PEL-030** | GPIB+RS-232 Card |
| **PEL-023** | RS-232 Card | **GTL-246** | USB Cable, USB 2.0, A-B Type, 1200mm |
| **PEL-024** | LAN Card | **GTL-248** | GPIB Cable, Double Shielded, 2000mm |
| **PEL-025** | USB Card | **GTL-250** | GPIB Cable, Double Shielded, 600mm |
| **PEL-026** | Hook Ring x 4 | | |
| **PEL-027-1** | Rack Mount Kit For PEL-5006C | | |
| **PEL-027-2** | Rack Mount Kit For PEL-5008C, PEL-5010C, PEL-5012C | | |
| **PEL-027-3** | Rack Mount Kit For PEL-5015C, PEL-5018C | | |
| **PEL-027-4** | Rack Mount Kit For PEL-5020C, PEL-5024C | | |
| **PEL-028** | HANDLES, U-shaped Handle(fixed to the bracket) | | |

## Rear Panel



Note: * Regarding the product delivery date, please contact your regional sales representative.



PEL-5006C-150-600
PEL-5006C-600-420
PEL-5006C-1200-240



PEL-5008C-150-800
PEL-5008C-600-560
PEL-5008C-1200-320



PEL-5010C-150-1000
PEL-5010C-600-700
PEL-5010C-1200-400



PEL-5012C-150-1200
PEL-5012C-600-840
PEL-5012C-1200-480



PEL-5015C-150-1500
PEL-5015C-600-1050
PEL-5015C-1200-600



PEL-5018C-150-1800
PEL-5018C-600-1260
PEL-5018C-1200-720



PEL-5020C-150-2000
PEL-5020C-600-1400
PEL-5020C-1200-800



PEL-5024C-150-2000
PEL-5024C-600-1680
PEL-5024C-1200-960

| Power / Voltage | 150V | 600V | 1200V |
|---|---|---|---|
| 6kW | PEL-5006C-150-600 (600A) | PEL-5006C-600-420 (420A) | PEL-5006C-1200-240 (240A) |
| 8kW | PEL-5008C-150-800 (800A) | PEL-5008C-600-560 (560A) | PEL-5008C-1200-320 (320A) |
| 10kW | PEL-5010C-150-1000 (1000A) | PEL-5010C-600-700 (700A) | PEL-5010C-1200-400 (400A) |
| 12kW | PEL-5012C-150-1200 (1200A) | PEL-5012C-600-840 (840A) | PEL-5012C-1200-480 (480A) |
| 15kW | PEL-5015C-150-1500 (1500A) | PEL-5015C-600-1050 (1050A) | PEL-5015C-1200-600 (600A) |
| 18kW | PEL-5018C-150-1800 (1800A) | PEL-5018C-600-1260 (1260A) | PEL-5018C-1200-720 (720A) |
| 20kW | PEL-5020C-150-2000 (2000A) | PEL-5020C-600-1400 (1400A) | PEL-5020C-1200-800 (800A) |
| 24kW | PEL-5024C-150-2000 (2000A) | PEL-5024C-600-1680 (1680A) | PEL-5024C-1200-960 (960A) |

**PEL-022** GPIB Card



**PEL-023** RS-232 Card



**PEL-024** LAN Card



**PEL-025** USB Card



**PEL-026** Hook Ring



**PEL-027-1~4** Rack Mount Kit



**PEL-028** Handles



# High Power DC Electronic Load

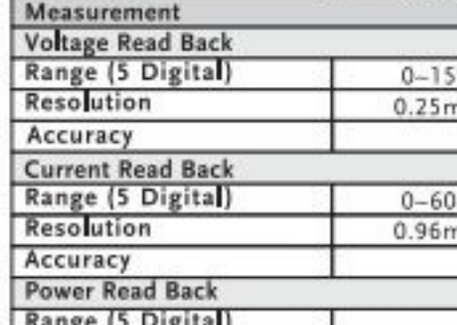
## SPECIFICATIONS

| MODEL | PEL-5006C-150-600 | | PEL-5008C-150-800 | | PEL-5010C-150-1000 | | PEL-5012C-150-1200 | |
|---|---|---|---|---|---|---|---|---|
| Power*1 | 6kW | | 8kW | | 10kW | | 12kW | |
| Current | 0 – 60A | 0 – 600A | 0 – 80A | 0 – 800A | 0 – 100A | 0 – 1000A | 0 – 120A | 0 – 1200A |
| Voltage | 0 ~ 150V | | | | | | | |
| Min. Operating Voltage | 0.7V @ 600A | | 0.7V @ 800A | | 0.7V @ 1000A | | 0.7V @ 1200A | |
| **Protections** | | | | | | | | |
| Over Power Protection (OPP) | 105% | | | | | | | |
| Over Current Protection (OCP) | 104% | | | | | | | |
| Over Voltage Protection (OVP) | 105% | | | | | | | |
| Over Temp Protection (OTP) | 90℃±5℃ | | | | | | | |
| **Constant Current Mode** | | | | | | | | |
| Range*2 | 60A | 600A | 80A | 800A | 100A | 1000A | 120A | 1200A |
| Resolution | 0.96mA | 9.6mA | 1.28mA | 12.8mA | 1.6mA | 16mA | 1.92mA | 19.2mA |
| Accuracy*3 | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Resistance Mode** | | | | | | | | |
| Range | 15000Ω~0.25Ω | 0.25Ω~0.0012Ω | 11250Ω~0.1875Ω | 0.1875Ω~0.0009Ω | 9000Ω~0.15Ω | 0.15Ω~0.0007Ω | 7500Ω~0.125Ω | 0.125Ω~0.0006Ω |
| Resolution | 66.666μS | 4.167μΩ | 88.888μS | 3.125μΩ | 111.111μS | 2.5μΩ | 133.333μS | 2.084μΩ |
| Accuracy | ±0.2% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode** | | | | | | | | |
| Range | 150V | | | | | | | |
| Resolution | 2.5mV | | | | | | | |
| Accuracy | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Power Mode** | | | | | | | | |
| Range | 600W | 6000W | 800W | 8000W | 1000W | 10000W | 1200W | 12000W |
| Resolution | 9.6mW | 96mW | 12.8mW | 128mW | 16mW | 160mW | 19.2mW | 192mW |
| Accuracy | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) |
| **Constant Voltage Mode + Constant Current Mode** | | | | | | | | |
| Range | 150V | 600A | 150V | 800A | 150V | 1000A | 150V | 1200A |
| Resolution | 2.5mV | 9.6mA | 2.5mV | 12.8mA | 2.5mV | 3.2mA | 2.5mV | 19.2mA |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode + Constant Power Mode** | | | | | | | | |
| Range | 150V | 6000W | 150V | 8000W | 150V | 10000W | 150V | 12000W |
| Resolution | 2.5mV | 96mW | 2.5mV | 128mW | 2.5mV | 160mW | 2.5mV | 192mW |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Surge Test** | | | | | | | | |
| Surge & Normal current | 0~600A | | 0~800A | | 0~1000A | | 0~1200A | |
| Surge time | 10~1000ms | | 10~1000ms | | 10~1000ms | | 10~1000ms | |
| Surge step | 1~5 | | | | | | | |
| **MPPT Mode** | | | | | | | | |
| Algorithm | P&O | | | | | | | |
| Load mode | CV | | | | | | | |
| P&O interval | 1000ms~60000ms ; resolution 1000ms | | | | | | | |
| **Dynamic Mode** | | | | | | | | |
| **Timing** | | | | | | | | |
| Thigh & Tlow | 0.010~9.999 / 99.99 / 999.9 / 9999ms | | | | | | | |
| Resolution | 0.001 / 0.01 / 0.1 / 1ms | | | | | | | |
| Accuracy | 1μs / 10μs / 100μs / 1ms + 50ppm | | | | | | | |
| Slew Rate | 0.0144A~0.9A/μs | 0.144A~9A/μs | 0.0192A~1.2A/μs | 0.192A~12A/μs | 0.024A~1.5A/μs | 0.24A~15A/μs | 0.0288A~1.8A/μs | 0.288A~18A/μs |
| Resolution | 0.0036A/μs | 0.036A/μs | 0.0048A/μs | 0.048A/μs | 0.006A/μs | 0.06A/μs | 0.0072A/μs | 0.072A/μs |
| Min. Rise Time | 66.7μs(typical) | | | | | | | |
| **Current** | | | | | | | | |
| Range | 0~60A | 60~600A | 0~80A | 80~800A | 0~100A | 100~1000A | 0~120A | 120~1200A |
| Resolution | 0.96mA | 9.6mA | 1.28mA | 12.8mA | 1.6mA | 16mA | 1.92mA | 19.2mA |
| **Measurement** | | | | | | | | |
| **Voltage Read Back** | | | | | | | | |
| Range (5 Digital) | 0~15V | 15~150V | 0~15V | 15~150V | 0~15V | 15~150V | 0~15V | 15~150V |
| Resolution | 0.25mV | 2.5mV | 0.25mV | 2.5mV | 0.25mV | 2.5mV | 0.25mV | 2.5mV |
| Accuracy | ±0.025% of (Reading + Range) | | | | | | | |
| **Current Read Back** | | | | | | | | |
| Range (5 Digital) | 0~60A | 60~600A | 0~80A | 80~800A | 0~100A | 100~1000A | 0~120A | 120~1200A |
| Resolution | 0.96mA | 9.6mA | 1.28mA | 12.8mA | 1.6mA | 16mA | 1.92mA | 19.2mA |
| Accuracy | ±0.05% of (Reading + Range) | | | | | | | |
| **Power Read Back** | | | | | | | | |
| Range (5 Digital) | 6000W | | 8000W | | 10000W | | 12000W | |
| Accuracy | ± 0.06% of (Reading + Range) | | | | | | | |
| **General** | | | | | | | | |
| Typical Short Resistance | 0.0012Ω | | 0.0009Ω | | 0.0007Ω | | 0.0006Ω | |
| Maximum Short Current | 600A | | 800A | | 1000A | | 1200A | |
| Load ON Voltage | 0.25 – 62.5V | | | | | | | |
| Load OFF Voltage | 0 ~ 62.5V | | | | | | | |
| Power Consumption | 510VA | | 920VA | | 920VA | | 920VA | |
| Dimension (HxWxD) | 445.6x481x757.3mm | | 571.6x481x757.3mm | | 571.6x481x757.3mm | | 571.6x481x757.3mm | |
| HxWxD (Not included Rack Mount &Leafeads) | 341.6x445.2x757.3mm | | 467.6x445.2x757.3mm | | 467.6x445.2x757.3mm | | 467.6x445.2x757.3mm | |
| Weight | 62 kg | | 77.5 kg | | 84.8 kg | | 92 kg | |
| Temperature*4 | 0~40℃ | | | | | | | |
| Safety & EMC | CE | | | | | | | |

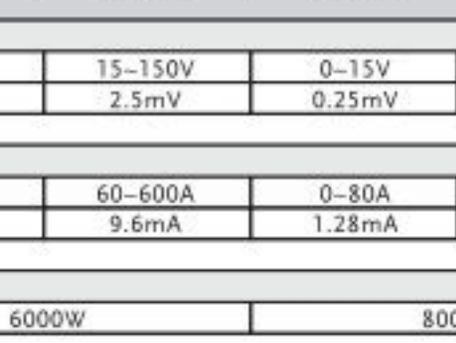
**Cooling : Advanced Fan Cooled**

**Input AC Power : 100~240 Vac ±10% , 50/60Hz, Single-phase**

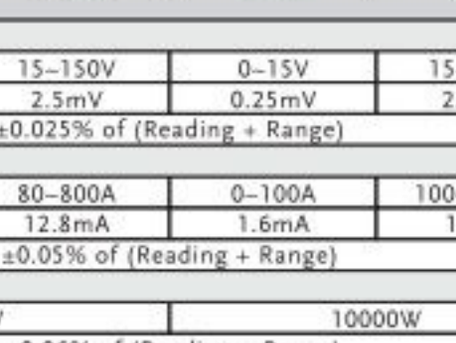
Note *1 : The power rating specifications at ambient temperature = 25°C
Note *2 : The range is automatically or forcing to range II only in CC Mode
Note *3 : If the operating current is below range 0.1%, the accuracy specification is 0.1% F.S.
Note *4 : Operating temperature range is 0~40℃ , all specifications apply for 25℃±5℃



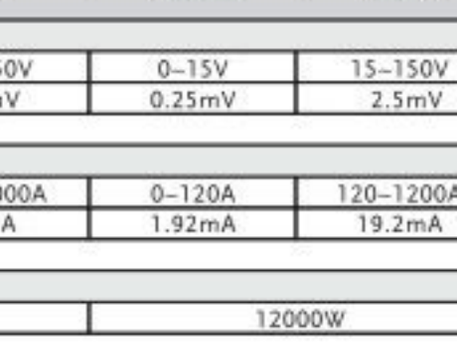

PEL-5006C-150-600




PEL-5008C-150-800




PEL-5010C-150-1000




PEL-5012C-150-1200

## SPECIFICATIONS

| MODEL | PEL-5015C-150-1500 | | PEL-5018C-150-1800 | | PEL-5020C-150-2000 | | PEL-5024C-150-2000 | |
|---|---|---|---|---|---|---|---|---|
| Power*1 | 15kW | | 18kW | | 20kW | | 24kW | |
| Current | 0 – 150A | 0 – 1500A | 0 – 180A | 0 – 1800A | 0 – 200A | 0 – 2000A | 0 – 200A | 0 – 2000A |
| Voltage | 0 ~ 150V | | | | | | | |
| Min. Operating Voltage | 0.7V @ 1500A | | 0.7V @ 1800A | | 0.7V @ 2000A | | 0.7V @ 2000A | |
| **Protections** | | | | | | | | |
| Over Power Protection (OPP) | 105% | | | | | | | |
| Over Current Protection (OCP) | 104% | | | | | | | |
| Over Voltage Protection (OVP) | 105% | | | | | | | |
| Over Temp Protection (OTP) | 90℃±5℃ | | | | | | | |
| **Constant Current Mode** | | | | | | | | |
| Range*2 | 150A | 1500A | 180A | 1800A | 200A | 2000A | 200A | 2000A |
| Resolution | 2.4mA | 24mA | 2.88mA | 28.8mA | 3.2mA | 32mA | 3.2mA | 32mA |
| Accuracy*3 | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Resistance Mode** | | | | | | | | |
| Range | 6000Ω~0.1Ω | 0.1Ω~0.0005Ω | 5000Ω~0.0833Ω | 0.0833Ω~0.0004Ω | 4500Ω~0.075Ω | 0.075Ω~0.0004Ω | 4500Ω~0.075Ω | 0.075Ω~0.0004Ω |
| Resolution | 166.666μS | 1.667μΩ | 200μS | 1.389μΩ | 222.22μS | 1.25μΩ | 222.22μS | 1.25μΩ |
| Accuracy | ±0.2% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode** | | | | | | | | |
| Range | 150V | | | | | | | |
| Resolution | 2.5mV | | | | | | | |
| Accuracy | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Power Mode** | | | | | | | | |
| Range | 1500W | 15000W | 1800W | 18000W | 2000W | 20000W | 2400W | 24000W |
| Resolution | 24mW | 240mW | 28.8mW | 288mW | 32mW | 320mW | 38.4mW | 384mW |
| Accuracy | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) |
| **Constant Voltage Mode + Constant Current Mode** | | | | | | | | |
| Range | 150V | 1500A | 150V | 1800A | 150V | 2000A | 150V | 2000A |
| Resolution | 2.5mV | 24mA | 2.5mV | 28.8mA | 2.5mV | 32mA | 2.5mV | 32mA |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode + Constant Power Mode** | | | | | | | | |
| Range | 150V | 15000W | 150V | 18000W | 150V | 20000W | 150V | 24000W |
| Resolution | 2.5mV | 240mW | 2.5mV | 288mW | 2.5mV | 320mW | 2.5mV | 384mW |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Surge Test** | | | | | | | | |
| Surge & Normal current | 0–1500A | | 0–1800A | | 0–2000A | | 0–2000A | |
| Surge time | 10–1000ms | | 10–1000ms | | 10–1000ms | | 10–1000ms | |
| Surge step | 1–5 | | | | | | | |
| **MPPT Mode** | | | | | | | | |
| Algorithm | P&O | | | | | | | |
| Load mode | CV | | | | | | | |
| P&O interval | 1000ms–60000ms ; resolution 1000ms | | | | | | | |
| **Dynamic Mode** | | | | | | | | |
| **Timing** | | | | | | | | |
| Thigh & Tlow | 0.010–9.999 / 99.99 / 999.9 / 9999ms | | | | | | | |
| Resolution | 0.001 / 0.01 / 0.1 / 1ms | | | | | | | |
| Accuracy | 1μs / 10μs / 100μs / 1ms + 50ppm | | | | | | | |
| Slew Rate | 0.036A~2.25A/μs | 0.360A~22.5A/μs | 0.0432A~2.7A/μs | 0.432A~27A/μs | 0.048A~3A/μs | 0.48A~30A/μs | 0.048A~3A/μs | 0.48A~30A/μs |
| Resolution | 0.009A/μs | 0.09A/μs | 0.0108A/μs | 0.108A/μs | 0.012A/μs | 0.12A/μs | 0.012A/μs | 0.12A/μs |
| Min. Rise Time | 66.7μs(typical) | | | | | | | |
| **Current** | | | | | | | | |
| Range | 0~150A | 150~1500A | 0~180A | 180~1800A | 0~200A | 200~2000A | 0~200A | 200~2000A |
| Resolution | 2.4mA | 24mA | 2.88mA | 28.8mA | 3.2mA | 32mA | 3.2mA | 32mA |
| **Measurement** | | | | | | | | |
| **Voltage Read Back** | | | | | | | | |
| Range (5 Digital) | 0~15V | 15~150V | 0~15V | 15~150V | 0~15V | 15~150V | 0~15V | 15~150V |
| Resolution | 0.25mV | 2.5mV | 0.25mV | 2.5mV | 0.25mV | 2.5mV | 0.25mV | 2.5mV |
| Accuracy | ±0.025% of (Reading + Range) | | | | | | | |
| **Current Read Back** | | | | | | | | |
| Range (5 Digital) | 0–150A | 15–1500A | 0–180A | 180–1800A | 0–200A | 200–2000A | 0–200A | 200–2000A |
| Resolution | 2.4mA | 24mA | 2.88mA | 28.8mA | 3.2mA | 32mA | 3.2mA | 32mA |
| Accuracy | ± 0.05% of (Reading + Range) | | | | | | | |
| **Power Read Back** | | | | | | | | |
| Range (5 Digital) | 15000W | | 18000W | | 20000W | | 24000W | |
| Accuracy | ± 0.06% of (Reading + Range) | | | | | | | |
| **General** | | | | | | | | |
| Typical Short Resistance | 0.0005Ω | | 0.0004Ω | | 0.0004Ω | | 0.0004Ω | |
| Maximum Short Current | 1500A | | 1800A | | 2000A | | 2000A | |
| Load ON Voltage | 0.25 ~ 62.5V | | | | | | | |
| Load OFF Voltage | 0 ~ 62.5V | | | | | | | |
| Power Consumption | 1320VA | | 1320VA | | 1700VA | | 1700VA | |
| Dimension (HxWxD) | 760.6x481x757.3mm | | 760.6x481x757.3mm | | 886.6x481x757.3mm | | 886.6x481x757.3mm | |
| HxWxD (Not included Rack Mount Kit,wheels) | 656.6x445.2x757.3mm | | 656.6x445.2x757.3mm | | 782.6x445.2x757.3mm | | 782.6x445.2x757.3mm | |
| Weight | 116.5 kg | | 124 kg | | 140.5 kg | | 155 kg | |
| Temperature*4 | 0~40℃ | | | | | | | |
| Safety & EMC | CE | | | | | | | |

**Cooling : Advanced Fan Cooled**

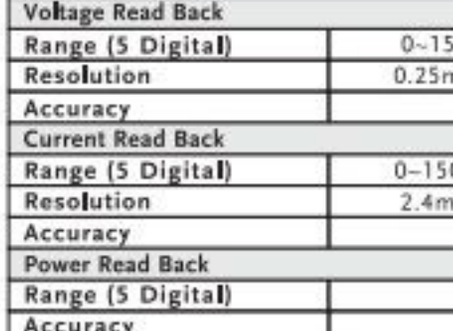
**Input AC Power : 100~240 Vac ±10% , 50/60Hz, Single-phase**

Note *1 : The power rating specifications at ambient temperature = 25°C

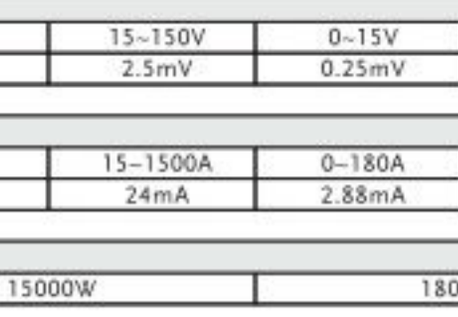
Note *2 : The range is automatically or forcing to range II only in CC Mode

Note *3 : If the operating current is below range 0.1%, the accuracy specification is 0.1% F.S.

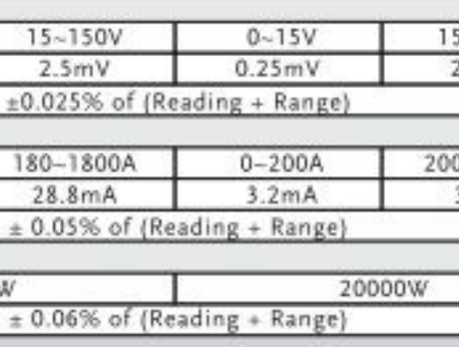
Note *4 : Operating temperature range is 0–40°C , all specifications apply for 25°C±5°C



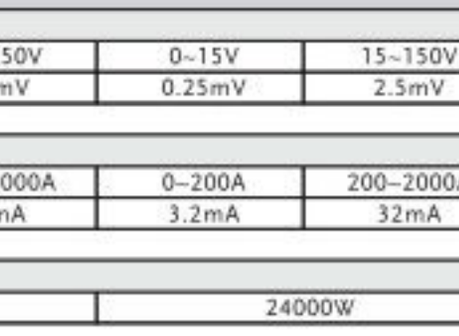

PEL-5015C-150-1500




PEL-5018C-150-1800




PEL-5020C-150-2000




PEL-5024C-150-2000

# High Power DC Electronic Load

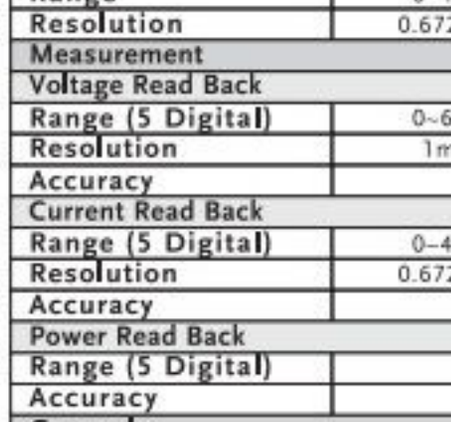
## SPECIFICATIONS

| MODEL | PEL-5006C-600-420 | | PEL-5008C-600-560 | | PEL-5010C-600-700 | | PEL-5012C-600-840 | |
|---|---|---|---|---|---|---|---|---|
| Power*1 | 6kW | | 8kW | | 10kW | | 12kW | |
| Current | 0 – 42A | 0 – 420A | 0 – 56A | 0 – 560A | 0 – 70A | 0 – 700A | 0 – 84A | 0 – 840A |
| Voltage | 0 – 600V | | | | | | | |
| Min. Operating Voltage | 10V @ 420A | | 10V @ 560A | | 10V @ 700A | | 10V @ 840A | |
| **Protections** | | | | | | | | |
| Over Power Protection (OPP) | 105% | | | | | | | |
| Over Current Protection (OCP) | 104% | | | | | | | |
| Over Voltage Protection (OVP) | 105% | | | | | | | |
| Over Temp Protection (OTP) | 90℃±5℃ | | | | | | | |
| **Constant Current Mode** | | | | | | | | |
| Range*2 | 42A | 420A | 56A | 560A | 70A | 700A | 84A | 840A |
| Resolution | 0.672mA | 6.72mA | 0.896mA | 8.96mA | 1.12mA | 11.2mA | 1.334mA | 13.44mA |
| Accuracy*3 | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Resistance Mode** | | | | | | | | |
| Range | 85712Ω~1.42853Ω | 1.42853Ω~0.02384Ω | 64284Ω~1.0714Ω | 1.0714Ω~0.01788Ω | 51427.2Ω~0.85712Ω | 0.85712Ω~0.014304Ω | 42856Ω~0.714267Ω | 0.714267Ω~0.01192Ω |
| Resolution | 11.6669μS | 23.84μΩ | 15.5559μS | 17.88μΩ | 19.4449μS | 14.304μΩ | 23.3339μS | 11.92μΩ |
| Accuracy | ±0.2% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode** | | | | | | | | |
| Range | 600V | | | | | | | |
| Resolution | 10mV | | | | | | | |
| Accuracy | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Power Mode** | | | | | | | | |
| Range | 600W | 6000W | 800W | 8000W | 1000W | 10000W | 1200W | 12000W |
| Resolution | 9.6mW | 96mW | 12.8mW | 128mW | 16mW | 160mW | 19.2mW | 192mW |
| Accuracy | ± 0.2% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.2% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.2% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.2% of (Setting+Range) | ± 0.1% of (Setting+Range) |
| **Constant Voltage Mode + Constant Current Mode** | | | | | | | | |
| Range | 600V | 420A | 600V | 560A | 600V | 700A | 600V | 840A |
| Resolution | 10mV | 6.72mA | 10mV | 8.96mA | 10mV | 11.2mA | 10mV | 13.44mA |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode + Constant Power Mode** | | | | | | | | |
| Range | 600V | 6000W | 600V | 8000W | 600V | 10000W | 600V | 12000W |
| Resolution | 10mV | 96mW | 10mV | 128mW | 10mV | 160mW | 10mV | 192mW |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Surge Test** | | | | | | | | |
| Surge & Normal current | 0~420A | | 0~560A | | 0~700A | | 0~840A | |
| Surge time | 10~1000ms | | 10~1000ms | | 10~1000ms | | 10~1000ms | |
| Surge step | 1~5 | | | | | | | |
| **MPPT Mode** | | | | | | | | |
| Algorithm | P&O | | | | | | | |
| Load mode | CV | | | | | | | |
| P&O interval | 1000ms~60000ms ; resolution 1000ms | | | | | | | |
| **Dynamic Mode** | | | | | | | | |
| **Timing** | | | | | | | | |
| Thigh & Tlow | 0.010~9.999 / 99.99 / 999.9 / 9999ms | | | | | | | |
| Resolution | 0.001 / 0.01 / 0.1 / 1ms | | | | | | | |
| Accuracy | 1μs / 10μs / 100μs / 1ms + 50ppm | | | | | | | |
| Slew Rate | 0.0288~1.8A/μs | 0.288A~18A/μs | 0.0288A~1.8A/μs | 0.288A~18A/μs | 0.0336A~2.1A/μs | 0.336A~21A/μs | 0.0384A~2.4/μs | 0.384A~24A/μs |
| Resolution | 0.0072A/μs | 0.072A/μs | 0.0072A/μs | 0.072A/μs | 0.0084A/μs | 0.084A/μs | 0.0096A/μs | 0.096A/μs |
| **Current** | | | | | | | | |
| Range | 0~42A | 42~420A | 0~56A | 56~560A | 0~70A | 70~700A | 0~84A | 84~840A |
| Resolution | 0.672mA | 6.72mA | 0.896mA | 8.96mA | 1.12mA | 11.2mA | 1.334mA | 13.34mA |
| **Measurement** | | | | | | | | |
| **Voltage Read Back** | | | | | | | | |
| Range (5 Digital) | 0~60V | 60~600V | 0~60V | 60~600V | 0~60V | 60~600V | 0~60V | 60~600V |
| Resolution | 1mV | 10mV | 1mV | 10mV | 1mV | 10mV | 1mV | 10mV |
| Accuracy | ±0.025% of (Reading + Range) | | | | | | | |
| **Current Read Back** | | | | | | | | |
| Range (5 Digital) | 0~42A | 42~420A | 0~56A | 56~560A | 0~70A | 70~700A | 0~84A | 84~840A |
| Resolution | 0.672mA | 6.72mA | 0.896mA | 8.96mA | 1.12mA | 11.2mA | 1.334mA | 13.34mA |
| Accuracy | ±0.05% of (Reading + Range) | | | | | | | |
| **Power Read Back** | | | | | | | | |
| Range (5 Digital) | 6000W | | 8000W | | 10000W | | 12000W | |
| Accuracy | ± 0.06% of (Reading + Range) | | | | | | | |
| **General** | | | | | | | | |
| Typical Short Resistance | 0.0239Ω | | 0.0179Ω | | 0.0143Ω | | 0.00120Ω | |
| Maximum Short Current | 420A | | 560A | | 700A | | 840A | |
| Load ON Voltage | 0.4 – 100V | | | | | | | |
| Load OFF Voltage | 0 – 100V | | | | | | | |
| Power Consumption | 510VA | | 920VA | | 920VA | | 920VA | |
| Dimension (HxWxD) | 445.6x481x757.3mm | | 571.6x481x757.3mm | | 571.6x481x757.3mm | | 571.6x481x757.3mm | |
| HxWxD(Not included Rack Mount Kit,wheels) | 341.6x445.2x757.3mm | | 467.6x445.2x757.3mm | | 467.6x445.2x757.3mm | | 467.6x445.2x757.3mm | |
| Weight | 62 kg | | 77.5 kg | | 84.8 kg | | 92 kg | |
| Temperature*4 | 0~40℃ | | | | | | | |
| Safety & EMC | CE | | | | | | | |

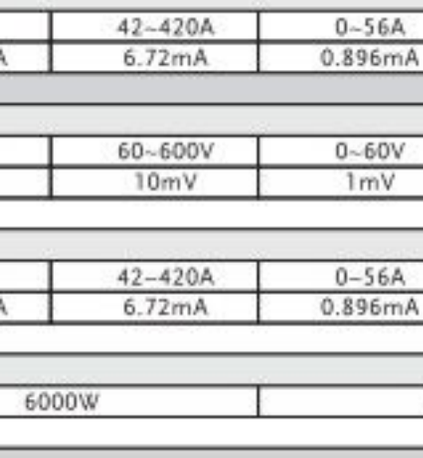
**Cooling : Advanced Fan Cooled**

**Input AC Power : 100~240 Vac ±10% , 50/60Hz, Single-phase**

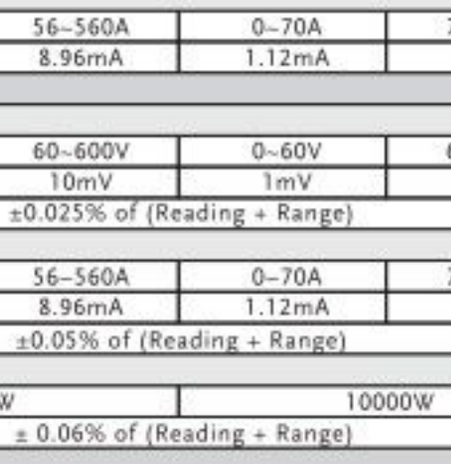
Note *1 : The power rating specifications at ambient temperature = 25°C
Note *2 : The range is automatically or forcing to range II only in CC Mode
Note *3 : If the operating current is below range 0.1%, the accuracy specification is 0.1% F.S.
Note *4 : Operating temperature range is 0~40°C , all specifications apply for 25°C±5°C



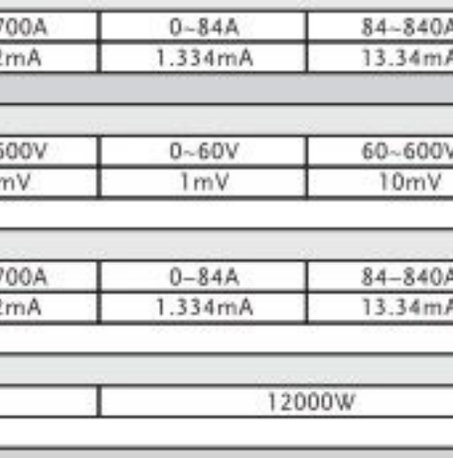

PEL-5006C-600-420




PEL-5008C-600-560




PEL-5010C-600-700




PEL-5012C-600-840

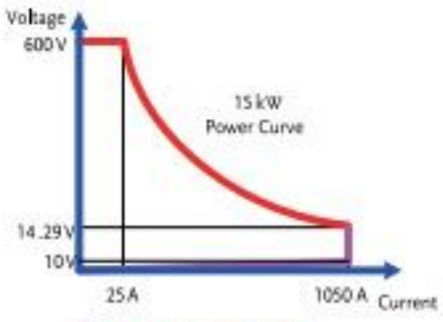
## SPECIFICATIONS

| MODEL | PEL-5015C-600-1050 | | PEL-5018C-600-1260 | | PEL-5020C-600-1400 | | PEL-5024C-600-1680 | |
|---|---|---|---|---|---|---|---|---|
| Power*1 | 15kW | | 18kW | | 20kW | | 24kW | |
| Current | 0 – 105A | 0 – 1050A | 0 – 126A | 0 – 1260A | 0 – 140A | 0 – 1400A | 0 – 168A | 0 – 1680A |
| Voltage | 0 ~ 600V | | | | | | | |
| Min. Operating Voltage | 10V @ 1050A | | 10V @ 1260A | | 10V @ 1400A | | 10V @ 1680A | |
| **Protections** | | | | | | | | |
| Over Power Protection (OPP) | 105% | | | | | | | |
| Over Current Protection (OCP) | 104% | | | | | | | |
| Over Voltage Protection (OVP) | 105% | | | | | | | |
| Over Temp Protection (OTP) | 90°C±5°C | | | | | | | |
| **Constant Current Mode** | | | | | | | | |
| Range*2 | 105A | 1050A | 126A | 1260A | 140A | 1400A | 168A | 1680A |
| Resolution | 1.68mA | 16.8mA | 2.016mA | 20.16mA | 2.24mA | 22.4mA | 2.688mA | 26.88mA |
| Accuracy*3 | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Resistance Mode** | | | | | | | | |
| Range | 34284.8~0.571413Ω | 0.571413~0.009536Ω | 28570.67~0.476178Ω | 0.476178~0.007947Ω | 25713.6~0.42856Ω | 0.42856~0.007152Ω | 21428~0.357133Ω | 0.357133~0.00596Ω |
| Resolution | 29.1674μS | 9.536μΩ | 35.0009μS | 7.947μΩ | 38.8899μS | 7.152μΩ | 46.6679μS | 5.96μΩ |
| Accuracy | ±0.2% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode** | | | | | | | | |
| Range | 600V | | | | | | | |
| Resolution | 10mV | | | | | | | |
| Accuracy | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Power Mode** | | | | | | | | |
| Range | 1500W | 15000W | 1800W | 18000W | 2000W | 20000W | 2400W | 24000W |
| Resolution | 24mW | 240mW | 28.8mW | 288mW | 32mW | 320mW | 38.4mW | 384mW |
| Accuracy | ± 0.2% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.2% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.2% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.2% of (Setting+Range) | ± 0.1% of (Setting+Range) |
| **Constant Voltage Mode + Constant Current Mode** | | | | | | | | |
| Range | 600V | 1050A | 600V | 1260A | 600V | 1400A | 600V | 1680A |
| Resolution | 10mV | 16.8mA | 10mV | 20.16mA | 10mV | 22.4mA | 10mV | 26.88mA |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode + Constant Power Mode** | | | | | | | | |
| Range | 600V | 15000W | 600V | 18000W | 600V | 20000W | 600V | 24000W |
| Resolution | 10mV | 240mW | 10mV | 288mW | 10mV | 320mW | 10mV | 384mW |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Surge Test** | | | | | | | | |
| Surge & Normal current | 0~1050A | | 0~1260A | | 0~1400A | | 0~1680A | |
| Surge time | 10~1000ms | | 10~1000ms | | 10~1000ms | | 10~1000ms | |
| Surge step | 1~5 | | | | | | | |
| **MPPT Mode** | | | | | | | | |
| Algorithm | P&O | | | | | | | |
| Load mode | CV | | | | | | | |
| P&O interval | 1000ms~60000ms ; resolution 1000ms | | | | | | | |
| **Dynamic Mode** | | | | | | | | |
| **Timing** | | | | | | | | |
| Thigh & Tlow | 0.010~9.999 / 99.99 / 999.9 / 9999ms | | | | | | | |
| Resolution | 0.001 / 0.01 / 0.1 / 1ms | | | | | | | |
| Accuracy | 1μs / 10μs / 100μs / 1ms + 50ppm | | | | | | | |
| Slew Rate | 0.0432A~2.7A/μs | 0.432A~27A/μs | 0.048A~3A/μs | 0.48A~30A/μs | 0.0528A~3.3A/μs | 0.528A~33A/μs | 0.0576A~3.6A/μs | 0.576A~36A/μs |
| Resolution | 0.0108A/μs | 0.108A/μs | 0.012A/μs | 0.12A/μs | 0.0132A/μs | 0.132A/μs | 0.0144A/μs | 0.144A/μs |
| **Current** | | | | | | | | |
| Range | 0~105A | 105~1050A | 0~126A | 126~1260A | 0~140A | 140~1400A | 0~168A | 168~1680A |
| Resolution | 1.68mA | 16.8mA | 2.016mA | 20.16mA | 2.24mA | 22.4mA | 2.688mA | 26.88mA |
| **Measurement** | | | | | | | | |
| **Voltage Read Back** | | | | | | | | |
| Range (5 Digital) | 0~60V | 60~600V | 0~60V | 60~600V | 0~60V | 60~600V | 0~60V | 60~600V |
| Resolution | 1mV | 10mV | 1mV | 10mV | 1mV | 10mV | 1mV | 10mV |
| Accuracy | ±0.025% of (Reading + Range) | | | | | | | |
| **Current Read Back** | | | | | | | | |
| Range (5 Digital) | 0~105A | 105~1050A | 0~126A | 126~1260A | 0~140A | 140~1400A | 0~168A | 168~1680A |
| Resolution | 1.68mA | 16.8mA | 2.016mA | 20.16mA | 2.24mA | 22.4mA | 2.688mA | 26.88mA |
| Accuracy | ± 0.05% of (Reading + Range) | | | | | | | |
| **Power Read Back** | | | | | | | | |
| Range (5 Digital) | 15000W | | 18000W | | 20000W | | 24000W | |
| Accuracy | ± 0.06% of (Reading + Range) | | | | | | | |
| **General** | | | | | | | | |
| Typical Short Resistance | 0.0096Ω | | 0.0080Ω | | 0.0072Ω | | 0.0060Ω | |
| Maximum Short Current | 1050A | | 1260A | | 1400A | | 1680A | |
| Load ON Voltage | 0.4 ~ 100V | | | | | | | |
| Load OFF Voltage | 0 – 100V | | | | | | | |
| Power Consumption | 1320VA | | 1320VA | | 1700VA | | 1700VA | |
| Dimension (HxWxD) | 760.6x481x757.3mm | | 760.6x481x757.3mm | | 886.6x481x757.3mm | | 886.6x481x757.3mm | |
| HxWxD(Not included Rack Mount &Lwheels) | 656.6x445.2x757.3mm | | 656.6x445.2x757.3mm | | 782.6x445.2x757.3mm | | 782.6x445.2x757.3mm | |
| Weight | 116.5 kg | | 124 kg | | 140.5 kg | | 155 kg | |
| Temperature*4 | 0~40°C | | | | | | | |
| Safety & EMC | CE | | | | | | | |

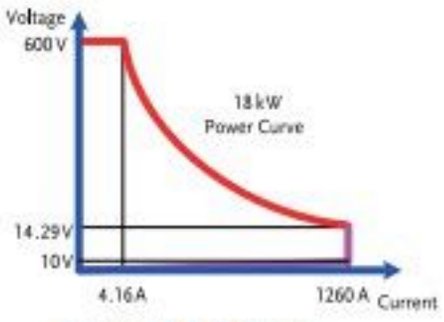
**Cooling : Advanced Fan Cooled**

**Input AC Power : 100~240 Vac ±10% , 50/60Hz, Single-phase**

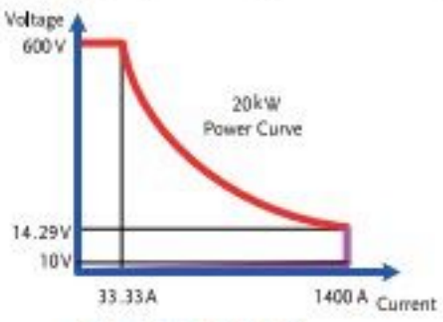
Note *1 : The power rating specifications at ambient temperature = 25°C
Note *2 : The range is automatically or forcing to range II only in CC Mode
Note *3 : If the operating current is below range 0.1%, the accuracy specification is 0.1% F.S.
Note *4 : Operating temperature range is 0~40°C , all specifications apply for 25°C±5°C



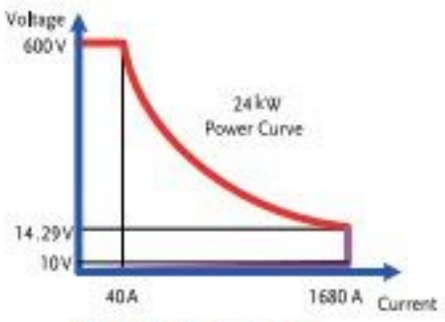

PEL-5015C-600-1050




PEL-5018C-600-1260




PEL-5020C-600-1400




PEL-5024C-600-1680

# High Power DC Electronic Load

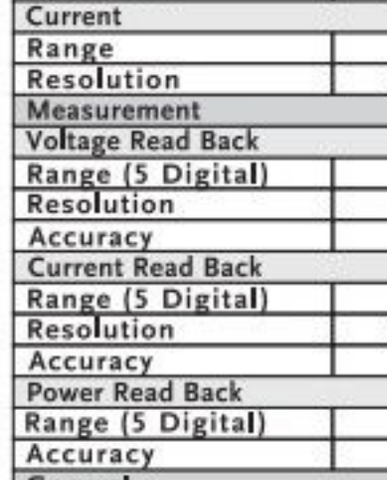
## SPECIFICATIONS

| MODEL | PEL-5006C-1200-240 | | PEL-5008C-1200-320 | | PEL-5010C-1200-400 | | PEL-5012C-1200-480 | |
|---|---|---|---|---|---|---|---|---|
| Power*1 | 6kW | | 8kW | | 10kW | | 12kW | |
| Current | 0 ~ 24A | 0 ~ 240A | 0 ~ 32A | 0 ~ 320A | 0 ~ 40A | 0 ~ 400A | 0 ~ 48A | 0 ~ 480A |
| Voltage | 0 ~ 1200V | | | | | | | |
| Min. Operating Voltage | 15V @ 240A | | 15V @ 320A | | 15V @ 400A | | 15V @ 480A | |
| **Protections** | | | | | | | | |
| Over Power Protection (OPP) | 105% | | | | | | | |
| Over Current Protection (OCP) | 104% | | | | | | | |
| Over Voltage Protection (OVP) | 104% | | | | | | | |
| Over Temp Protection (OTP) | 90℃±5℃ | | | | | | | |
| **Constant Current Mode** | | | | | | | | |
| Range*2 | 24A | 240A | 32A | 320A | 40A | 400A | 48A | 480A |
| Resolution | 0.384mA | 3.84mA | 0.512mA | 5.12mA | 0.64mA | 6.4mA | 0.768mA | 7.68mA |
| Accuracy*3 | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Resistance Mode** | | | | | | | | |
| Range | 30KΩ~5Ω | 5Ω~0.0625Ω | 22.5KΩ~3.75Ω | 3.75Ω~0.0468Ω | 18KΩ~3Ω | 3Ω~0.0375Ω | 15KΩ~2.5Ω | 2.5Ω~0.0312Ω |
| Resolution | 3.333μS | 83.334μΩ | 4.444μS | 62.5μΩ | 5.5555μS | 50μΩ | 6.6666μS | 41.667μΩ |
| Accuracy | ±0.2% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode** | | | | | | | | |
| Range | 1200V | | | | | | | |
| Resolution | 20mV | | | | | | | |
| Accuracy | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Power Mode** | | | | | | | | |
| Range | 600W | 6000W | 800W | 8000W | 1000W | 10000W | 1200W | 12000W |
| Resolution | 9.6mW | 96mW | 12.8mW | 128mW | 16mW | 160mW | 19.2mW | 192mW |
| Accuracy | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) |
| **Constant Voltage Mode + Constant Current Mode** | | | | | | | | |
| Range | 1200V | 240A | 1200V | 320A | 1200V | 400A | 1200V | 480A |
| Resolution | 20mV | 3.84mA | 20mV | 5.12mA | 20mV | 6.4mA | 20mV | 7.68mA |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode + Constant Power Mode** | | | | | | | | |
| Range | 1200V | 6000W | 1200V | 8000W | 1200V | 10000W | 1200V | 12000W |
| Resolution | 20mV | 96mW | 20mV | 128mW | 20mV | 160mW | 20mV | 192mW |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Surge Test** | | | | | | | | |
| Surge & Normal current | 0~240A | | 0~320A | | 0~400A | | 0~480A | |
| Surge time | 10~1000ms | | 10~1000ms | | 10~1000ms | | 10~1000ms | |
| Surge step | 1~5 | | | | | | | |
| **MPPT Mode** | | | | | | | | |
| Algorithm | P&O | | | | | | | |
| Load mode | CV | | | | | | | |
| P&O interval | 1000ms~60000ms ; resolution 1000ms | | | | | | | |
| **Dynamic Mode** | | | | | | | | |
| **Timing** | | | | | | | | |
| Thigh & Tlow | 0.010~9.999 / 99.99 / 999.9 / 9999ms | | | | | | | |
| Resolution | 0.001 / 0.01 / 0.1 / 1ms | | | | | | | |
| Accuracy | 1μs / 10μs / 100μs / 1ms + 50ppm | | | | | | | |
| Slew Rate | 0.0192A~1.2A/μs | 0.192A~12A/μs | 0.0192A~1.2A/μs | 0.192A~12A/μs | 0.0224A~1.4A/μs | 0.224A~14A/μs | 0.0256A~1.6A/μs | 0.256A~16A/μs |
| Resolution | 0.0048A/μs | 0.048A/μs | 0.0048A/μs | 0.048A/μs | 0.0056A/μs | 0.056A/μs | 0.0064A/μs | 0.064A/μs |
| **Current** | | | | | | | | |
| Range | 0~24A | 24~240A | 0~32A | 32~320A | 0~40A | 40~400A | 0~48A | 48~480A |
| Resolution | 0.384mA | 3.84mA | 0.512mA | 5.12mA | 0.64mA | 6.4mA | 0.768mA | 7.68mA |
| **Measurement** | | | | | | | | |
| **Voltage Read Back** | | | | | | | | |
| Range (5 Digital) | 0~120V | 120~1200V | 0~120V | 120~1200V | 0~120V | 120~1200V | 0~120V | 120~1200V |
| Resolution | 2mV | 20mV | 2mV | 20mV | 2mV | 20mV | 2mV | 20mV |
| Accuracy | ±0.025% of (Reading + Range) | | | | | | | |
| **Current Read Back** | | | | | | | | |
| Range (5 Digital) | 0~24A | 24~240A | 0~32A | 32~320A | 0~40A | 40~400A | 0~48A | 48~480A |
| Resolution | 0.384mA | 3.84mA | 0.512mA | 5.12mA | 0.64mA | 6.4mA | 0.768mA | 7.68mA |
| Accuracy | ±0.05% of (Reading + Range) | | | | | | | |
| **Power Read Back** | | | | | | | | |
| Range (5 Digital) | 6000W | | 8000W | | 10000W | | 12000W | |
| Accuracy | ± 0.06% of (Reading + Range) | | | | | | | |
| **General** | | | | | | | | |
| Typical Short Resistance | 0.0625Ω | | 0.0469Ω | | 0.0375Ω | | 0.0313Ω | |
| Maximum Short Current | 240A | | 320A | | 400A | | 480A | |
| Load ON Voltage | 0.96 ~ 240V | | | | | | | |
| Load OFF Voltage | 0 ~ 240V | | | | | | | |
| Power Consumption | 510VA | | 920VA | | 920VA | | 920VA | |
| Dimension (HxWxD) | 445.6x481x757.3mm | | 571.6x481x757.3mm | | 571.6x481x757.3mm | | 571.6x481x757.3mm | |
| HxWxD(Not included Rack Mount Kit,wheels) | 341.6x445.2x757.3mm | | 467.6x445.2x757.3mm | | 467.6x445.2x757.3mm | | 467.6x445.2x757.3mm | |
| Weight | 62 kg | | 77.5 kg | | 84.8 kg | | 92 kg | |
| Temperature*4 | 0~40℃ | | | | | | | |
| Safety & EMC | CE | | | | | | | |

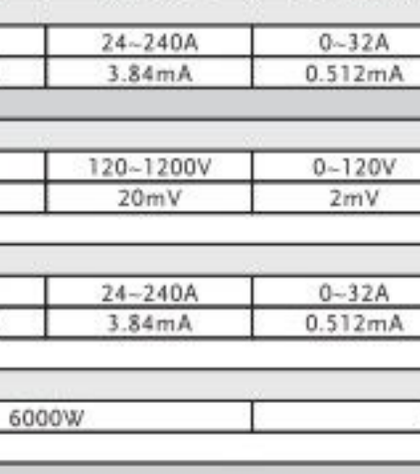
**Cooling : Advanced Fan Cooled**

**Input AC Power : 100~240 Vac ±10% , 50/60Hz, Single-phase**

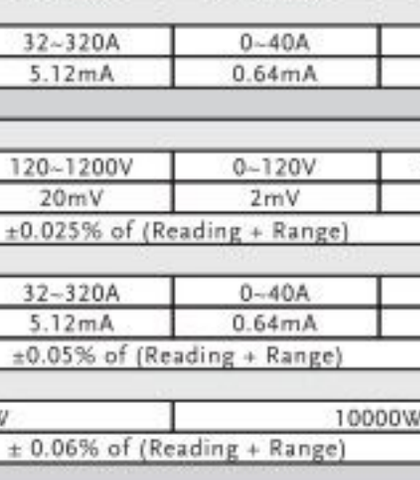
Note *1 : The power rating specifications at ambient temperature = 25°C
Note *2 : The range is automatically or forcing to range II only in CC Mode
Note *3 : If the operating current is below range 0.1%, the accuracy specification is 0.1% F.S.
Note *4 : Operating temperature range is 0~40°C , all specifications apply for 25°C±5°C



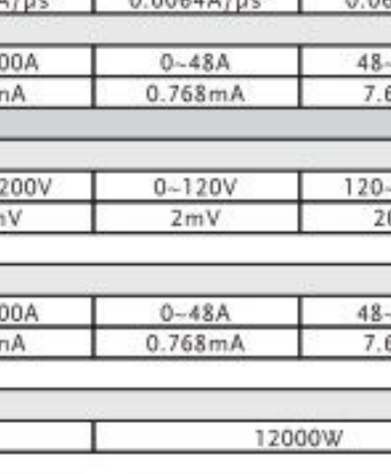
PEL-5006C-1200-240



PEL-5008C-1200-320



PEL-5010C-1200-400



PEL-5012C-1200-480

## SPECIFICATIONS

| MODEL | PEL-5015C-1200-600 | | PEL-5018C-1200-720 | | PEL-5020C-1200-800 | | PEL-5024C-1200-960 | |
|---|---|---|---|---|---|---|---|---|
| Power*1 | 15kW | | 18kW | | 20kW | | 24kW | |
| Current | 0 – 60A | 0 – 600A | 0 – 72A | 0 – 720A | 0 – 80A | 0 – 800A | 0 – 96A | 0 – 960A |
| Voltage | 0 – 1200V | | | | | | | |
| Min. Operating Voltage | 15V @ 600A | | 15V @ 720A | | 15V @ 800A | | 15V @ 960A | |
| **Protections** | | | | | | | | |
| Over Power Protection (OPP) | 105% | | | | | | | |
| Over Current Protection (OCP) | 104% | | | | | | | |
| Over Voltage Protection (OVP) | 104% | | | | | | | |
| Over Temp Protection (OTP) | 90℃±5℃ | | | | | | | |
| **Constant Current Mode** | | | | | | | | |
| Range*2 | 60A | 600A | 72A | 720A | 80A | 800A | 96A | 960A |
| Resolution | 0.96mA | 9.6mA | 1.152mA | 11.52mA | 1.28mA | 12.8mA | 1.536mA | 15.36mA |
| Accuracy*3 | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Resistance Mode** | | | | | | | | |
| Range | 12Ω~2Ω | 2Ω~ 0.0250Ω | 10KΩ~1.666Ω | 1.666Ω~0.0208Ω | 9KΩ~1.5Ω | 1.5Ω~0.0187Ω | 7.5KΩ~1.25Ω | 1.25Ω~0.0156Ω |
| Resolution | 8.3333μS | 33.334μΩ | 10μS | 27.778μΩ | 11.111μS | 25μΩ | 13.333μS | 20.834μΩ |
| Accuracy | ±0.2% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode** | | | | | | | | |
| Range | 1200V | | | | | | | |
| Resolution | 20mV | | | | | | | |
| Accuracy | ± 0.05% of (Setting + Range) | | | | | | | |
| **Constant Power Mode** | | | | | | | | |
| Range | 1500W | 15000W | 1800W | 18000W | 2000W | 20000W | 2400W | 24000W |
| Resolution | 24mW | 240mW | 28.8mW | 288mW | 32mW | 320mW | 38.4mW | 384mW |
| Accuracy | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) | ± 0.1% of (Setting+Range) |
| **Constant Voltage Mode + Constant Current Mode** | | | | | | | | |
| Range | 1200V | 600A | 1200V | 720A | 1200V | 800A | 1200V | 960A |
| Resolution | 20mV | 9.6mA | 20mV | 3.2mA | 20mV | 3.84mA | 20mV | 15.36mA |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Constant Voltage Mode + Constant Power Mode** | | | | | | | | |
| Range | 1200V | 15000W | 1200V | 18000W | 1200V | 20000W | 1200V | 24000W |
| Resolution | 20mV | 240mW | 20mV | 288mW | 20mV | 320mW | 20mV | 384mW |
| Accuracy | ± 1.0% of (Setting + Range) | | | | | | | |
| **Surge Test** | | | | | | | | |
| Surge & Normal current | 0~600A | | 0~720A | | 0~800A | | 0~960A | |
| Surge time | 10~1000ms | | 10~1000ms | | 10~1000ms | | 10~1000ms | |
| Surge step | 1~5 | | | | | | | |
| **MPPT Mode** | | | | | | | | |
| Algorithm | P&O | | | | | | | |
| Load mode | CV | | | | | | | |
| P&O interval | 1000ms~60000ms ; resolution 1000ms | | | | | | | |
| **Dynamic Mode** | | | | | | | | |
| **Timing** | | | | | | | | |
| Thigh & Tlow | 0.010~9.999 / 99.99 / 999.9 / 9999ms | | | | | | | |
| Resolution | 0.001 / 0.01 / 0.1 / 1ms | | | | | | | |
| Accuracy | 1μs / 10μs / 100μs / 1ms + 50ppm | | | | | | | |
| Slew Rate | 0.0288A~1.8A/μs | 0.288A~18A/μs | 0.032A~2A/μs | 0.32A~20A/μs | 0.0352A~2.2A/μs | 0.352A~22A/μs | 0.0384A~2.4A/μs | 0.384A~24A/μs |
| Resolution | 0.0072A/μs | 0.072A/μs | 0.008A/μs | 0.08A/μs | 0.0088A/μs | 0.088A/μs | 0.0096A/μs | 0.096A/μs |
| **Current** | | | | | | | | |
| Range | 0~60A | 60~600A | 0~72A | 72~720A | 0~80A | 80~800A | 0~96A | 96~960A |
| Resolution | 0.96mA | 9.6mA | 1.152mA | 11.52mA | 1.28mA | 12.8mA | 1.536mA | 15.36mA |
| **Measurement** | | | | | | | | |
| **Voltage Read Back** | | | | | | | | |
| Range (5 Digital) | 0~120V | 120~1200V | 0~120V | 120~1200V | 0~120V | 120~1200V | 0~120V | 120~1200V |
| Resolution | 2mV | 20mV | 2mV | 20mV | 2mV | 20mV | 2mV | 20mV |
| Accuracy | ±0.025% of (Reading + Range) | | | | | | | |
| **Current Read Back** | | | | | | | | |
| Range (5 Digital) | 0~60A | 60~600A | 0~72A | 72~720A | 0~80A | 80~800A | 0~96A | 96~960A |
| Resolution | 0.96mA | 9.6mA | 1.152mA | 11.52mA | 1.28mA | 12.8mA | 1.536mA | 15.36mA |
| Accuracy | ±0.05% of (Reading + Range) | | | | | | | |
| **Power Read Back** | | | | | | | | |
| Range (5 Digital) | 15000W | | 18000W | | 20000W | | 24000W | |
| Accuracy | ± 0.06% of (Reading + Range) | | | | | | | |
| **General** | | | | | | | | |
| Typical Short Resistance | 0.0250Ω | | 0.0209Ω | | 0.0188Ω | | 0.0157Ω | |
| Maximum Short Current | 600A | | 720A | | 800A | | 960A | |
| Load ON Voltage | 0.96 ~ 240V | | | | | | | |
| Load OFF Voltage | 0 ~ 240V | | | | | | | |
| Power Consumption | 1320VA | | 1320VA | | 1700VA | | 1700VA | |
| Dimension (HxWxD) | 760.6x481x757.3mm | | 760.6x481x757.3mm | | 886.6x481x757.3mm | | 886.6x481x757.3mm | |
| HxWxD (Not included Rack Mount Kit,wheel) | 656.6x445.2x757.3mm | | 656.6x445.2x757.3mm | | 782.6x445.2x757.3mm | | 782.6x445.2x757.3mm | |
| Weight | 116.5 kg | | 124 kg | | 140.5 kg | | 155 kg | |
| Temperature*4 | 0~40℃ | | | | | | | |
| Safety & EMC | CE | | | | | | | |

**Cooling : Advanced Fan Cooled**

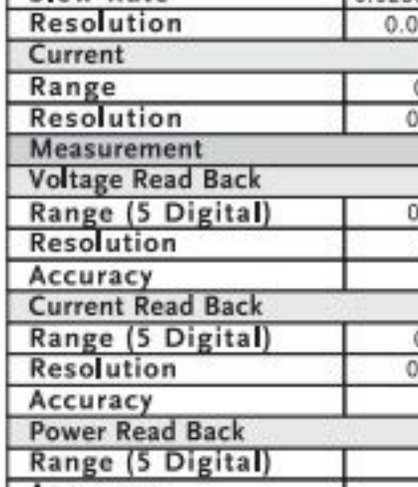
**Input AC Power : 100~240 Vac ±10% , 50/60Hz, Single-phase**

Note *1 : The power rating specifications at ambient temperature = 25 ℃

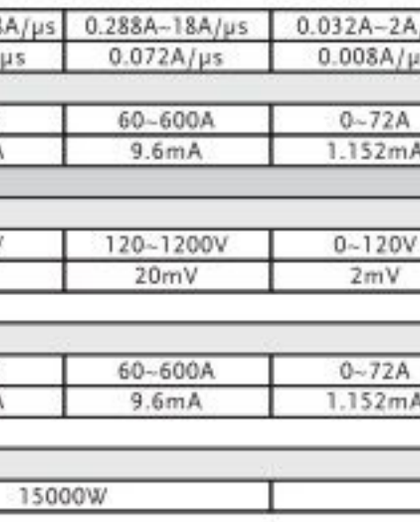
Note *2 : The range is automatically or forcing to range II only in CC Mode

Note *3 : If the operating current is below range 0.1%, the accuracy specification is 0.1% F.S.

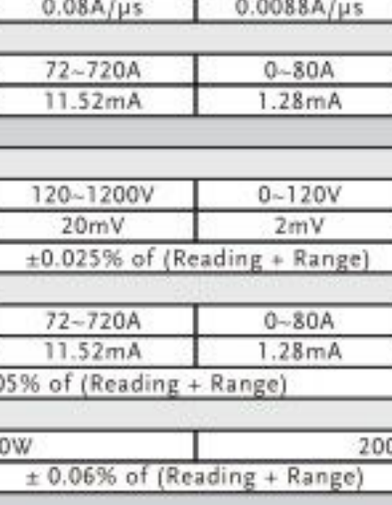
Note *4 : Operating temperature range is 0~40℃ , all specifications apply for 25℃±5℃




PEL-5015C-1200-600




PEL-5018C-1200-720




PEL-5020C-1200-800




PEL-5024C-1200-960

# DC Electronic Load



NEW

**PEL-503-80-50**



NEW

**PEL-507-80-140**

CE RS-232 USB

## FEATURES

- ✲ 5-digit Digital Voltage, Current and Power Meter
- ✲ Simultaneous Display of Voltage, Current, and Watts
- ✲ Short-circuit Time Can be Set During Short-circuit Test
- ✲ Automatic Test Function of Overcurrent Protection/Overpower Protection
- ✲ The Battery Discharge Test Function Can Set the Discharge Stop Voltage(Vbatt), Discharge Capacity(AH, WH) and Stop Discharge Time
- ✲ Surge Test Can Simulate Boot Overshoot Current and Transient Current From Hot Plugging
- ✲ Constant Current, Constant Resistance, Constant Voltage, Constant Power and Dynamic Mode
- ✲ Overvoltage, Overcurrent, Overpower, Over Temperature Protection and Reverse Polarity Detection
- ✲ Voltage Polarity Display Can be set to Positive Value"+" or Negative Value"-"
- ✲ Communications Interface: RS232, USB

The PEL-500 series single-channel electronic load has a total of 5 models and provides 0~80V/ 0~500V voltage operating ranges and 250~700W power operating range. The series can be applied to R&D, quality control, ATE system and production test, including voltage source/current source test; switching power supply transient response; constant voltage mode for current limiting test; battery simulation; and battery discharge test.

The PEL-500 series provides a 5-digit digital display of voltage, current and power. Users can monitor the measurement data of the DUT at the same time. In order to facilitate users to evaluate whether the DUT can withstand the overshoot current, the PEL-500 series provides Surge test, which can simulate the boot overshoot current and the transient current from hot plugging. The built-in battery discharge test function can determine the conditions for stopping the discharge according to the test requirements of the DUT, including setting the discharge stop voltage (Vbatt), discharge capacity (AH, WH) and stop discharge time.

Users can set the loading voltage/unloading voltage of the PEL-500 series for testing according to the characteristics of the DUT. When the output voltage of the DUT rises to the loading voltage value, the loading starts. When the output voltage drops to the unloading voltage, the loading ends. Users can use the GO/NG function to pre-set the judgment conditions according to the function and specifications of the DUT. The PEL-500 series will automatically generate the judgment results according to the set judgment conditions during the test.

Under the safety test requirements of the power supply, the PEL-500 series not only provides the Short test function, but also provides the automatic test function of overcurrent protection/overpower protection to simplify users' complicated manual operation and verify the OCP/OPP of the DUT's action points. The generated measurement results help users confirm whether the actual operating action points of the DUT for OCP/OPP are within the measurement regulations.

In addition to the function of providing load current waveforms to the oscilloscope via the BNC output terminal of Imonitor, the PEL-500 series also provides overvoltage, overcurrent, overpower and over temperature protection, and reverse polarity detection. When any one of them generates a trigger action, The PEL-500 series will have protective or reminding measures to protect the PEL-500 from damage due to abnormal operating ranges.

## ORDERING INFORMATION

| | |
|---|---|
| **PEL-503-80-50** | 80V/50A/250W DC Electronic Load |
| **PEL-504-80-70** | 80V/70A/350W DC Electronic Load |
| **PEL-504-500-15** | 500V/15A/350W DC Electronic Load |
| **PEL-507-80-140** | 80V/140A/700W DC Electronic Load |
| **PEL-507-500-30** | 500V/30A/700W DC Electronic Load |

PEL-507-500-30
- Power rating: 7-> 700W
- Maximum output voltage: 500-> 500V
- Maximum output current: 30-> 30A

## OPTIONAL ACCESSORIES

| | |
|---|---|
| **GTL-238** | RS-232 Cable, 9-pin, M-F Type, 1000mm |
| **GTL-246** | USB Cable, USB 2.0, A-B Type, 1200mm |

Note: * Regarding the product delivery date, please contact your regional sales representative.





**GTL-238** RS-232 Cable, 9-pin, M-F Type, 1000mm



## Rear Panel





| Model | | PEL-503-80-50 | | PEL-504-80-70 | | PEL-504-500-15 | | PEL-507-80-140 | | PEL-507-500-30 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **INPUT RATINGS** | | | | | | | | | | | |
| Power(Watt) | | 250 W | | 350 W | | 350 W | | 700 W | | 700 W | |
| Current(Ampere) | | 50 A | | 70 A | | 15 A | | 140 A | | 30 A | |
| Voltage(Volt) | | 80 V | | 80 V | | 500 V | | 80 V | | 500 V | |
| Min. Operating Voltage | | 1.0V @ 50A | | 1.2V @ 70A | | 6V @ 15A | | 0.9V @ 140A | | 3V @ 30A | |
| **PROTECTIONS** | | | | | | | | | | | |
| Over Power Protection(OPP) | | ≒262.5W | | ≒367.5W | | ≒367.5W | | ≒735W | | ≒735W | |
| Over Current Protection(OCP) | | ≒52.5A | | ≒73.5A | | ≒15.75A | | ≒147A | | ≒31.5A | |
| Over Voltage Protection(OVP) | | ≒84V | | ≒84V | | ≒525V | | ≒84V | | ≒525V | |
| Over Temp. Protection(OTP) | | YES | | YES | | YES | | YES | | YES | |
| **CC Mode** | | | | | | | | | | | |
| Range | | 0~5.04~50.4A | | 0~7.02~70.2A | | 0~1.5~15A | | 0~14.04~140.4A | | 0~3~30A | |
| Resolution | | 0.084mA/0.84mA | | 0.117mA/1.17mA | | 0.025mA/0.25mA | | 0.234mA/2.34mA | | 0.05mA/ 0.5mA | |
| Accuracy | | ±0.1% of (SETTING + RANGE) | | | | | | | | | |
| **CR Mode** | | | | | | | | | | | |
| Range | | 0.016–1.6–96000Ω | | 0.0114–1.14–68400Ω | | 0.4–40–2400000Ω | | 0.0057–0.57–34200Ω | | 0.2–20–1200000Ω | |
| Resolution | | 26.666μΩ/0.010416mSiemens | | 19μΩ/0.014619mSiemens | | 666.667μΩ/0.416μSiemens | | 9.5μΩ/29.239μSiemens | | 333.334μΩ/0.833μSiemens | |
| Accuracy | | ±0.2% of (SETTING + RANGE) | | | | | | | | | |
| **CV Mode** | | | | | | | | | | | |
| Range | | 0~8.1~81V | | 0~8.1~81V | | 0~60~500V | | 0~8.1~81V | | 0~60~500V | |
| Resolution | | 0.135mV/1.35mV | | 0.135mV/1.35mV | | 1mV/10mV | | 0.135mV/1.35mV | | 1mV/10mV | |
| Accuracy | | ±0.05% of (SETTING + RANGE) | | | | | | | | | |
| **CP Mode** | | | | | | | | | | | |
| Range | | 0~25.02~250.2W | | 0~35.04~350.4W | | 0~35.04~350.4W | | 0~70.02~700.2W | | 0~70.02~700.2W | |
| | | (Imax=r1:5A, r2:50A) | | (Imax=r1:7A, r2:70A) | | (Imax=r1:1.5A, r2:15A) | | (Imax=r1:14A, r2:140A) | | (Imax=r1:3A, r2:30A) | |
| Resolution | | 0.417mW/4.17mW | | 0.584mW/5.84mW | | 0.584mW/5.84mW | | 1.167mW/11.67mW | | 1.17mW/117mW | |
| Accuracy | | ±0.5% of (SETTING + RANGE) | | | | | | | | | |
| **Dynamic Mode** | | | | | | | | | | | |
| THIGH/TLOW | | 10μS to 9.999 Sec | | | | | | | | | |
| Resolution | | 0.001/0.01/0.1/1mS | | | | | | | | | |
| Slew rate | L | 0.032~2A/μs | | 0.0464~2.90A/μs | | 1~62.5mA/μs | | 0.0096~0.6A/μs | | 2~125mA/μs | |
| | H | 3.2–200mA/μs | | 4.64–290mA/μs | | 10–625mA/μs | | 0.096–6A/μs | | 20–1250mA/μs | |
| Accuracy | | ±5%±10μs | | | | | | | | | |
| **Measurement** | | | | | | | | | | | |
| Voltage Read Back | Range (5 Digital) | 0~8.1~81V | | 0~8.1~81V | | 0~60~500V | | 0~8.1~81V | | 0~60~500V | |
| | Resolution | 0.135mV/1.35mV | | 0.135mV/1.35mV | | 1mV/10mV | | 0.135mV/1.35mV | | 1mV/10mV | |
| | Accuracy | ±0.025% of (READING+ RANGE) | | | | | | | | | |
| Current Read Back | Range (5 Digital) | 0~5.04~50.4A | | 0~7.02~70.2A | | 0~1.5~15A | | 0~14.04~140.4A | | 0~3~30A | |
| | Resolution | 0.084mA/0.84mA | | 0.117mA/1.17mA | | 0.025mA/0.25mA | | 0.234mA/2.34mA | | 0.05mA/ 0.5mA | |
| | Accuracy | ±0.1% of (READING+ RANGE) | | | | | | | | | |
| Power Read Back | Range (5 Digital) | 25W | 250W | 35W | 350W | 35W | 350W | 70W | 700W | 70W | 700W |
| | Resolution | 0.001W | 0.01W | 0.001W | 0.01W | 0.001W | 0.01W | 0.001W | 0.01W | 0.001W | 0.01W |
| | Accuracy | ±0.1% of (READING+ RANGE) | | | | | | | | | |
| **Surge Test** | | | | | | | | | | | |
| Surge & Normal current | | 0–50A | | 0–70A | | 0–15A | | 0–140A | | 0–30A | |
| Surge time | | 10~1000ms | | 10~1000ms | | 10~1000ms | | 10~1000ms | | 10~1000ms | |
| Surge step | | 1~5 | | 1~5 | | 1~5 | | 1~5 | | 1~5 | |
| **Battery Discharge Test** | | | | | | | | | | | |
| UVP | | 0–81V | | 0–81V | | 0–500V | | 0–81V | | 0–500V | |
| Time | | 1~99999 Sec | | 1~99999 Sec | | 1~99999 Sec | | 1~99999 Sec | | 1~99999 Sec | |
| Capacity | | 0.1~19999.9AH/0.1~19999.9WH | | | | | | | | | |
| **Others** | | | | | | | | | | | |
| Load ON Voltage | | 0.1–25V | | | | 0.4–100V | | 0.1–25V | | 0.4–100V | |
| Accuracy | | 1% of (SETTING + RANGE) | | | | | | | | | |
| Load OFF Voltage | | 0~25V | | | | 0~100V | | 0~25V | | 0~100V | |
| Accuracy | | 0.05% of (SETTING + RANGE) | | | | | | | | | |
| Imonitor (Non-isolated) | | 5.04 A/V | | 7.02 A/V | | 1.5 A/V | | 14.04 A/V | | 3 A/V | |
| Current Monitor | | Full scale: 10V | | | | | | | | | |
| Accuracy | | 0.5% of (SETTING + RANGE) | | | | | | | | | |
| Typical Short Resistance | | 0.018Ω | | 0.0169Ω | | 0.367Ω | | 0.0053Ω | | 0.087Ω | |
| Max. short Current | | 50A | | 70A | | 15A | | 140A | | 30A | |
| Power input | | 115/230 Vac±10%, 50/60Hz | | | | | | | | | |
| Interface (Standard) | | USB/RS232 | | | | | | | | | |
| Power Consumption | | 40 VA | | | | | | 60 VA | | | |
| Dimension (HxWxD) | | 205 x 123 x 477mm | | 205 x 123 x 477mm | | 205 x 123 x 477mm | | 205 x 231 x 480mm | | 205 x 231 x 480mm | |
| Weight | | 5.3kg | | 5.3kg | | 5.3kg | | 10.3kg | | 10.3kg | |

# AC & DC Electronic Load



## AEL-5000 Series

NEW

CE | RS-232 | GPIB | USB | LAN

GW Instek launches 20 models of the AEL-5000 series AC/DC electronic loads depending on the power range. The power range of a single unit is from 1875W to 22500W, and up to 8 units can be connected in parallel. The maximum power of single-phase parallel connection can reach 180kW, and the total power of 3-phase can reach 540kW, which are suitable for UPS, Inverter/Breaker, AC Power Source, Battery, Fuse/Breaker, DC Power Source and other applications.

The AEL-5000 series has built-in precision measurement circuits such as 16-bit A/D and DSP to provide accurate measurement items, which include voltage root mean square value (Vrms), current root mean square value (Arms), and watt value (Watt), volt-ampere (VA), crest factor (CF), power factor (PF), total harmonic distortion (THD), voltage total harmonic distortion (VTHD), current total harmonic distortion (ITHD) , peak current (Ipeak), maximum current (Amax), minimum current (Amin), maximum voltage (Vmax), minimum voltage (Vmin), time measurement. In addition, built-in test modes include UPS Efficiency, PV Inverter Efficiency, UPS Back-up time, Battery Discharge time, UPS transfer time, Fuse/Breaker Trip/Non-Trip, short circuit simulation, OCP, OPP and other test modes.

The AEL-5000 series has the Turbo mode (ON or OFF can be selected) design, which can increase the current and power of the electronic load by 2 times in one second. For test applications that require transient high power and large current such as transient overload test of protective components or short circuit of Fuse/Breaker and AC power supply, OCP and OPP tests etc.. The Turbo mode provides the most economical solution.

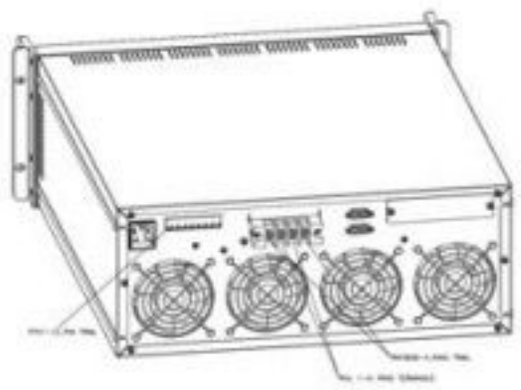
The AEL-5000 series also supports the Load On startup function (pre-set Load On). When the inverter or uninterruptible power supply is turned on, the series directly loads the set load current to verify that whether startup of the inverter or uninterrupted power supply connecting to the electrical appliance is stable. At the same time, the Load On start function can also set positive half cycle or negative half load to verify whether the output voltage of the inverter or uninterruptible power supply remains stable when the actual electrical appliance only has a positive half cycle or negative half cycle load current. Control load angle and unload angle can also be set (range 0–359 degrees) to verify the stability of the transient response of the inverter or uninterruptible power supply when the appliance is plugged in and unplugged. In addition, the series also supports SCR/TRIAC current phase modulation waveform, 90 degree Trailing Edge and Leading Edge settings.

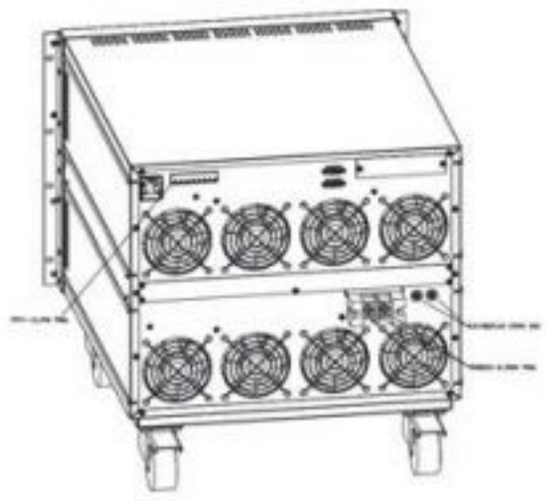
For the application of the adjustable bandwidth (BW) function, when the bandwidth of the DUT does not match the bandwidth of the AEL-5000 series, there will be oscillations. Users can reduce the BW setting value accordingly to meet the response speed of the DUT. Inrush Current verifies whether the transient response of the inverter output voltage is stable when the electrical appliance is turned on (Inrush Current) and when the electrical appliance is suddenly connected (Surge Current).

The entire series of AEL-5000 provides over-voltage warning, over-current, over-power, and over-temperature protection. Analog Input terminal can control constant current, constant power and other working modes through external voltage. Vmonitor/Imonitor terminal is used to connect external voltage/current monitoring device. In addition, a variety of optional control interfaces are provided such as GPIB, RS-232, USB, and LAN to meet the needs of system integration.

## FEATURES

* **Turbo Mode (Multiplier Mode) Can Withstand up to 2 Times the Rating Current and Power of the Electronic Load in a Short Period of Time**
* **Operating Mode: CC, linear CC, CR, CV, CP and AC Rectifier Loads**
* **Measurement Items: Voltage Value(Vrms, Vpeak, Vmax., Vmin), Current Value(Irms, Ipeak, Imax., Imin.), Watt Value, Volt-ampere Value(VA), Frequency Value, Crest Factor, Power Factor, Voltage Total Distortion(V THD, VH), Current Total Distortion (I THD, IH ), Etc**
* **Eight Units Connected in Parallel up to 180kW for Single-phase and 540kW for Three-phase**
* **Support Loading and Unloading Angle Control, Loading and Unloading Angle Control Can be set at the Full Range of 0-359 Degrees**
* **Support Positive Half Cycle or Negative Half Cycle Load**
* **Support SCR/TRIAC Current Phase Modulation Waveform, 90-degree Trailing Edge and Leading Edge**
* **Support the Capacitive Load (Inrush Current)when the Power Supply is Turned on and the Transient Current (Surge Current) Test when the Load is Suddenly Connected (Hot Plug-in) During Operation**
* **Crest Factor Range: 1.414–5.0**
* **Power Factor Range: 0.1–1.0 Leading or Trailing**
* **Frequency Range: DC, 40–440Hz**
  **(AEL-5003-480-18.75/AEL-5004-480-28: DC, 40~70Hz), and 800Hz and 1kHz Need to be Customized**
* **Optional Control Interfaces: GPIB, RS-232, USB, LAN**





## ORDERING INFORMATION

| | | |
|---|---|---|
| **AEL-5002-350-18.75** | 350V/18.75A/1875W | AC & DC Electronic Load |
| **AEL-5003-350-28** | 350V/28A/2800W | AC & DC Electronic Load |
| **AEL-5004-350-37.5** | 350V/37.5A/3750W | AC & DC Electronic Load |
| **AEL-5006-350-56** | 350V/56A/5600W | AC & DC Electronic Load |
| **AEL-5008-350-75** | 350V/75A/7500W | AC & DC Electronic Load |
| **AEL-5012-350-112.5** | 350V/112.5A/11250W | AC & DC Electronic Load |
| **AEL-5015-350-112.5** | 350V/112.5A/15000W | AC & DC Electronic Load |
| **AEL-5019-350-112.5** | 350V/112.5A/18750W | AC & DC Electronic Load |
| **AEL-5023-350-112.5** | 350V/112.5A/22500W | AC & DC Electronic Load |
| **AEL-5002-425-18.75** | 425V/18.75A/1875W | AC & DC Electronic Load |
| **AEL-5003-425-28** | 425V/28A/2800W | AC & DC Electronic Load |
| **AEL-5004-425-37.5** | 425V/37.5A/3750W | AC & DC Electronic Load |
| **AEL-5006-425-56** | 425V/56A/5600W | AC & DC Electronic Load |
| **AEL-5008-425-75** | 425V/75A/7500W | AC & DC Electronic Load |
| **AEL-5012-425-112.5** | 425V/112.5A/11250W | AC & DC Electronic Load |
| **AEL-5015-425-112.5** | 425V/112.5A/15000W | AC & DC Electronic Load |
| **AEL-5019-425-112.5** | 425V/112.5A/18750W | AC & DC Electronic Load |
| **AEL-5023-425-112.5** | 425V/112.5A/22500W | AC & DC Electronic Load |
| **AEL-5003-480-18.75** | 480V/18.75A/2800W | AC & DC Electronic Load |
| **AEL-5004-480-28** | 480V/28A/3750W | AC & DC Electronic Load |




**STANDARD ACCESSORIES**

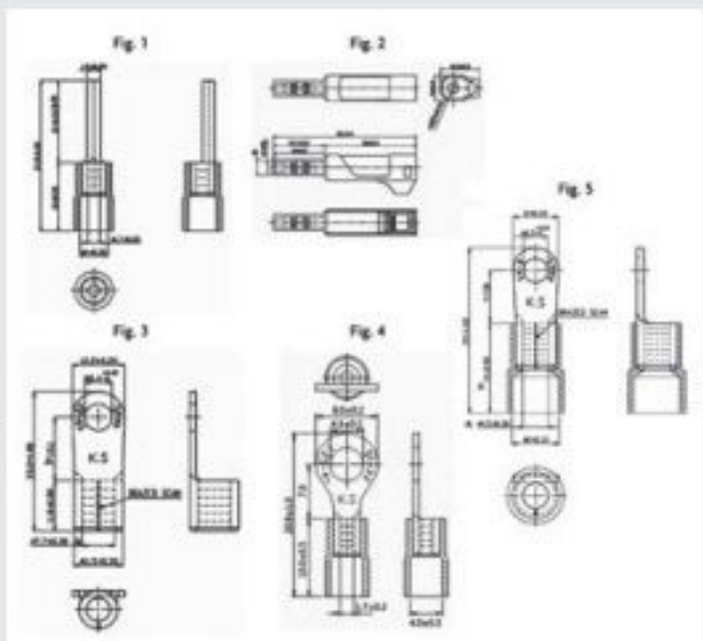
AEL-5000 Series operation manual
**HD-DSUB** : 15pin MALE to MALE 150cm x 1
PTV1-12 PIN TRML : Please refer to Fig.1 x 6

**AEL-5002-xxx-18.75/AEL-5003-xxx-28/AEL-5004-xxx-37.5**

**PVL 1-4** RING TERMINALS : Please refer to Fig.4 x 2
**RNYBS8-4** RING TRML : Please refer to Fig.5 x 2

**AEL-5006-xxx-56/AEL-5008-xxx-78/AEL-5012-xxx-112.5/ AEL-5015-xxx-112.5/AEL-5019-xxx-112.5/AEL-5023-xxx/112.5**

**SLS10B RED** PLUG CONN 20A RED : Please refer to Fig.2; The terminal is used for Vsense x 1
**SLS10B BLK** PLUG CONN 20A BLK : Please refer to Fig.2; The terminal is used for Vsense x 1
**RNB S22-6** RING TRML, #4 : Please refer to Fig.3 x 2




## OPTIONAL ACCESSORIES

| | | | |
|---|---|---|---|
| **PEL-022** | GPIB Card | **PEL-030** | GPIB+RS-232 Card |
| **PEL-023** | RS-232 Card | **GTL-246** | USB Cable, USB 2.0, A-B Type, 1200mm |
| **PEL-024** | LAN Card | **GTL-248** | GPIB Cable, Double Shielded, 2000mm |
| **PEL-025** | USB Card | **GTL-250** | GPIB Cable, Double Shielded, 600mm |

**PEL-028** HANDLES, U-shaped handle(fixed to the bracket) (for AEL-5006/5008/5012/5015)
**PEL-029** HANDLES Rack Accessories (for AEL-5002/5003/5004)

Note: * Regarding the product delivery date, please contact your regional sales representative.



AEL-5002-350-18.75
AEL-5003-350-28
AEL-5004-350-37.5
AEL-5002-425-18.75
AEL-5003-425-28
AEL-5004-425-37.5
AEL-5003-480-18.75
AEL-5004-480-28

AEL-5006-350-56
AEL-5008-350-75
AEL-5006-425-56
AEL-5008-425-75

AEL-5012-350-112.5
AEL-5012-425-112.5

AEL-5015-350-112.5
AEL-5015-425-112.5

AEL-5019-350-112.5
AEL-5019-425-112.5

AEL-5023-350-112.5
AEL-5023-425-112.5

| MODEL | Power (W) | | Current(Ampere) | | Voltage(Volt) |
|---|---|---|---|---|---|
| | Turbo OFF | Turbo ON | Turbo OFF | Turbo ON | |
| AEL-5002-350-18.75 | 1875 W | 3750W (x2)* | 18.75 Arms / 56.25Apeak | 37.5Arms/56.25Apeak (x2)* | |
| AEL-5003-350-28 | 2800W | 5600W (x2)* | 28 Arms / 84Apeak | 56Arms/84Apeak (x2)* | |
| AEL-5004-350-37.5 | 3750 W | 7500W (x2)* | 37.5 Arms / 112.5Apeak | 75.0Arms/112.5Apeak (x2)* | 50~350Vrms / 500Vdc |
| AEL-5002-425-18.75 | 1875 W | 3750W (x2)* | 18.75 Arms / 56.25Apeak | 37.5Arms/56.25Apeak (x2)* | |
| AEL-5003-425-28 | 2800W | 5600W (x2)* | 28 Arms / 84Apeak | 56Arms/84Apeak (x2)* | |
| AEL-5004-425-37.5 | 3750 W | 7500W (x2)* | 37.5 Arms / 112.5Apeak | 75.0Arms/112.5Apeak (x2)* | 50~425Vrms / 600Vdc |
| AEL-5006-350-56 | 5600 W | 11200W (x2)* | 56.0 Arms / 168Apeak | 112.0Arms/ 168Apeak (x2)* | |
| AEL-5008-350-75 | 7500 W | 15000W (x2)* | 75.0 Arms / 225Apeak | 150.0Arms/225Apeak (x2)* | |
| AEL-5012-350-112.5 | 11250W | 22500W (x2)* | 112.5 Arms / 337.5Apeak | 225Arms/337.5Apeak (x2)* | |
| AEL-5015-350-112.5 | 15000W | 30000W (x2)* | 112.5 Arms / 337.5Apeak | 225Arms/337.5Apeak (x2)* | |
| AEL-5019-350-112.5 | 18750W | 37500W (x2)* | 112.5 Arms / 337.5Apeak | 225Arms/337.5Apeak (x2)* | |
| AEL-5023-350-112.5 | 22500W | 45000W (x2)* | 112.5 Arms / 337.5Apeak | 225Arms/337.5Apeak (x2)* | 50~350Vrms / 500Vdc |
| AEL-5006-425-56 | 5600 W | 11200W (x2)* | 56.0 Arms / 168Apeak | 112.0Arms/ 168Apeak (x2)* | |
| AEL-5008-425-75 | 7500 W | 15000W (x2)* | 75.0 Arms / 225Apeak | 150.0Arms/225Apeak (x2)* | |
| AEL-5012-425-112.5 | 11250W | 22500W (x2)* | 112.5 Arms / 337.5Apeak | 225Arms/337.5Apeak (x2)* | |
| AEL-5015-425-112.5 | 15000W | 30000W (x2)* | 112.5 Arms / 337.5Apeak | 225Arms/337.5Apeak (x2)* | |
| AEL-5019-425-112.5 | 18750W | 37500W (x2)* | 112.5 Arms / 337.5Apeak | 225Arms/337.5Apeak (x2)* | |
| AEL-5023-425-112.5 | 22500W | 45000W (x2)* | 112.5 Arms / 337.5Apeak | 225Arms/337.5Apeak (x2)* | 50~425Vrms / 600Vdc |
| AEL-5003-480-18.75 | 2800W | 5600W (x2)* | 18.75 Arms / 56.25Apeak | 37.5Arms/56.25Apeak (x2)* | |
| AEL-5004-480-28 | 3750 W | 7500W (x2)* | 28 Arms / 84Apeak | 56Arms/84Apeak (x2)* | 50~480Vrms / 700Vdc |

* Power and current boost rate of Turbo ON

## SPECIFICATIONS

| MODEL | AEL-5002-350-18.75 | AEL-5003-350-28 | AEL-5004-350-37.5 | AEL-5002-425-18.75 | AEL-5003-425-28 | AEL-5004-425-37.5 |
|---|---|---|---|---|---|---|
| Power (W) | 1875 W | 2800W | 3750 W | 1875 W | 2800W | 3750 W |
| Current(Ampere) | 18.75 Arms / 56.25Apeak | 28 Arms / 84Apeak | 37.5 Arms / 112.5Apeak | 18.75 Arms / 56.25Apeak | 28 Arms / 84Apeak | 37.5 Arms / 112.5Apeak |
| Voltage(Volt) | 50~350Vrms / 500Vdc | | | 50~425Vrms / 600Vdc | | |
| FREQUENCY Range | DC,40~440Hz(CC,CP Mode) , DC~440Hz(LIN,CR,CV Mode) | | | DC,40~440Hz(CC,CP Mode) , DC~440Hz(LIN,CR,CV Mode) | | |
| **PROTECTIONS** | | | | | | |
| Over Power Protection | ≒1968.75Wrms or Programmable | ≒2940Wrms or Programmable | ≒3937.5Wrms or Programmable | ≒1968.75Wrms or Programmable | ≒2940Wrms or Programmable | ≒3937.5Wrms or Programmable |
| Over Current Protection | ≒19.687 Arms or Programmable | ≒29.4 Arms or Programmable | ≒39.375 Arms, or Programmable | ≒19.687 Arms or Programmable | ≒29.4 Arms or Programmable | ≒39.375 Arms, or Programmable |
| Over Vlotage Protection | ≒367.5 Vrms / 525Vdc | | | ≒446.25 Vrms/630Vdc | | |
| Over Temp. Protection | Yes | | | Yes | | |
| **OPERATION MODE** | | | | | | |
| Constant Current Mode for Sine-Wave | | | | | | |
| Range | 0~18.75A | 0~28A | 0~37.5A | 0~18.75A | 0~28A | 0~37.5A |
| Resolution | 0.3125mA/16bits | 0.5mA/16bits | 0.625mA/16bits | 0.3125mA/16bits | 0.5mA/16bits | 0.625mA/16bits |
| Accuracy | ± ( 0.1% of setting + 0.2% of range ) @ 50/60Hz , ± 0.5% of ( setting + range ) @ DC and 400Hz | | | ± ( 0.1% of setting + 0.2% of range ) @ 50/60Hz , ± 0.5% of ( setting + range ) @ DC and 400Hz | | |
| Linear Constant Current Mode for Sine-Wave, Square-Wave or Quasi-Square Wave, PWM Wave | | | | | | |
| Range | 0~18.75A | 0~28A | 0~37.5A | 0~18.75A | 0~28A | 0~37.5A |
| Resolution | 0.3125mA/16bits | 0.5mA/16bits | 0.625mA/16bits | 0.3125mA/16bits | 0.5mA/16bits | 0.625mA/16bits |
| Accuracy | ± ( 0.1% of setting + 0.2% of range ) @ 50/60Hz , ± 0.5% of ( setting + range ) @ DC and 400Hz | | | ± ( 0.1% of setting + 0.2% of range ) @ 50/60Hz , ± 0.5% of ( setting + range ) @ DC and 400Hz | | |
| **Constant Resistance Mode** | | | | | | |
| Range | 3.2 ohm ~ 64k ohm | 2.0 ohm ~ 40k ohm | 1.6 ohm ~ 32k ohm | 3.2 ohm ~ 64k ohm | 2.0 ohm ~ 40k ohm | 1.6 ohm ~ 32k ohm |
| Resolution*1 | 0.0052083mS/16bits | 0.0083333mS/16bits | 0.010416mS/16bits | 0.0052083mS/16bits | 0.0083333mS/16bits | 0.010416mS/16bits |
| Accuracy | ±0.2% of ( setting + range ) @ 50/60Hz , ± ( 0.5% of setting + 2% of range ) @ DC and 400Hz | | | ±0.2% of ( setting + range ) @ 50/60Hz , ± ( 0.5% of setting + 2% of range ) @ DC and 400Hz | | |
| **Constant Voltage Mode** | | | | | | |
| Range | 50~350Vrms / 500Vdc | | | 50~425Vrms / 600Vdc | | |
| Resolution | 0.01V | | | 0.1V | | |
| Accuracy | ±(0.1% of setting + 0.1% of range) | | | ±(0.1% of setting + 0.1% of range) | | |
| **Constant Power Mode** | | | | | | |
| Range | 1875W | 2800W | 3750W | 1875W | 2800W | 3750W |
| Resolution | 0.1W | 0.1W | 0.1W | 0.1W | 0.1W | 0.1W |
| Accuracy*4 | ±0.5% of ( setting + range ) @ 50/60Hz , ±2% of ( setting + range ) | | | ±0.5% of ( setting + range ) @ 50/60Hz , ±2% of ( setting + range ) | | |
| **CREST FACTOR (CC & CP MODE ONLY)** | | | | | | |
| Range | √2~5 | | | √2~5 | | |
| Resolution | 0.1 | | | 0.1 | | |
| Accuracy | (0.5% / Irms) + 1%F.S. | | | (0.5% / Irms) + 1%F.S. | | |
| **POWER FACTOR (CC & CP MODE ONLY)** | | | | | | |
| Range | 0~1 Lag or Lead | | | 0~1 Lag or Lead | | |
| Resolution | 0.01 | | | 0.01 | | |
| Accuracy | 1%F.S. | | | 1%F.S. | | |
| **TEST MODE** | | | | | | |
| **UPS Efficient Measurement** | Non-Linear Mode | | | Non-Linear Mode | | |
| Operating Frequency | Auto : 40~440Hz | | | Auto : 40~440Hz | | |
| Current Range | 0~18.75A | 0~28A | 0~37.5A | 0~18.75A | 0~28A | 0~37.5A |
| PF Range | 0~1 | | | 0~1 | | |
| **Measuring Efficiency For PV Systems, Power Conditioners for THD 80%** | Resistive + Non-Linear Mode | | | Resistive + Non-Linear Mode | | |
| Operating Frequency | Auto : 40~440Hz | | | Auto : 40~440Hz | | |
| Current Range | 0~18.75A | 0~28A | 0~37.5A | 0~18.75A | 0~28A | 0~37.5A |
| Resistive Range | 3.2 ohm ~ 64k ohm | 2.0 ohm ~ 40k ohm | 1.6 ohm ~ 32k ohm | 3.2 ohm ~ 64k ohm | 2.0 ohm ~ 40k ohm | 1.6 ohm ~ 32k ohm |
| **UPS Back-Up Function(CC,LIN,CR,CP)** | | | | | | |
| UVP (VTH) | 50~350Vrms / 500Vdc | | | 50~425Vrms / 600Vdc | | |
| UPS Back-Up Time | 1~99999 Sec. (>27H) | | | 1~99999 Sec. (>27H) | | |
| **Battery Discharge Function(CC,LIN,CR,CP)** | | | | | | |
| UVP (VTH) | 50~350Vrms / 500Vdc | | | 50~425Vrms / 600Vdc | | |
| Battery Discharge Time | 1~99999 Sec. (>27H) | | | 1~99999 Sec. (>27H) | | |
| **UPS Transfer Time** | | | | | | |
| Current Range | 0~18.75A | 0~28A | 0~37.5A | 0~18.75A | 0~28A | 0~37.5A |
| UVP (VTH) | 2.5V | | | 2.5V | | |
| Time Range | | | | | | |
| **Fuse Test Mode** | | | | | | |
| Max. Current – Turbo OFF(CC1~3) | 18.75Arms | 28.0Arms | 37.5Arms | 18.75Arms | 28.0Arms | 37.5Arms |
| Max. Current – Turbo ON(CC3) | | | | | | |
| Max. Current – Turbo ON(CC1~2) | 37.5Arms (x2) *3 | 56.0Arms (x2) *3 | 75.0Arms (x2) *3 | 37.5Arms (x2) *3 | 56.0Arms (x2) *3 | 75.0Arms (x2) *3 |
| Trip & Non-Trip Time – Turbo OFF(Time1~3) | 0.01~333.33 Sec. | | | 0.01~333.33 Sec. | | |
| Trip & Non-Trip Time – Turbo ON(Time1~2) | 0.01~0.5 Sec. | | | 0.01~0.5 Sec. | | |
| Trip & Non-Trip Time – Turbo ON(Time3) | 0.01~600.00 Sec. | | | 0.01~600.00 Sec. | | |
| OFF Time | 0.1~999.9 Sec. | | | 0.1~999.9 Sec. | | |
| Meas. Accuracy | ±0.003 Sec. | | | ±0.003 Sec. | | |
| Repeat Cycle | 0~99999 | | | 0~99999 | | |
| **Short/OPP/OCP Test Function** | | | | | | |
| Short Time – Turbo OFF | 0.1~105Sec. or Cont. | | | 0.1~105Sec. or Cont. | | |
| Short Time – Turbo ON | 0.1~1Sec. | | | 0.1~1Sec. | | |
| OPP/OCP Step Time – Turbo OFF | 100ms | | | 100ms | | |
| OPP/OCP Step Time – Turbo ON | 100ms, up to 10 Steps | | | 100ms, up to 10 Steps | | |
| OCP Istop – Turbo OFF | 18.75Arms | 28.0Arms | 37.5Arms | 18.75Arms | 28.0Arms | 37.5Arms |
| OCP Istop – Turbo ON | 37.5Arms | 56.0Arms | 75.0Arms | 37.5Arms | 56.0Arms | 75.0Arms |
| OPP Pstop – Turbo OFF | 1875W | 2800W | 3750W | 1875W | 2800W | 3750W |
| OPP Pstop – Turbo ON | 3750W | 5600W | 7500W | 3750W | 5600W | 7500W |
| **Programmable Inrush Current Simulation: Istart - Istop / Tsop** | | | | | | |
| Istart, Inrush Start Current | 0~37.5A | 0~56A | 0~75A | 0~37.5A | 0~56A | 0~75A |
| Inrush Step Time | 0.1ms~100ms | | | 0.1ms~100ms | | |
| Istop, Inrush Stop Current | 0~18.75A | 0~28A | 0~37.5A | 0~18.75A | 0~28A | 0~37.5A |
| **Programmable Surge Current Simulation: S1/T1 - S2/T2 - S3/T3** | | | | | | |
| S1 and S2 Current | 0~37.5A | 0~56A | 0~75A | 0~37.5A | 0~56A | 0~75A |
| T1 and T2 Time | 0.01~0.5Sec. | | | 0.01~0.5Sec. | | |
| S3 Current | 0~18.75A | 0~28A | 0~37.5A | 0~18.75A | 0~28A | 0~37.5A |
| T3 Time | 0.01~9.99Sec. or Cont. | | | 0.01~9.99Sec. or Cont. | | |
| **MEASUREMENTS** | | | | | | |
| VOLTAGE READBACK V METER | | | | | | |
| Range | 500V | | | 600V | | |
| Resolution | 0.01V | | | 0.01V | | |
| Accuracy | ±0.05% of (reading + range) | | | ±0.05% of (reading + range) | | |
| Parameter | Vrms,V Max/Min,+/-Vpk | | | Vrms,V Max/Min,+/-Vpk | | |
| CURRENT READBACK A METER | | | | | | |
| Range | 9.375Arms/18.75Arms | 14Arms/28Arms | 18.75Arms/37.5Arms | 9.375Arms/18.75Arms | 14Arms/28Arms | 18.75Arms/37.5Arms |
| Resolution | 0.2mA/0.4mA | 0.3mA/0.6mA | 0.4mA/0.8mA | 0.2mA/0.4mA | 0.3mA/0.6mA | 0.4mA/0.8mA |
| Accuracy | ±0.05% of ( reading + range ) @ 50/60Hz | | | ±0.05% of ( reading + range ) @ 50/60Hz | | |
| Parameter | Irms,I Max/Min,+/-Ipk | | | Irms,I Max/Min,+/-Ipk | | |
| WATT READBACK W METER | | | | | | |
| Range | 1875W | 2800W | 3750W | 1875W | 2800W | 3750W |
| Resolution | 0.03125W | 0.05W | 0.0625W | 0.03125W | 0.05W | 0.0625W |
| Accuracy*4 | ±0.5% of ( reading + range ) @ 50/60Hz , ±2% of ( reading + range ) | | | ±0.5% of ( reading + range ) @ 50/60Hz , ±2% of ( reading + range ) | | |
| VA METER | Vrms×Arms Correspond To Vrms and Arms | | | Vrms×Arms Correspond To Vrms and Arms | | |
| POWER FACTOR METER | | | | | | |
| Range | +/- 0.000~1.000 | | | +/- 0.000~1.000 | | |
| Accuracy | ±(0.002±(0.001/PF)*F) | | | ±(0.002±(0.001/PF)*F) | | |
| Frequency METER(Hz) | | | | | | |
| Range | DC,40~440Hz | | | DC,40~440Hz | | |
| Accuracy | 0.1% | | | 0.1% | | |
| Other Parameter METER | VA, VAR, CF_I, Ipeak, Imax., Imin, Vmax., Vmin., IHD, VHD, ITHD, VTHD | | | | | |
| **OTHERS** | | | | | | |
| Start up Loading | Yes , Power on loading during Inverter / UPS start up | | | Yes , Power on loading during Inverter / UPS start up | | |
| Load ON / OFF Angle | 0 ~ 359 degree can be programmed for the angle of load ON and load OFF loading | | | 0 ~ 359 degree can be programmed for the angle of load ON and load OFF loading | | |
| Half Cycle and SCR/TRIAC Loading | Postive or Negative half cycle, 90° Trailing edge or Leading edge current waveform can be programmed | | | Postive or Negative half cycle, 90° Trailing edge or Leading edge current waveform can be programmed | | |
| Master/Slave (3 Phase or Parallel Application) | Yes, 1 master and upto 7 slave units | | | Yes, 1 master and upto 7 slave units | | |
| External Programming Input (OPTION) | F.S / 10Vdc, Resolution 0.1V | | | F.S / 10Vdc, Resolution 0.1V | | |
| External SYNC Input | TTL | | | TTL | | |
| Vmonitor (Isolated) | ±500V / ±10V | | | ±600V / ±10V | | |
| Imonitor (Isolated) | ±56.25Apk / ±10Vpk | ±84Apk / ±10Vpk | ±112.5Apk / ±10Vpk | ±56.25Apk / ±10Vpk | ±84Apk / ±10Vpk | ±112.5Apk / ±10Vpk |
| Interface (OPTION) | GPIB ; RS-232 ; LAN ; USB | | | GPIB ; RS-232 ; LAN ; USB | | |
| MAX. Power Consumption | 1500VA | | | 1500VA | | |
| Operation Temperature *2 | | | | 0 ~ 40 °C | | |
| Current of Input Impedance(mA)@50/60Hz ; @ 400Hz | -V*0.3 ; -V*2.2 | -V*0.45 ; -V*3.3 | -V*0.6 ; -V*4.4 | -V*0.3 ; -V*2.2 | -V*0.45 ; -V*3.3 | -V*0.6 ; -V*4.4 |
| Dimension( H x W x D ) | 177 x 440 x 552.6 mm | 177 x 440 x 552.6 mm | 177 x 440 x 552.6 mm | 177 x 440 x 552.6 mm | 177 x 440 x 552.6 mm | 177 x 440 x 552.6 mm |
| Weight | 21.5kg | 27.5kg | 33.5kg | 21.5kg | 27.5kg | 33.5kg |

*1 ms (mil[siemens) is the unit of conductance(G), one siemens equal to 1/Ω

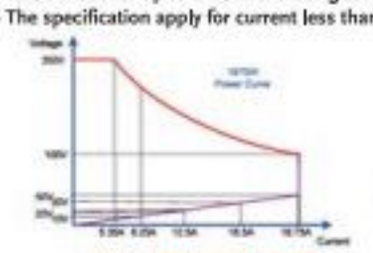
*2 Operating temperature range is 0~40°C, all specification apply for 25°C±5°C, Except as noted

*3 Turbo mode for up to 2X Current rating & Power rating support Fuse, Short/OCP/OPP test function

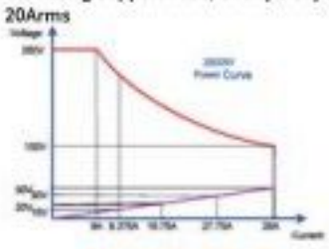
*4 The specification apply for current less than 20Arms

* All specifications apply for 50/60Hz

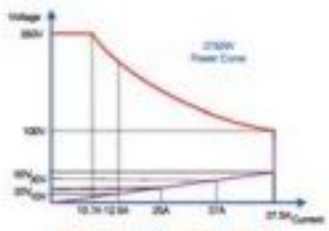
* All specifications subject to change without notice



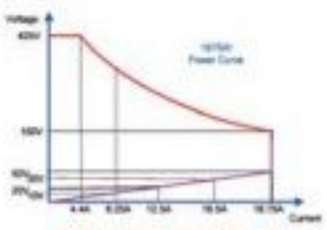
AEL-5002-350-18.75



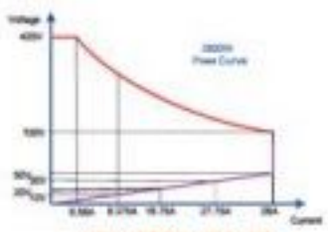
AEL-5003-350-28



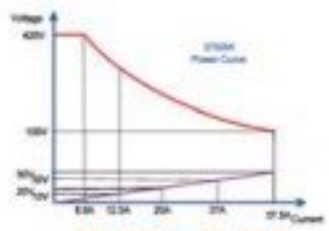
AEL-5004-350-37.5



AEL-5002-425-18.75



AEL-5003-425-28



AEL-5004-425-37.5

## SPECIFICATIONS

| MODEL | AEL-5006-350-56 | AEL-5008-350-75 | AEL-5012-350-112.5 | AEL-5015-350-112.5 | AEL-5019-350-112.5 | AEL-5023-350-112.5 |
|---|---|---|---|---|---|---|
| Power (W) | 5600 W | 7500 W | 11250W | 15000 W | 18750W | 22500W |
| Current(Ampere) | 56 Arms / 168Apeak | 75 Arms / 225Apeak | 112.5 Arms / 337.5Apeak | 112.5 Arms / 337.5Apeak | 112.5 Arms / 337.5Apeak | 112.5 Arms / 337.5Apeak |
| Voltage(Volt) | 50~350Vrms / 500Vdc | | | | | |
| FREQUENCY Range | DC,40~440Hz(CC,CP Mode) , DC~440Hz(LIN,CR,CV Mode) | | | | | |
| **PROTECTIONS** | | | | | | |
| Over Power Protection | ≒ 5880Wrms or Programmable | ≒ 7875Wrms or Programmable | ≒11812.5Wrms or Programmable | ≒11812.5Wrms or Programmable | ≒19687.5Wrms or Programmable | ≒23625Wrms or Programmable |
| Over Current Protection | ≒ 58.8 Arms, or Programmable | ≒ 78.75 Arms, or Programmable | ≒ 118.125 Arms or Programmable | ≒ 118.125 Arms or Programmable | ≒ 118.125 Arms or Programmable | ≒ 118.125 Arms or Programmable |
| Over Vlotage Protection | ≒ 367.5 Vrms/525Vdc | | | | | |
| Over Temp. Protection | Yes | | | | | |
| **OPERATION MODE** | | | | | | |
| Constant Current Mode for Sine-Wave | | | | | | |
| Range | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| Resolution | 1mA/16bits | 1.25mA/16bits | 1.875mA/16bits | 1.875mA/16bits | 1.875mA/16bits | 1.875mA/16bits |
| Accuracy | ± ( 0.1% of setting + 0.2% of range ) @ 50/60Hz , ± 0.5% of ( setting + range ) @ DC and 400Hz | | | | | |
| Linear Constant Current Mode for Sine-Wave, Square-Wave or Quasi-Square Wave, PWM Wave | | | | | | |
| Range | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| Resolution | 1mA/16bits | 1.25mA/16bits | 1.875mA/16bits | 1.875mA/16bits | 1.875mA/16bits | 1.875mA/16bits |
| Accuracy | ± ( 0.1% of setting + 0.2% of range ) @ 50/60Hz , ± 0.5% of ( setting + range ) @ DC and 400Hz | | | | | |
| **Constant Resistance Mode** | | | | | | |
| Range | 1 ohm ~ 20k ohm | 0.8 ohm ~ 16k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm |
| Resolution*1 | 0.016666mS/16bits | 0.020832mS/16bits | 0.031248mS/16bits | 0.031248mS/16bits | 0.031248mS/16bits | 0.031248mS/16bits |
| Accuracy | ±0.2% of ( setting + range ) @ 50/60Hz , ± ( 0.5% of setting + 2% of range ) @ DC and 400Hz | | | | | |
| **Constant Voltage Mode** | | | | | | |
| Range | 50~350Vrms / 500Vdc | | | | | |
| Resolution | 0.1V | | | | | |
| Accuracy | ±0.2% of ( setting + range ) @ 50/60Hz | | | | | |
| **Constant Power Mode** | | | | | | |
| Range | 5600W | 7500W | 11250W | 15000 W | 18750W | 22500W |
| Resolution | 0.1W | 0.1W | 1W | 1W | 1W | 1W |
| Accuracy *4 | ±0.5% of ( setting + range ) @ 50/60Hz , ±2% of ( setting + range ) | | | | | |
| **CREST FACTOR (CC & CP MODE ONLY)** | | | | | | |
| Range | √2~5 | | | | | |
| Resolution | 0.1 | | | | | |
| Accuracy | (0.5% / Irms) + 1%F.S. | | | | | |
| **POWER FACTOR (CC & CP MODE ONLY)** | | | | | | |
| Range | 0~1 Lag or Lead | | | | | |
| Resolution | 0.01 | | | | | |
| Accuracy | 1%F.S. | | | | | |
| **TEST MODE** | | | | | | |
| **UPS Efficint Measurement** | Non-Linear Mode | | | | | |
| Operating Frequency | Auto : 40~440Hz | | | | | |
| Current Range | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| PF Range | 0~1 | | | | | |
| **Measuring Efficiency For PV Systems, Power Conditioners for THD 80%** | Resistive + Non-Linear Mode | | | | | |
| Operating Frequency | Auto : 40~440Hz | | | | | |
| Current Range | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| Resistive Range | 1 ohm ~ 20k ohm | 0.8 ohm ~ 16k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm |
| **UPS Back-Up Function(CC,LIN,CR,CP)** | | | | | | |
| UVP (VTH) | 50~350Vrms / 500Vdc | | | | | |
| UPS Back-Up Time | 1~99999 Sec. (>27H) | | | | | |
| **Battery Discharge Function(CC,LIN,CR,CP)** | | | | | | |
| UVP (VTH) | 50~350Vrms / 500Vdc | | | | | |
| Battery Discharge Time | 1~99999 Sec. (>27H) | | | | | |
| **UPS Transfer Time** | | | | | | |
| Current Range | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| UVP (VTH) | 2.5V | | | | | |
| Time range | 0.15ms~999.99ms | | | | | |
| **Fuse Test Mode** | | | | | | |
| Max. Current — Turbo OFF(CC1~3) / Turbo ON(CC3) | 56Arms | 75Arms | 112.5Arms | 112.5Arms | 112.5Arms | 112.5Arms |
| Max. Current — Turbo ON(CC1~2) | 112Arms (x2) *3 | 150Arms (x2) *3 | 225Arms (x2) *3 | 225Arms (x2) *3 | 225Arms (x2) *3 | 225Arms (x2) *3 |
| Trip & Non-Trip Time — Turbo OFF(Time1~3) | 0.01~333.33 Sec. | | | | | |
| Trip & Non-Trip Time — Turbo ON(Time1~2) | 0.01~0.50 Sec. | | | | | |
| Trip & Non-Trip Time — Turbo ON(Time3) | 0.01~600.00 Sec. | | | | | |
| OFF Time | 0.1~999.9 Sec. | | | | | |
| Meas. Accuracy | ±0.003 Sec. | | | | | |
| Repeat Cycle | 0~99999 | | | | | |
| **Short/OPP/OCP Test Function** | | | | | | |
| Short Time — Turbo OFF | 0.1~10Sec. or Cont. | | | | | |
| Short Time — Turbo ON | 0.1~1Sec. | | | | | |
| OPP/OCP Step Time — Turbo OFF | 100ms | | | | | |
| OPP/OCP Step Time — Turbo ON | 100ms, up to 10 Steps | | | | | |
| OCP Istop — Turbo OFF | 56Arms | 75Arms | 112.5Arms | 112.5Arms | 112.5Arms | 112.5Arms |
| OCP Istop — Turbo ON | 112Arms | 150Arms | 225Arms | 225Arms | 225Arms | 225Arms |
| OPP Pstop — Turbo OFF | 5600W | 7500W | 11250W | 15000W | 18750W | 22500W |
| OPP Pstop — Turbo ON | 11200W | 15000W | 22500W | 30000W | 37500W | 45000W |
| **Programmable Inrush Current Simulation: Istart - Istop / Tsop** | | | | | | |
| Istart, Inrush Start Current | 0~112A | 0~150A | 0~225A | 0~225A | 0~225A | 0~225A |
| Inrush Step Time | 0.1ms~100ms | | | | | |
| Istop, Inrush Stop Current | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| **Programmable Surge Current Simulation: S1/T1 - S2/T2 - S3/T3** | | | | | | |
| S1 and S2 Current | 0~112A | 0~150A | 0~225A | 0~225A | 0~225A | 0~225A |
| T1 and T2 Time | 0.01~0.5Sec. | | | | | |
| S3 Current | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| T3 Time | 0.01~9.99Sec. or Cont. | | | | | |
| MEASUREMENTS | | | | | | |
| VOLTAGE READBACK V METER | | | | | | |
| Range | 500V | | | | | |
| Resolution | 0.01V | | | | | |
| Accuracy | ±0.05% of (reading + range) | | | | | |
| Parameter | Vrms,V Max/Min.+/-Vpk | | | | | |
| CURRENT READBACK A METER | | | | | | |
| Range | 28Arms/56Arms | 37.5Arms/75Arms | 56.25Arms/112.5Arms | 56.25Arms/112.5Arms | 56.25Arms/112.5Arms | 56.25Arms/112.5Arms |
| Resolution | 0.6mA/1.2mA | 0.8mA/1.6mA | 1.2mA/2.4mA | 1.2mA/2.4mA | 1.2mA/2.4mA | 1.2mA/2.4mA |
| Accuracy | ±0.1% of ( reading + range ) @ 50/60Hz | | | | | |
| Parameter | Irms,I Max/Min.+/-Ipk | | | | | |
| WATT READBACK W METER | | | | | | |
| Range | 5600W | 7500W | 11250W | 15000W | 18750W | 22500W |
| Resolution | 0.1W | 0.125W | 0.1875W | 0.25W | 0.3125W | 0.375W |
| Accuracy *4 | ±0.5% of ( reading + range ) @ 50/60Hz , ±2% of ( reading + range ) | | | | | |
| VA METER | Vrms×Arms Correspond To Vrms and Arms | | | | | |
| Power Factor METER | | | | | | |
| Range | +/- 0.000~1.000 | | | | | |
| Accuracy | ±(0.002±(0.001/PF)*F) | | | | | |
| Frequency METER(Hz) | | | | | | |
| Range | DC,40~440Hz | | | | | |
| Accuracy | 0.1% | | | | | |
| Other Parameter METER | VA, VAR, CF, I, Ipeak, Imax., Imin, Vmax., Vmin., IHD, VHD, ITHD, VTHD | | | | | |
| OTHERS | | | | | | |
| Start up Loading | Yes , Power on loading during Inverter / UPS start up | | | | | |
| Load ON / OFF Angle | 0 ~ 359 degree can be programmed for the angle of load ON and load OFF loading | | | | | |
| Half Cycle and SCR/TRIAC Loading | Positive or Negative half cycle, 90° Trailing edge or Leading edge current waveform can be programmed | | | | | |
| Master/Slave (3 Phase or Parallel Application) | Yes, 1 master and upto 7 slave unit | | | | | |
| External Programming Input (OPTION) | F.S / 10Vdc, Resulotion 0.1V | | | | | |
| External SYNC Input | TTL | | | | | |
| Vmonitor (Isolated) | ±500V / ±10V | | | | | |
| Imonitor (Isolated) | ±168Apk / ±10Vpk | ±225Apk / ±10Vpk | ±337.5Apk / ±10Vpk | ±337.5Apk / ±10Vpk | ±337.5Apk / ±10Vpk | ±337.5Apk / ±10Vpk |
| Interface (OPTION) | GPIB ; RS-232 ; LAN ; USB | | | | | |
| MAX. Power Consumption | 270VA | 270VA | 390VA | 510VA | 630VA | 750VA |
| Operation Temperature *2 | 0 ~ 40 °C | | | | | |
| Current of Input Impedance(mA)@50/60Hz ; @ 400Hz | -V*0.9 ; -V*6.6 | -V*1.2 ; -V*8.8 | -V*1.8 ; -V*13.2 | -V*2.4 ; -V*17.6 | -V*3.0 ; -V*22 | -V*3.6 ; -V*26.4 |
| Dimension( H x W x D ) | 457.8 x 480 x 593 mm | 457.8 x 480 x 593 mm | 635.7 x 480 x 593 mm | 813.5 x 480 x 593 mm | 1283 x 600 x 600 mm | 1283 x 600 x 600 mm |
| Weight | 58 kg | 70 kg | 105kg | 140kg | 200kg | 295kg |

*1 ms (millisiemens) is the unit of conductance(G), one siemens equal to 1/Ω

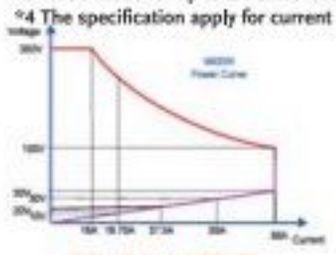
*2 Operating temperature range is 0~40°C, all specification apply for 25°C±5°C, Except as noted

*3 Turbo mode for up to 2X Current rating & Power rating support Fuse, Short/OCP/OPP test function

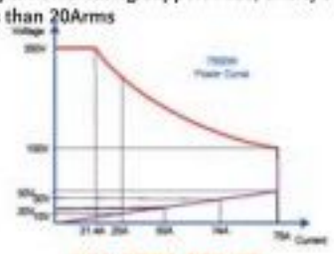
*4 The specification apply for current less than 20Arms

* All specifications apply for 50/60Hz

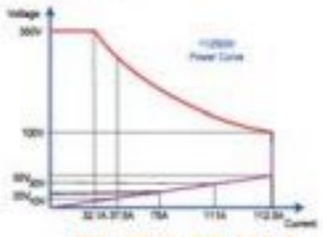
* All specifications subject to change without notice



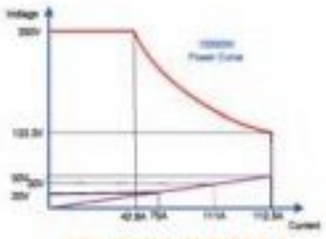
AEL-5006-350-56



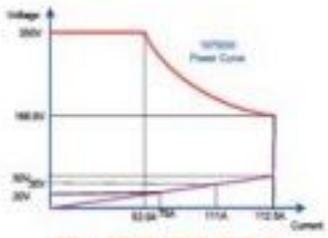
AEL-5008-350-75



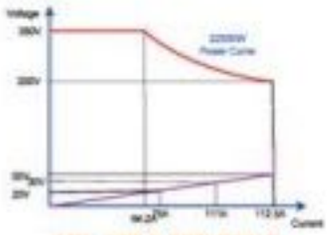
AEL-5012-350-112.5



AEL-5015-350-112.5



AEL-5019-350-112.5



AEL-5023-350-112.5

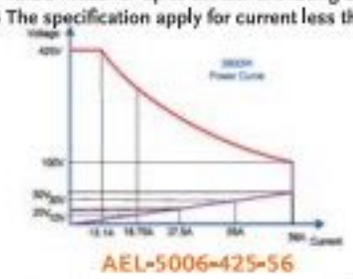
# AC & DC Electronic Load

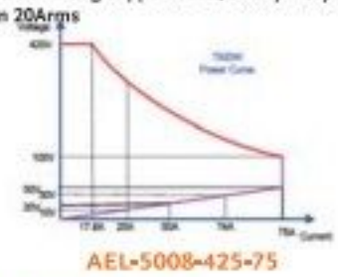
## SPECIFICATIONS

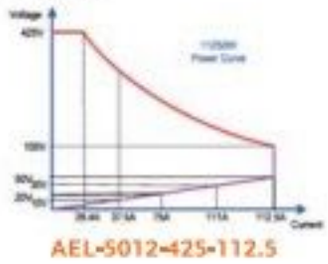
| MODEL | AEL-5006-425-56 | AEL-5008-425-75 | AEL-5012-425-112.5 | AEL-5015-425-112.5 | AEL-5019-425-112.5 | AEL-5023-425-112.5 |
|---|---|---|---|---|---|---|
| Power (W) | 5600 W | 7500 W | 11250W | 15000 W | 18750W | 22500W |
| Current(Ampere) | 56 Arms / 168Apeak | 75 Arms / 225Apeak | 112.5 Arms / 337.5Apeak | 112.5 Arms / 337.5Apeak | 112.5 Arms / 337.5Apeak | 112.5 Arms / 337.5Apeak |
| Voltage(Volt) | 50~425Vrms / 600Vdc | | | | | |
| FREQUENCY Range | DC,40~440Hz(CC,CP Mode) , DC~440Hz(LIN,CR,CV Mode) | | | | | |
| **PROTECTIONS** | | | | | | |
| Over Power Protection | ≒ 5880Wrms or Programmable | ≒ 7875Wrms or Programmable | ≒11812.5Wrms or Programmable | ≒15750Wrms or Programmable | ≒19687.5Wrms or Programmable | ≒23625Wrms or Programmable |
| Over Current Protection | ≒ 58.8 Arms, or Programmable | ≒ 78.75 Arms, or Programmable | ≒ 118.125 Arms or Programmable | ≒ 118.125 Arms or Programmable | ≒ 118.125 Arms or Programmable | ≒ 118.125 Arms or Programmable |
| Over Vlotage Protection | ≒ 446.25 Vrms/630Vdc | | | | | |
| Over Temp. Protection | Yes | | | | | |
| **OPERATION MODE** | | | | | | |
| **Constant Current Mode for Sine-Wave** | | | | | | |
| Range | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| Resolution | 1mA/16bits | 1.25mA/16bits | 1.875mA/16bits | 1.875mA/16bits | 1.875mA/16bits | 1.875mA/16bits |
| Accuracy | ± ( 0.1% of setting + 0.2% of range ) @ 50/60Hz , ± 0.5% of ( setting + range ) @ DC and 400Hz | | | | | |
| **Linear Constant Current Mode for Sine-Wave, Square-Wave or Quasi-Square Wave, PWM Wave** | | | | | | |
| Range | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| Resolution | 1mA/16bits | 1.25mA/16bits | 1.875mA/16bits | 1.875mA/16bits | 1.875mA/16bits | 1.875mA/16bits |
| Accuracy | ± ( 0.1% of setting + 0.2% of range ) @ 50/60Hz , ± 0.5% of ( setting + range ) @ DC and 400Hz | | | | | |
| **Constant Resistance Mode** | | | | | | |
| Range | 1 ohm ~ 20k ohm | 0.8 ohm ~ 16k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm |
| Resolution^1 | 0.016666mS/16bits | 0.020832mS/16bits | 0.031248mS/16bits | 0.031248mS/16bits | 0.031248mS/16bits | 0.031248mS/16bits |
| Accuracy | ±0.2% of ( setting + range ) @ 50/60Hz , ± ( 0.5% of setting + 2% of range ) @ DC and 400Hz | | | | | |
| **Constant Voltage Mode** | | | | | | |
| Range | 50~425Vrms / 600Vdc | | | | | |
| Resolution | 0.1V | | | | | |
| Accuracy | ±0.2% of ( setting + range ) @ 50/60Hz | | | | | |
| **Constant Power Mode** | | | | | | |
| Range | 5600W | 7500W | 11250W | 15000 W | 18750W | 22500W |
| Resolution | 0.1W | 0.1W | 1W | 1W | 1W | 1W |
| Accuracy^4 | ±0.5% of ( setting + range ) @ 50/60Hz , ±2% of ( setting + range ) | | | | | |
| **CREST FACTOR (CC & CP MODE ONLY)** | | | | | | |
| Range | √2~5 | | | | | |
| Resolution | 0.1 | | | | | |
| Accuracy | (0.5% / Irms) + 1%F.S. | | | | | |
| **POWER FACTOR (CC & CP MODE ONLY)** | | | | | | |
| Range | 0~1 Lag or Lead | | | | | |
| Resolution | 0.01 | | | | | |
| Accuracy | 1%F.S. | | | | | |
| **TEST MODE** | | | | | | |
| **UPS Efficient Measurement** | Non-Linear Mode | | | | | |
| Operating Frequency | Auto : 40~440Hz | | | | | |
| Current Range | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| PF Range | 0~1 | | | | | |
| **Measuring Efficiency For PV System, Power Conditioners for THD 80%** | Resistive + Non-Linear Mode | | | | | |
| Operating Frequency | Auto : 40~440Hz | | | | | |
| Current Range | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| Resistive Range | 1 ohm ~ 20k ohm | 0.8 ohm ~ 16k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm | 0.533 ohm ~ 10.666k ohm |
| **UPS Back-Up Function(CC,LIN,CR,CP)** | | | | | | |
| UVP (VTH) | 50~425Vrms / 600Vdc | | | | | |
| UPS Back-Up Time | 1~99999 Sec. (>27H) | | | | | |
| **Battery Discharge Function(CC,LIN,CR,CP)** | | | | | | |
| UVP (VTH) | 50~425Vrms / 600Vdc | | | | | |
| Battery Discharge Time | 1~99999 Sec. (>27H) | | | | | |
| **UPS Transfer Time** | | | | | | |
| Current Range | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| UVP (VTH) | 2.5V | | | | | |
| Time range | 0.15ms~999.99ms | | | | | |
| **Fuse Test Mode** | | | | | | |
| Max. Current — Turbo OFF(CC1~3) / Turbo ON(CC3) | 56Arms | 75Arms | 112.5Arms | 112.5Arms | 112.5Arms | 112.5Arms |
| Max. Current — Turbo ON(CC1~2) | 112Arms (x2) *3 | 150Arms (x2) *3 | 225Arms (x2) ^3 | 225Arms (x2) ^3 | 225Arms (x2) ^3 | 225Arms (x2) ^3 |
| Trip & Non-Trip Time — Turbo OFF(Time1~3) | 0.01~333.33 Sec. | | | | | |
| Trip & Non-Trip Time — Turbo ON(Time1~2) | 0.01~0.50 Sec. | | | | | |
| Trip & Non-Trip Time — Turbo ON(Time3) | 0.01~600.00 Sec. | | | | | |
| OFF Time | 0.1~999.9 Sec. | | | | | |
| Meas. Accuracy | ±0.003 Sec. | | | | | |
| Repeat Cycle | 0~99999 | | | | | |
| **Short/OPP/OCP Test Function** | | | | | | |
| Short Time — Turbo OFF | 0.1~10Sec. or Cont. | | | | | |
| Short Time — Turbo ON | 0.1~1Sec. | | | | | |
| OPP/OCP Step Time — Turbo OFF | 100ms | | | | | |
| OPP/OCP Step Time — Turbo ON | 100ms, up to 10 Steps | | | | | |
| OCP Istop — Turbo OFF | 56Arms | 75Arms | 112.5Arms | 112.5Arms | 112.5Arms | 112.5Arms |
| OCP Istop — Turbo ON | 112Arms | 150Arms | 225Arms | 225Arms | 225Arms | 225Arms |
| OPP Pstop — Turbo OFF | 5600W | 7500W | 11250W | 15000W | 18750W | 22500W |
| OPP Pstop — Turbo ON | 11200W | 15000W | 22500W | 30000W | 37500W | 45000W |
| **Programmable Inrush Current Simulation: Istart - Istop / Twp** | | | | | | |
| Istart, Inrush Start Current | 0~112A | 0~150A | 0~225A | 0~225A | 0~225A | 0~225A |
| Inrush Step Time | 0.1ms~100ms | | | | | |
| Istop, Inrush Stop Current | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| **Programmable Surge Current Simulation: S1/T1 - S2/T2 - S3/T3** | | | | | | |
| S1 and S2 Current | 0~112A | 0~150A | 0~225A | 0~225A | 0~225A | 0~225A |
| T1 and T2 Time | 0.01~0.5Sec. | | | | | |
| S3 Current | 0~56A | 0~75A | 0~112.5A | 0~112.5A | 0~112.5A | 0~112.5A |
| T3 Time | 0.01~9.99Sec. or Cont. | | | | | |
| **MEASUREMENTS** | | | | | | |
| VOLTAGE READBACK V METER | | | | | | |
| Range | 600V | | | | | |
| Resolution | 0.01V | | | | | |
| Accuracy | ±0.05% of (reading + range) | | | | | |
| Parameter | Vrms,V Max/Min,+/-Vpk | | | | | |
| CURRENT READBACK A METER | | | | | | |
| Range | 28Arms/56Arms | 37.5Arms/75Arms | 56.25Arms/112.5Arms | 56.25Arms/112.5Arms | 56.25Arms/112.5Arms | 56.25Arms/112.5Arms |
| Resolution | 0.6mA/1.2mA | 0.8mA/1.6mA | 1.2mA/2.4mA | 1.2mA/2.4mA | 1.2mA/2.4mA | 1.2mA/2.4mA |
| Accuracy | ±0.1% of ( reading + range ) @ 50/60Hz | | | | | |
| Parameter | Irms,I Max/Min,+/-Ipk | | | | | |
| WATT READBACK W METER | | | | | | |
| Range | 5600W | 7500W | 11250W | 15000W | 18750W | 22500W |
| Resolution | 0.1W | 0.125W | 0.1875W | 0.25W | 0.3125W | 0.375W |
| Accuracy^4 | ±0.5% of ( reading + range ) @ 50/60Hz , ±5% of ( reading + range ) | | | | | |
| VA METER | Vrms×Arms Correspond To Vrms and Arms | | | | | |
| Power Factor METER | | | | | | |
| Range | +/- 0.000~1.000 | | | | | |
| Accuracy | ±[0.002±(0.001/PF)*F] | | | | | |
| Frequency METER(Hz) | | | | | | |
| Range | DC,40~440Hz | | | | | |
| Accuracy | 0.1% | | | | | |
| Other Parameter METER | VA, VAR, CF_I, Ipeak, Imax., Imin. Vmax., Vmin., IHD, VHD, ITHD, VTHD | | | | | |
| **OTHERS** | | | | | | |
| Start up Loading | Yes , Power on loading during Inverter / UPS start up | | | | | |
| Load ON / OFF Angle | 0 ~ 359 degree can be programmed for the angle of load ON and load OFF loading | | | | | |
| Half Cycle and SCR/TRIAC Loading | Postive or Negative half cycle, 90° Trailing edge or Leading edge current waveform can be programmed | | | | | |
| Master/Slave (3 Phase or Parallel Application) | Yes, 1 master and upto 7 slave unit | | | | | |
| External Programming Input (OPTION) | F.S / 10Vdc, Resolution 0.1V | | | | | |
| External SYNC Input | TTL | | | | | |
| Vmonitor (Isolated) | ±600V / ±10V | | | | | |
| Imonitor (Isolated) | ±168Apk / ±10Vpk | ±225Apk / ±10Vpk | ±337.5Apk / ±10Vpk | ±337.5Apk / ±10Vpk | ±337.5Apk / ±10Vpk | ±337.5Apk / ±10Vpk |
| Interface (OPTION) | GPIB ; RS-232 ; LAN ; USB | | | | | |
| MAX. Power Consumption | 270VA | 270VA | 390VA | 510VA | 630VA | 750VA |
| Operation Temperature *2 | 0 ~ 40 ℃ | | | | | |
| Current of Input Impedance(mA)@50/60Hz ; @ 400Hz | -V*0.9 ; -V*6.6 | -V*1.2 ; -V*8.8 | -V*1.8 ; -V*13.2 | -V*2.4 ; -V*17.6 | -V*3.0 ; -V*22 | -V*3.6 ; -V*26.4 |
| Dimension( H x W x D ) | 457.8 x 480 x 593 mm | 457.8 x 480 x 593 mm | 635.7 x 480 x 593 mm | 813.5 x 480 x 593 mm | 1283 x 600 x 600 mm | 1283 x 600 x 600 mm |
| Weight | 58 kg | 70 kg | 105kg | 140kg | 260kg | 295kg |

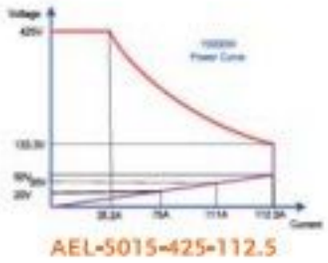
*1 ms (millisiemens) is the unit of conductance(G), one siemens equal to 1/Ω
*2 Operating temperature range is 0~40℃, all specification apply for 25℃±5℃, Except as noted
*3 Turbo mode for up to 2X Current rating & Power rating support Fuse, Short/OCP/OPP test function
*4 The specification apply for current less than 20Arms

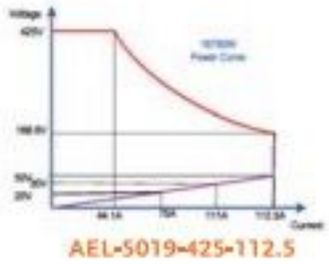
* All specifications apply for 50/60Hz
* All specifications subject to change without notice

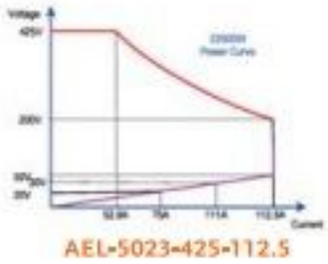

AEL-5006-425-56


AEL-5008-425-75


AEL-5012-425-112.5


AEL-5015-425-112.5


AEL-5019-425-112.5


AEL-5023-425-112.5

## SPECIFICATIONS

| MODEL | | AEL-5003-480-18.75 | AEL-5004-480-28 |
|---|---|---|---|
| Power (W) | | 2800W | 3750 W |
| Current(Ampere) | | 18.75 Arms / 56.25Apeak | 28 Arms / 84Apeak |
| Voltage(Volt) | | 50~480Vrms / 700Vdc | |
| FREQUENCY Range | | DC,40~70Hz(CC,CP Mode) , DC~70Hz(LIN,CR,CV Mode) | |
| **PROTECTIONS** | | | |
| Over Power Protection | | ≒2940Wrms or Programmable | ≒3937.5Wrms or Programmable |
| Over Current Protection | | ≒ 19.687 Arms or Programmable | ≒ 29.4 Arms or Programmable |
| Over Vlotage Protection | | ≒ 504Vrms / 735Vdc | |
| Over Temp. Protection | | Yes | |
| **OPERATION MODE** | | | |
| Constant Current Mode for Sine-Wave | | | |
| Range | | 0~18.75A | 0~28A |
| Resolution | | 0.3125mA/16bits | 0.5mA/16bits |
| Accuracy | | ± ( 0.1% of setting + 0.2% of range ) @ 50/60Hz , ± 0.5% of ( setting + range ) @ DC and 400Hz | |
| Linear Constant Current Mode for Sine-Wave, Square-Wave or Quasi-Square Wave, PWM Wave | | | |
| Range | | 0~18.75A | 0~28A |
| Resolution | | 0.3125mA/16bits | 0.5mA/16bits |
| Accuracy | | ± ( 0.1% of setting + 0.2% of range ) @ 50/60Hz , ± 0.5% of ( setting + range ) @ DC and 400Hz | |
| **Constant Resistance Mode** | | | |
| Range | | 4 ohm ~ 80K ohm | 2.5 ohm ~ 50K ohm |
| Resolution*1 | | 0.004166mS/16bits | 0.006666mS/16bits |
| Accuracy | | ±0.2% of ( setting + range ) @ 50/60Hz , ± ( 0.5% of setting + 2% of range ) @ DC and 400Hz | |
| **Constant Voltage Mode** | | | |
| Range | | 50~480Vrms / 700Vdc | |
| Resolution | | 0.0125V | |
| Accuracy | | ±(0.1% of setting + 0.1% of range) | |
| **Constant Power Mode** | | | |
| Range | | 2800W | 3750W |
| Resolution | | 0.1W | 0.1W |
| Accuracy*4 | | ±0.5% of ( setting + range ) @ 50/60Hz , ±2% of ( setting + range ) | |
| **CREST FACTOR (CC & CP MODE ONLY)** | | | |
| Range | | √2~5 | |
| Resolution | | 0.1 | |
| Accuracy | | (0.5% / Irms) + 1%F.S. | |
| **POWER FACTOR (CC & CP MODE ONLY)** | | | |
| Range | | 0~1 Lag or Lead | |
| Resolution | | 0.01 | |
| Accuracy | | 1%F.S. | |
| **TEST MODE** | | | |
| **UPS Efficient Measurement** | | Non-Linear Mode | |
| Operating Frequency | | Auto ; 40~70Hz | |
| Current Range | | 0~18.75A | 0~28A |
| PF Range | | 0~1 | |
| **Measuring Efficiency For PV Systems, Power Conditioners for THD 80%** | | Resistive + Non-Linear Mode | |
| Operating Frequency | | Auto ; 40~70Hz | |
| Current Range | | 0~18.75A | 0~28A |
| Resistive Range | | 4 ohm ~ 80k ohm | 2.5 ohm ~ 50k ohm |
| **UPS Back-Up Function(CC,LIN,CR,CP)** | | | |
| UVP (VTH) | | 50~480Vrms / 700Vdc | |
| UPS Back-Up Time | | 1~99999 Sec. (>27H) | |
| **Battery Discharge Function(CC,LIN,CR,CP)** | | | |
| UVP (VTH) | | 50~480Vrms / 700Vdc | |
| Battery Discharge Time | | 1~99999 Sec. (>27H) | |
| **UPS Transfer Time** | | | |
| Current Range | | 0~18.75A | 0~28A |
| UVP (VTH) | | 2.5V | |
| Time range | | 0.15ms~999.99ms | |
| **Fuse Test Mode** | | | |
| Max. Current | Turbo OFF(CC1~3) | 18.75Arms | 28.0Arms |
| | Turbo ON(CC3) | | |
| | Turbo ON(CC1~2) | 37.5Arms (x2) *3 | 56.0Arms (x2) *3 |
| Trip & Non-Trip Time | Turbo OFF(Time1~3) | 0.01~333.33 Sec. | |
| | Turbo ON(Time1~2) | 0.01~0.50 Sec. | |
| | Turbo ON(Time3) | 0.01~600.00 Sec. | |
| OFF Time | | 0.1~999.9 Sec. | |
| Meas. Accuracy | | ±0.003 Sec. | |
| Repeat Cycle | | 0~99999 | |
| **Short/OPP/OCP Test Function** | | | |
| Short Time | Turbo OFF | | |
| | Turbo ON | | |
| OPP/OCP Step Time | Turbo OFF | 100ms | |
| | Turbo ON | 100ms, up to 10 Steps | |
| OCP Istop | Turbo OFF | 18.75Arms | 28.0Arms |
| | Turbo ON | 37.5Arms | 56.0Arms |
| OPP Pstop | Turbo OFF | 2800W | 3750W |
| | Turbo ON | 5600W | 7500W |
| **Programmable Inrush Current Simulation: Istart - Istop / Tstop** | | | |
| Istart, Inrush Start Current | | 0~37.5$I_C$ | 0~56A $I_C$ |
| Inrush Stop Time | | 0.1ms~100ms | |
| Istop, Inrush Stop Current | | 0~18.75A | 0~28A |
| **Programmable Surge Current Simulation: S1/T1 - S2/T2 - S3/T3** | | | |
| S1 and S2 Current | | 0~37.5A | 0~56A |
| T1 and T2 Time | | 0.01~0.5Sec. | |
| S3 Current | | 0~18.75A | 0~28A |
| T3 Time | | 0.01~9.99Sec. or Cont. | |
| **MEASUREMENTS** | | | |
| VOLTAGE READBACK V METER | | | |
| Range | | 700V | |
| Resolution | | 0.0125V | |
| Accuracy | | ±0.05% of (reading + range) | |
| Parameter | | Vrms,V Max/Min.+/-Vpk | |
| CURRENT READBACK A METER | | | |
| Range | | 9.375Arms/18.75Arms | 14Arms/28Arms |
| Resolution | | 0.2mA/0.4mA | 0.3mA/0.6mA |
| Accuracy | | ±0.05% of ( reading + range ) @ 50/60Hz | |
| Parameter | | Irms,I Max/Min.+/-Ipk | |
| WATT READBACK W METER | | | |
| Range | | 2800W | 3750W |
| Resolution | | 0.05W | 0.0625W |
| Accuracy*4 | | ±0.5% of ( reading + range ) @ 50/60Hz , ±2% of ( reading + range ) | |
| VA METER | | VrmsxArms Correspond To Vrms and Arms | |
| Power Factor METER | | | |
| Range | | +/- 0.000~1.000 | |
| Accuracy | | ±(0.002+(0.001/PF)*F) | |
| Frequency METER(Hz) | | | |
| Range | | DC,40~70Hz | |
| Accuracy | | 0.1% | |
| Other Parameter METER | | | |
| VA, VAR, CF_I, Ipeak, Imax., Imin. Vmax., Vmin., IHD, VHD, ITHD, VTHD | | | |
| **OTHERS** | | | |
| Start up Loading | | Yes , Power on loading during inverter / UPS start up | |
| Load ON / OFF Angle | | 0 ~ 359 degree can be programmed for the angle of load ON and load OFF loading | |
| Half Cycle and SCR/TRIAC Loading | | Postive or Negative half cycle, 90° Trailing edge or Leading edge current waveform can be programmed | |
| Master/Slave (3 Phase or Parallel Application) | | Yes, 1 master and upto 7 slave units | |
| External Programming Input (OPTION) | | F.S / 10Vdc, Resulotion 0.1V | |
| External SYNC Input | | TTL | |
| Vmonitor (Isolated) | | ±700V / ±10V | |
| Imonitor (Isolated) | | ±56.25Apk / ±10Vpk | ±84Apk / ±10Vpk |
| Interface (OPTION) | | GPIB ; RS-232 ; LAN ; USB | |
| MAX. Power Consumption | | 150VA | |
| Operation Temperature *2 | | 0 ~ 40 °C | |
| Current of Input Impedance(mA)@50/60Hz ; @ 400Hz | | -V*0.3 ; -V*2.2 | -V*0.4 ; -V*2.95 |
| Dimension( H x W x D ) | | 177 x 440 x 552.6 mm | 177 x 440 x 552.6 mm |
| Weight | | 27.5kg | 33.5kg |

*1 ms (millisiemens) is the unit of conductance(G), one siemens equal to 1/Ω

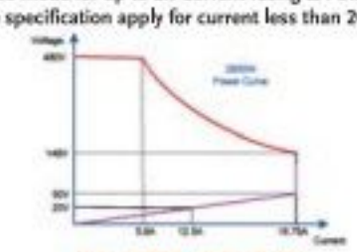
*2 Operating temperature range is 0~40°C, all specification apply for 25°C±5°C, Except as noted

*3 Turbo mode for up to 2X Current rating & Power rating support Fuse, Short/OCP/OPP test function

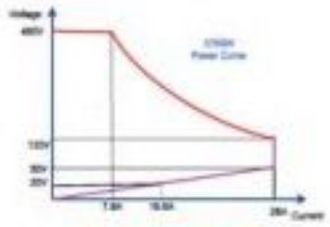
*4 The specification apply for current less than 20Arms

* All specifications apply for 50/60Hz

* All specifications subject to change without notice



AEL-5003-480-18.75



AEL-5004-480-28

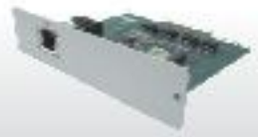
**PEL-022** GPIB Card



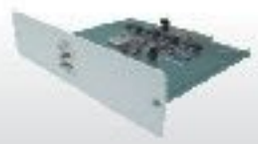
**PEL-023** RS-232 Card



**PEL-024** LAN Card



**PEL-025** USB Card



**PEL-028** HANDLES, U-shaped handle (for AEL-5006/5008/5012/5015)



**PEL-029** HANDLES Rack Accessories (for AEL-5002/5003/5004)



# High Power DC Electronic Load



## PEL-5000G Series

NEW

CE | RS-232 | GPIB | USB | LAN | UKCA

## FEATURES

- ☆ 4U/6K High Power Density Design Also for Bench Testing
- ☆ Turbo Mode Function, Which Allows 1.5 Times the Rated Power or Current to be Used Within Two Seconds
- ☆ Turbo Mode can be Used with OCP/OPP/ BMS/Short Mode/Surge Mode/Hot Plug-In Testing
- ☆ High Tolerance to Environmental Temperature, with 4k/5kW Models not Affected by Environmental Temperature in Power Usage
- ☆ Can set the Power-on Status Value
- ☆ Short Circuit Duration Can be set Within
- ☆ Short Circuit Test Voltage Meter Display Can be Configured as Polarity Positive ("+") or Negative("-")
- ☆ Optional Interface : GPIB, RS232, USB, LAN
- ☆ Protection function Testing for Battery BMS
- ☆ Protection Against V, I, W, and ℃

GW Instek PEL-5000G series single-channel electronic load provides 150V/ 600V/ 1200V models with a power range of 4, 5, 6kW. PEL-5000G can test and verify the specifications of batteries, electric vehicle chargers/charging stations, electric vehicle batteries and solar panels. PEL-5000G supports parallel connection for same voltage specification and different power models. PEL-5000G can support up to 8 units connected in parallel.

PEL-5000G Series has its own control and display panel, CC / CR / CV / CP /Dynamic modes. The new Turbo mode is designed for overload or protection testing, which includes OCP, OPP, Short for AC/DC or DC/DC power source; Over Charge/Discharge and Short for Battery BMS protection; and Blow/Not Blow testing for Fuse, Breaker or PTC Current Protection Components.

Support Short, OCCP and OCDP protection tests for battery BMS protection testing, the peak current before protection and protection response time are measured. The BMS, Fuse, OCP and OPP single-key test functions on the module make test more efficient. The SHORT duration setting and SHORT_VH, SHORT_VL setting function, also can measure Short Voltage and Current. PEL-5000G also provides Programmable LOAD ON/OFF voltage, GO/NG meter check, Voltage meter display" + "or"–" is selectable

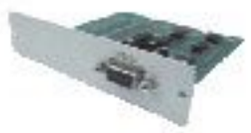
Dynamic can be simulated under CC, CP mode. The current Rise / Fall slew rate can be adjusted individually and there is an external signal input so that load can have a simulated Specific Load Current Waveform. PEL-5000G also provides 150 sets Store / Recall larger memory is much advance feature for each different application. The 150 sets test parameter and status storage function can call the storage memory real time in accordance with the auto sequence requirement, at any time to tune out the stored memory for use.

The communication interfaces supported by PEL-5000G include GPIB, RS232, USB, and LAN. The power, voltage and current of each model are shown in the following table:

**PEL-022** GPIB Card



**PEL-023** RS-232 Card



**PEL-024** LAN Card



**PEL-025** USB Card



**PEL-028** Handles



**PEL-031** Rack Mount Kit

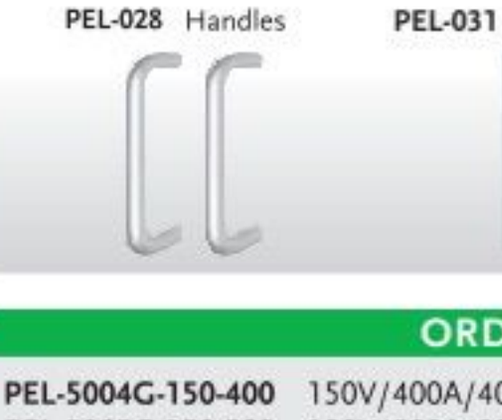


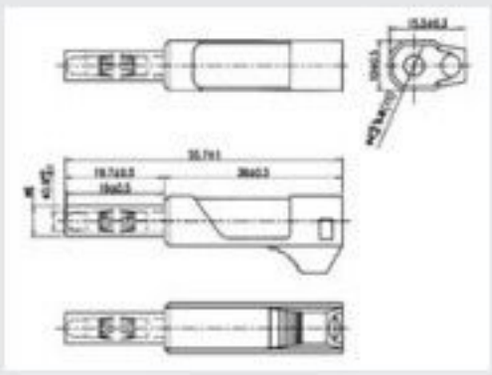
**PEL-032** 9923 Current Waveform Generator + RS232 Interface



## ORDERING INFORMATION

| | |
|---|---|
| **PEL-5004G-150-400** | 150V/400A/4000W High Power DC Electronic Load |
| **PEL-5005G-150-500** | 150V/500A/5000W High Power DC Electronic Load |
| **PEL-5006G-150-600** | 150V/600A/6000W High Power DC Electronic Load |
| **PEL-5004G-600-280** | 600V/280A/4000W High Power DC Electronic Load |
| **PEL-5005G-600-350** | 600V/350A/5000W High Power DC Electronic Load |
| **PEL-5006G-600-420** | 600V/420A/6000W High Power DC Electronic Load |
| **PEL-5004G-1200-160** | 1200V/160A/4000W High Power DC Electronic Load |
| **PEL-5005G-1200-200** | 1200V/200A/5000W High Power DC Electronic Load |
| **PEL-5006G-1200-240** | 1200V/240A/6000W High Power DC Electronic Load |



**STANDARD ACCESSORIES**

PEL-5000G Series operation manual
BANANA PLUGS : Please refer to Fig.1 x 1
BNC – BNC CABLE : BNC to BNC CABLE, 1m x 1
HD-DSUB : 15PIN Parallel wire Parallel Wire x 1
PEL-028 HANDLES, U-shaped handle(fixed to the bracket)
PEL-031 Rack Mount Kit For PEL-5000G

## OPTIONAL ACCESSORIES

| | | | |
|---|---|---|---|
| **PEL-022** | GPIB Card | **GTL-246** | USB Cable, USB 2.0, A-B Type, 1200mm |
| **PEL-023** | RS-232 Card | **GTL-248** | GPIB Cable, Double Shielded, 2000mm |
| **PEL-024** | LAN Card | **GTL-250** | GPIB Cable, Double Shielded, 600mm |
| **PEL-025** | USB Card | **PEL-032** | 9923 Current Waveform Generator + RS232 Interface |
| **PEL-030** | GPIB+RS-232 Card | | |

Note: * Regarding the product delivery date, please contact your regional sales representative.

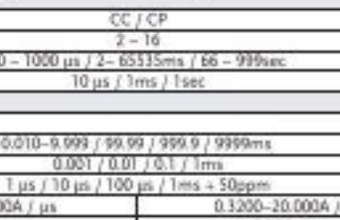
## Rear Panel

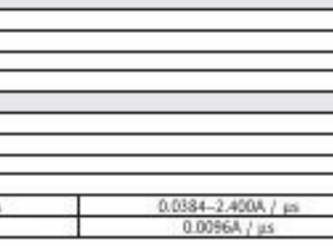


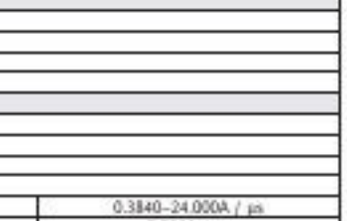
## SPECIFICATIONS

| MODEL | PEL-5004G-150-400 | | PEL-5005G-150-500 | | PEL-5006G-150-600 | |
|---|---|---|---|---|---|---|
| Power*1 | 0 ~ 4kW | 0 ~ 6kW max.*5 | 0 ~ 5kW | 0 ~ 7.5kW max.*5 | 0 ~ 6kW | 0 ~ 9kW max.*5 |
| Current | 0 ~ 400A | 0 ~ 600A max.*5 | 0 ~ 500A | 0 ~ 750A max.*5 | 0 ~ 600A | 0 ~ 900A max.*5 |
| Voltage | 0 ~ 150V | | 0 ~ 150V | | 0 ~ 150V | |
| Min. Operating Voltage | 0.7V@400A | | 0.7V@500A | | 0.7V@600A | |
| **Protections** | | | | | | |
| Over Power Protection(OPP) | 105% | | | | | |
| Over Current Protection(OCP | 104% | | | | | |
| Over Voltage Protection(OVP) | 105% | | | | | |
| Over Temp Protection(OTP) | 90°C±5°C | | | | | |
| **Constant Current Mode** | | | | | | |
| Range*2 | 0 ~ 40A | 0 ~ 400A | 0 ~ 50A | 0 ~ 500A | 0 ~ 60A | 0 ~ 600A |
| Resolution | 0.64mA | 6.4mA | 0.80mA | 8.0mA | 0.96mA | 9.6mA |
| Accuracy*3 | ± 0.05% of (Setting + Range) | | | | | |
| **Constant Resistance Mode** | | | | | | |
| Range | 22.5kΩ ~ 0.375Ω | 0.375Ω ~ 0.0018Ω | 18kΩ ~ 0.3Ω | 0.3Ω ~ 0.0015Ω | 15kΩ ~ 0.25Ω | 0.25Ω ~ 0.0012Ω |
| Resolution | 44μS | 6.25μΩ | 56μS | 5μΩ | 67μS | 4.167μΩ |
| Accuracy | ± 0.1%(Vin / Setting)±0.1% F.S. | ± 0.1% of (Setting + Range)±0.1% F.S. | ± 0.1%(Vin / Setting)±0.1% F.S. | ± 0.1% of (Setting + Range)±0.1% F.S. | ± 0.1%(Vin / Setting) ±0.1% F.S. | ± 0.1% of (Setting + Range) ±0.1% F.S. |
| **Constant Voltage Mode** | | | | | | |
| Range | 0 ~ 150V | | | | | |
| Resolution | 2.5mV | | | | | |
| Accuracy | ± 0.05% of (Setting + Range) | | | | | |
| **Constant Power Mode** | | | | | | |
| Range | 0 ~ 400W | 400 ~ 4kW | 0 ~ 500W | 500 ~ 5kW | 0 ~ 600W | 600 ~ 6kW |
| Resolution | 6.4mW | 64mW | 8mW | 80mW | 9.6mW | 96mW |
| Accuracy*4 | ± 0.2% of (Setting + Range) | | | | | |
| **Constant Voltage Mode + Current Limit Mode** | | | | | | |
| Range | 150V | 400A | 150V | 500A | 150V | 600A |
| Resolution | 2.5mV | 6.4mA | 2.5mV | 8mA | 2.5mV | 9.6mA |
| Accuracy*4 | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) |
| **Constant Voltage Mode + Power Limit Mode** | | | | | | |
| Range | 150V | 4kW | 150V | 5kW | 150V | 6kW |
| Resolution | 2.5mV | 64mW | 2.5mV | 80mW | 2.5mV | 96mW |
| Accuracy*4 | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) |
| **Turbo Mode *5** | **OFF** | **ON** | **OFF** | **ON** | **OFF** | **ON** |
| **Short / OCP / OPP Test Function** | | | | | | |
| Max. Current | 400A | 600A | 500A | 750A | 600A | 900A |
| Max. Power | 4000W | 6000W | 5000W | 7500W | 6000W | 9000W |
| Test Accuracy*6 | ± 1.0% of (Reading + Range) | | | | | |
| Short Time | 100 ~ 10000ms<br>Continuous | 100 ~ 2000ms | 100 ~ 10000ms<br>Continuous | 100 ~ 2000ms | 100 ~ 10000ms<br>Continuous | 100 ~ 2000ms |
| Setting. Accuracy | ±5ms | | | | | |
| Short V Hi | Setting range : 0.00V ~ 150.00V / Resolution : 0.0025V | | | | | |
| Short V Lo | Setting range : 0.00V ~ 150.00V / Resolution : 0.0025V | | | | | |
| OCP Time (Tstep) | 100ms | 20ms | 100ms | 20ms | 100ms | 20ms |
| Setting. Accuracy | ±5ms | | | | | |
| OCP ISTAR / ISTEP / ISTOP | Setting range : 0.00A ~ 400.00A / Resolution : 6.4mA | Setting range : 0.00A ~ 600.00A / Resolution : 9.6mA | Setting range : 0.00A ~ 500.00A / Resolution : 8.0mA | Setting range : 0.00A ~ 750.00A / Resolution : 12mA | Setting range : 0.00A ~ 600.00A / Resolution : 9.60mA | Setting range : 0.00A ~ 900.00A / Resolution : 14.4mA |
| OCP VTH | Setting range : 0.00V ~ 150.00V / Resolution : 0.0025 V | | | | | |
| OPP Time (Tstep) | 100ms | 20ms | 100ms | 20ms | 100ms | 20ms |
| Setting. Accuracy | ±5ms | | | | | |
| OPP PSTAR / PSTEP / PSTOP | Setting range : 0.00W ~ 4000.0W / Resolution : 64.0mW | Setting range : 0.00W ~ 6000.0W / Resolution : 96.0mW | Setting range : 0.00W ~ 5000.0W / Resolution : 80.0mW | Setting range : 0.00W ~ 7500.0W / Resolution : 120mW | Setting range : 0.00W ~ 6000.0W / Resolution : 96mW | Setting range : 0.00W ~ 9000.0W / Resolution : 144mW |
| OPP VTH | Setting range : 0.00V ~ 150.00V / Resolution : 0.0025V | | | | | |
| **Bms Test Mode*7** | | | | | | |
| Max. Current | 400A | 600A | 500A | 750A | 600A | 900A |
| Meas. Accuracy*4 | ±3.0% of ( Reading + Range ) | | | | | |
| Short test Time | 0.05ms~10ms / Resolution : 0.01ms | | | | | |
| Meas. Accuracy | ±0.02ms | | | | | |
| Setting Accuracy | ±0.05ms | | | | | |
| Short ITH | Setting range : 0.19A ~ 200.00A / Resolution : 6.4mA | Setting range : 0.28A ~ 300.00A / Resolution : 9.6mA | Setting range : 0.24A ~ 250.00A / Resolution : 8.0mA | Setting range : 0.36A ~ 375.00A / Resolution : 12mA | Setting range : 0.28A ~ 300.00A / Resolution : 9.6mA | Setting range : 0.43A ~ 450.00A / Resolution : 14.4mA |
| OCP ISTAR | Setting range : 0.64A ~ 400.00A / Resolution : 6.4mA | Setting range : 0.96A ~ 600.00A / Resolution : 9.6mA | Setting range : 0.80A ~ 500.00A / Resolution : 8.0mA | Setting range : 1.20A ~ 750.00A / Resolution : 12mA | Setting range : 0.96A ~ 600.00A / Resolution : 9.6mA | Setting range : 1.44A ~ 900.00A / Resolution : 14.4mA |
| OCP TSTEP | 0.05 ~ 10ms<br>11 ~ 1000ms | 0.05 ~ 10ms | 0.05 ~ 10ms<br>11 ~ 1000ms | 0.05 ~ 10ms | 0.05 ~ 10ms<br>11 ~ 1000ms | 0.05 ~ 10ms |
| Meas. Accuracy | ±0.1ms / ±0.5ms | ±0.5ms | ±0.1ms / ±0.5ms | ±0.5ms | ±0.1ms / ±0.5ms | ±0.5ms |
| OCP ISTEP | Setting range : 0.00A ~ 400.00A / Resolution : 6.4mA | Setting range : 6.00A ~ 600.00A / Resolution : 9.6mA | Setting range : 0.00A ~ 500.00A / Resolution : 8.0mA | Setting range : 7.50A ~ 750.00A / Resolution : 12mA | Setting range : 0.00A ~ 600.00A / Resolution : 9.6mA | Setting range : 9.00A ~ 900.00A / Resolution : 14.4mA |
| OCP ISTOP | Setting range : 0.64A ~ 400.00A / Resolution : 6.4mA | Setting range : 0.96A ~ 600.00A / Resolution : 9.6mA | Setting range : 0.80A ~ 500.00A / Resolution : 8.0mA | Setting range : 1.20A ~ 750.00A / Resolution : 12mA | Setting range : 0.96A ~ 600.00A / Resolution : 9.6mA | Setting range : 1.44A ~ 900.00A / Resolution : 14.4mA |
| OCP ITH | Setting range : 0.19A ~ 200.00A / Resolution : 6.4mA | Setting range : 0.28A ~ 300.00A / Resolution : 9.6mA | Setting range : 0.24A ~ 250.00A / Resolution : 8.0mA | Setting range : 0.36A ~ 375.00A / Resolution : 12mA | Setting range : 0.28A ~ 300.00A / Resolution : 9.6mA | Setting range : 0.43A ~ 450.00A / Resolution : 14.4mA |
| **Surge Test Mode** | | | | | | |
| Surge Current | 0 ~ 600A | | 0 ~ 750A | | 0 ~ 900A | |
| Normal Current | 0 ~ 300A | | 0 ~ 375A | | 0 ~ 450A | |
| Surge Time | 10 ~ 2000ms | | 10 ~ 2000ms | | 10 ~ 2000ms | |
| Surge Step | 1 ~ 5 | | 1 ~ 5 | | 1 ~ 5 | |
| **Cal test Mode** | | | | | | |
| Mode CC | Setting range : 0.00A ~ 400.00A / Resolution : 6.4mA | | Setting range : 0.00A ~ 500.00A / Resolution : 8.0mA | | Setting range : 0.00A ~ 600.00A / Resolution : 9.6mA | |
| Mode CP | Setting range : 0.00W ~ 4000.0W / Resolution : 64.0mW | | Setting range : 0.00W ~ 5000.0W / Resolution : 80.0mW | | Setting range : 0.00W ~ 6000.0W / Resolution : 96mW | |
| STOP Voltage(UVP) | Setting range : 0.00V ~ 150.00V / Resolution : 0.0025V | | | | | |
| STOP TIME | Setting range : OFF 1 ~ 99999s / Resolution : 1s | | | | | |
| STOP CAP.AH | Setting range : OFF 0.1 ~ 19999AH / Resolution : 0.1AH | | | | | |
| STOP CAP.WH | Setting range : OFF 0.1 ~ 19999WH / Resolution : 0.1WH | | | | | |
| **SEQ Load Mode ( remote only )** | | | | | | |
| Load mode | CC / CP | | | | | |
| Setting STEP | 2 ~ 16 | | | | | |
| Timing | 20 ~ 1000 μs / 2~ 65535ms / 66 ~ 999sec | | | | | |
| Resolution | 10 μs / 1ms / 1sec | | | | | |
| **Dynamic Mode** | | | | | | |
| Timing | | | | | | |
| Thigh & Tlow | 0.010~9.999 / 99.99 / 999.9 / 9999ms | | | | | |
| Resolution | 0.001 / 0.01 / 0.1 / 1ms | | | | | |
| Accuracy | 1 μs / 10 μs / 100 μs / 1ms ± 50ppm | | | | | |
| Slew Rate | 0.0256~1.600A / μs | 0.2560~16.000A / μs | 0.0320~2.000A / μs | 0.3200~20.000A / μs | 0.0384~2.400A / μs | 0.3840~24.000A / μs |
| Resolution | 0.0064A / μs | 0.064A / μs | 0.008A / μs | 0.08A / μs | 0.0096A / μs | 0.096A / μs |
| Min. Rise Time | 25 μs(typical) | | | | | |
| Accuracy | ±( 5% of Setting )±10 μs | | | | | |
| Current | | | | | | |
| Range | 0 ~ 40A | 40 ~ 400A | 0 ~ 50A | 50 ~ 500A | 0 ~ 60A | 60 ~ 600A |
| Resolution | 0.64mA | 6.4mA | 0.8mA | 8mA | 0.96mA | 9.6mA |
| **Conf Key Parameter** | | | | | | |
| LDon Voltage | Setting range : 0.25V ~ 62.50V / Resolution : 0.25V | | | | | |
| LDoFF Voltage | Setting range : 0.000V ~ 62.250V / Resolution : 0.002SV | | | | | |
| Average Time | 0 ~ 64 | | | | | |
| CV Res. Speed | 1 ~ 4 (Fastest) | | | | | |
| **Measurement** | | | | | | |
| Voltage Read Back Range (5 Digital) | 0 ~ 15V | 15 ~ 150V | 0 ~ 15V | 15 ~ 150V | 0 ~ 15V | 15 ~ 150V |
| Resolution | 0.25mV | 2.5mV | 0.25mV | 2.5mV | 0.25mV | 2.5mV |
| Accuracy | ± 0.025% of (Reading + Range) | | | | | |
| Current Read Back Range (5 Digital) | 0 ~ 40A | 40 ~ 400A | 0 ~ 50A | 50 ~ 500A | 0 ~ 60A | 60 ~ 600A |
| Resolution | 0.64mA | 6.4mA | 0.8mA | 8mA | 0.96mA | 9.6mA |
| Accuracy | ± 0.05% of (Reading + Range) | | | | | |
| Power Read Back Range (5 Digital) | 4kW | | 5kW | | 6kW | |
| Resolution | 0.01W | | | | | |
| Accuracy*4 | ± 0.06% of (Reading + Range) | | | | | |
| **General** | | | | | | |
| Typical Short Resistance | 1.8mΩ | | 1.5mΩ | | 1.2mΩ | |
| Maximum Short Current | 400A | | 500A | | 600A | |
| Load ON Voltage | 0.25 ~ 62.5V | | | | | |
| Load OFF Voltage | 0 ~ 62.25V | | | | | |
| Power Consumption | 550VA | | | | | |
| Dimension(H x W x D) | 177mm x 440mm x 745mm | | | | | |
| Weight | 28kg | | | | | |
| Temperature*8 | 0 ~ 40°C | | | | | |
| Safety & EMC | CE | | | | | |

Note *1 : The power rating specifications at ambient temperature = 25 °C
Note *2 : The range is automatically or forcing to range II only in CC mode
Note *3 : If the operating current is below range 0.1%, the accuracy specification is 0.1% F.S.
Note *4 : Power range = Vrange x Irange
Note *5 : Turbo mode for up to 1.5X Current rating & Power rating support Surge, Bms, Short /OCP /OPP test function
Note *6 : The best accuracy of OCP /OPP test is Istep /Pstep=1%FS
Note *7 : Bms Test function for Battery Management System Board SHORT, OCCP and OCDP Test
Note *8 : Operating temperature range is 0~40°C, All specifications apply for 25°C±5°C, Except as noted


PEL-5004G-150-400


PEL-5005G-150-500

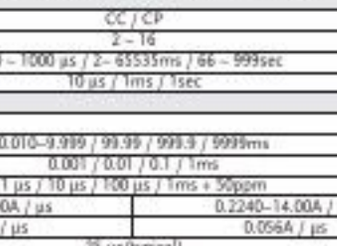

PEL-5006G-150-600

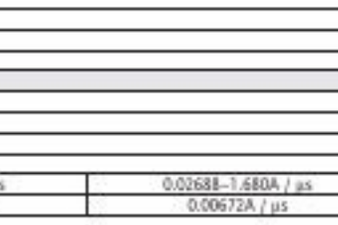
# High Power DC Electronic Load

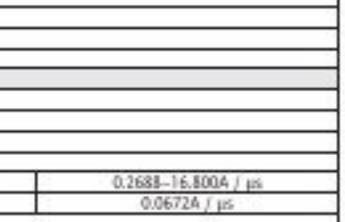
## SPECIFICATIONS

| MODEL | PEL-5004G-600-280 | | PEL-5005G-600-350 | | PEL-5006G-600-420 | |
|---|---|---|---|---|---|---|
| Power[*1] | 0 – 4kW | 0 – 6kW max.[*1] | 0 – 5kW | 0 – 7.5kW max.[*1] | 0 – 6kW | 0 – 9kW max.[*1] |
| Current | 0 – 280A | 0 – 420A max.[*1] | 0 – 350A | 0 – 525A max.[*1] | 0 – 420A | 0 – 630A max.[*1] |
| Voltage | 0 – 600V | | 0 – 600V | | 0 – 600V | |
| Min. Operating Voltage | 10V@280A | | 10V@350A | | 10V@420A | |
| **Protections** | | | | | | |
| Over Power Protection(OPP) | 105% | | | | | |
| Over Current Protection(OCP) | 104% | | | | | |
| Over Voltage Protection(OVP) | 105% | | | | | |
| Over Temp Protection(OTP) | 90°C±5°C | | | | | |
| **Constant Current Mode** | | | | | | |
| Range[*2] | 0 – 28A | 0 – 280A | 0 – 35A | 0 – 350A | 0 – 42A | 0 – 420A |
| Resolution | 0.448mA | 4.48mA | 0.56mA | 5.6mA | 0.672mA | 6.72mA |
| Accuracy[*3] | ± 0.05% of (Setting + Range) | | | | | |
| **Constant Resistance Mode** | | | | | | |
| Range | 128610Ω – 2.1435Ω | 2.1435Ω – 0.0357Ω | 102888Ω – 1.7148Ω | 1.7148Ω – 0.0285Ω | 85740Ω – 1.4290Ω | 1.4290Ω – 0.0238Ω |
| Resolution | 8 µS | 35.73µΩ | 10 µS | 28.584µΩ | 12 µS | 23.82µΩ |
| Accuracy | ± 0.1%(Vin / Setting)±0.1% IF.S. | ± 0.1% of (Setting + Range)±0.1% IF.S. | ± 0.1%(Vin / Setting)±0.1% IF.S. | ± 0.1% of (Setting + Range)±0.1% IF.S. | ± 0.1%(Vin / Setting) ±0.1% IF.S. | ± 0.1% of (Setting + Range) ±0.1% IF.S. |
| **Constant Voltage Mode** | | | | | | |
| Range | 0 – 600V | | | | | |
| Resolution | 10mV | | | | | |
| Accuracy | ± 0.05% of (Setting + Range) | | | | | |
| **Constant Power Mode** | | | | | | |
| Range | 0 – 400W | 400 – 4kW | 0–500W | 500–5kW | 0–600W | 600–6kW |
| Resolution | 6.4mW | 64mW | 8mW | 80mW | 9.6mW | 96mW |
| Accuracy[*4] | ± 0.2% of (Setting + Range) | | | | | |
| **Constant Voltage Mode + Current Limit Mode** | | | | | | |
| Range | 600V | 280A | 600V | 350A | 600V | 420A |
| Resolution | 10mV | 4.48mA | 10mV | 5.6mA | 10mV | 6.72mA |
| Accuracy[*4] | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) |
| **Constant Voltage Mode + Power Limit Mode** | | | | | | |
| Range | 600V | 4kW | 600V | 5kW | 600V | 6kW |
| Resolution | 10mV | 64mW | 10mV | 80mW | 10mV | 96mW |
| Accuracy[*4] | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) |
| **Turbo Mode[*5]** | **OFF** | **ON** | **OFF** | **ON** | **OFF** | **ON** |
| **Short / OCP / OPP Test Function** | | | | | | |
| Max. Current | 280A | 420A | 350A | 525A | 420A | 630A |
| Max. Power | 4000W | 6000W | 5000W | 7500W | 6000W | 9000W |
| Test Accuracy[*6] | ± 1.0% of (Reading + Range) | | | | | |
| Short Time | 100 – 10000ms<br>Continuous | 100 – 2000ms | 100 – 10000ms<br>Continuous | 100 – 2000ms | 100 – 10000ms<br>Continuous | 100 – 2000ms |
| Setting. Accuracy | ±5ms | | | | | |
| Short V Hi | Setting range : 0.00V - 600.00V / Resolution : 0.01V | | | | | |
| Short V Lo | Setting range : 0.00V - 600.00V / Resolution : 0.01V | | | | | |
| OCP Time (Tstep) | 100ms | 20ms | 100ms | 20ms | 100ms | 20ms |
| Setting. Accuracy | ±5ms | | | | | |
| OCP ISTAR / ISTEP / ISTOP | Setting range : 0.00A - 280.00A / Resolution : 4.48mA | Setting range : 0.00A - 420.00A / Resolution : 6.72mA | Setting range : 0.00A - 350.00A / Resolution : 5.6mA | Setting range : 0.00A - 525.00A / Resolution : 8.4mA | Setting range : 0.00A - 420.00A / Resolution : 6.72mA | Setting range : 0.00A - 630.00A / Resolution : 10.08mA |
| OCP VTH | Setting range : 0.00V - 600.00V / Resolution : 0.01 V | | | | | |
| OPP Time(Tstep) | 100ms | 20ms | 100ms | 20ms | 100ms | 20ms |
| Setting. Accuracy | ±5ms | | | | | |
| OPP PSTAR / PSTEP / PSTOP | Setting range : 0.00W - 4000.0W / Resolution : 64.0mW | Setting range : 0.00W - 6000.0W / Resolution : 96.0mW | Setting range : 0.00W - 5000.0W / Resolution : 80.0mW | Setting range : 0.00W - 7500.0W / Resolution : 120mW | Setting range : 0.00W - 6000.0W / Resolution : 96mW | Setting range : 0.00W - 9000.0W / Resolution : 144mW |
| OPP VTH | Setting range : 0.00V - 600.00V / Resolution : 0.01V | | | | | |
| **BMS Test Mode[*7]** | | | | | | |
| Max. Current | 280A | 420A | 350A | 525A | 420A | 630A |
| Meas. Accuracy[*6] | ±3.0% of ( Reading + Range ) | | | | | |
| Short test Time | 0.05ms-10ms / Resolution : 0.01ms | | | | | |
| Meas. Accuracy | ±0.02ms | | | | | |
| Setting Accuracy | ±0.05ms | | | | | |
| Short ITH | Setting range : 0.13A - 140.00A / Resolution : 4.48mA | Setting range : 0.20A - 210.00A / Resolution : 6.72mA | Setting range : 0.16A - 175.00A / Resolution : 5.6mA | Setting range : 0.25A - 262.50A / Resolution : 8.4mA | Setting range : 0.20A - 210.00A / Resolution : 6.72mA | Setting range : 0.30A - 315.0 A / Resolution : 10.08mA |
| OCP ISTAR | Setting range : 0.44A - 280.00A / Resolution : 4.48mA | Setting range : 0.67A - 420.00A / Resolution : 6.72mA | Setting range : 0.56A - 350.00A / Resolution : 5.6mA | Setting range : 0.84A - 525.00A / Resolution : 8.4mA | Setting range : 0.67A - 420.00A / Resolution : 6.72mA | Setting range : 1.00A - 630.00A / Resolution : 10.08mA |
| OCP TSTEP | 0.05 – 10ms<br>11 – 1000ms | 0.05 – 10ms | 0.05 – 10ms<br>11 – 1000ms | 0.05 – 10ms | 0.05 – 10ms<br>11 – 1000ms | 0.05 – 10ms |
| Meas. Accuracy | ±0.1ms / ±0.5ms | ±0.5ms | ±0.1ms / ±0.5ms | ±0.5ms | ±0.1ms / ±0.5ms | ±0.5ms |
| OCP ISTEP | Setting range : 0.00A - 280.00A / Resolution : 4.48mA | Setting range : 4.20A - 420.00A / Resolution : 6.72mA | Setting range : 0.00A - 350.00A / Resolution : 5.6mA | Setting range : 5.25A - 525.00A / Resolution : 8.4mA | Setting range : 0.00A - 420.00A / Resolution : 6.72mA | Setting range : 6.30A - 630.00A / Resolution : 10.08mA |
| OCP ISTOP | Setting range : 0.44A - 280.00A / Resolution : 4.48mA | Setting range : 0.67A - 420.00A / Resolution : 6.72mA | Setting range : 0.56A - 350.00A / Resolution : 5.6mA | Setting range : 0.84A - 525.00A / Resolution : 8.4mA | Setting range : 0.67A - 420.00A / Resolution : 6.72mA | Setting range : 1.00A - 630.00A / Resolution : 10.08mA |
| OCP ITH | Setting range : 0.13A - 140.00A / Resolution : 4.48mA | Setting range : 0.20A - 210.00A / Resolution : 6.72mA | Setting range : 0.16A - 175.00A / Resolution : 5.6mA | Setting range : 0.25A - 262.50A / Resolution : 8.4mA | Setting range : 0.20A - 210.00A / Resolution : 6.72mA | Setting range : 0.30A - 315.00A / Resolution : 10.08mA |
| **Surge Test Mode** | | | | | | |
| Surge Current | 0 – 420A | | 0 – 525A | | 0 – 630A | |
| Normal Current | 0 – 210A | | 0 – 262.5A | | 0 – 315A | |
| Surge Time | 10 – 2000ms | | 10 – 2000ms | | 10 – 2000ms | |
| Surge Step | 1 – 5 | | 1 – 5 | | 1 – 5 | |
| **Bms test Mode** | | | | | | |
| Mode CC | Setting range : 0.00A - 280.00A / Resolution : 4.48mA | | Setting range : 0.00A - 350.00A / Resolution : 5.6mA | | Setting range : 0.00A - 420.00A / Resolution : 6.72mA | |
| Mode CP | Setting range : 0.00W - 4000.0W / Resolution : 64.0mW | | Setting range : 0.00W - 5000.0W / Resolution : 80.0mW | | Setting range : 0.00W - 6000.0W / Resolution : 96mW | |
| STOP Voltage (UVP) | Setting range : 0.00V - 600.00V / Resolution : 0.01V | | | | | |
| STOP TIME | Setting range : OFF 1 - 99999s / Resolution : 1s | | | | | |
| STOP CAP.AH | Setting range : OFF 0.1 - 19999AH / Resolution : 0.1AH | | | | | |
| STOP CAP.WH | Setting range : OFF 0.1 - 19999WH / Resolution : 0.1WH | | | | | |
| **SEQ Load Mode ( remote only )** | | | | | | |
| Load Mode | CC / CP | | | | | |
| Setting STEP | 2 – 16 | | | | | |
| Timing | 20 – 1000 µs / 2– 65535ms / 66 – 999sec | | | | | |
| Resolution | 10 µs / 1ms / 1sec | | | | | |
| **Dynamic Mode** | | | | | | |
| Timing | | | | | | |
| Thigh & Tlow | 0.010–9.999 / 99.99 / 999.9 / 9999ms | | | | | |
| Resolution | 0.001 / 0.01 / 0.1 / 1ms | | | | | |
| Accuracy | 1 µs / 10 µs / 100 µs / 1ms + 50ppm | | | | | |
| Slew Rate | 0.01792–1.120A / µs | 0.1792–11.200A / µs | 0.0224–1.400A / µs | 0.2240–14.00A / µs | 0.02688–1.680A / µs | 0.2688–16.800A / µs |
| Resolution | 0.00448A / µs | 0.0448A / µs | 0.0056A / µs | 0.056A / µs | 0.00672A / µs | 0.0672A / µs |
| Min. Rise Time | 25 µs(typical) | | | | | |
| Accuracy | ±( 5% of Setting )±10 µs | | | | | |
| Current | | | | | | |
| Range | 0 – 28A | 28 – 280A | 0 – 35A | 35 – 350A | 0 – 42A | 42 – 420A |
| Resolution | 0.45mA | 4.48mA | 0.56mA | 5.6mA | 0.67mA | 6.72mA |
| **Conf Key Parameter** | | | | | | |
| LDon Voltage | Setting range : 0.4V - 100.0V / Resolution : 0.4V | | | | | |
| LDoFF Voltage | Setting range : 0.000V - 99.60V / Resolution : 0. 01V | | | | | |
| Average Time | 0 – 64 | | | | | |
| CV Res. Speed | 1 – 4 (Fastest) | | | | | |
| **Measurement** | | | | | | |
| Voltage Read Back Range (5 Digital) | 0 – 60V | 60– 600V | 0 – 60V | 60 – 600V | 0 – 60V | 60 – 600V |
| Resolution | 1.00mV | 10.0mV | 1.00mV | 10.0mV | 1.00mV | 10.0mV |
| Accuracy | ± 0.025% of (Reading + Range) | | | | | |
| Current Read Back Range (5 Digital) | 0 – 28A | 28 – 280A | 0 – 35A | 35 – 350A | 0 – 42A | 42 – 420A |
| Resolution | 0.448mA | 4.48mA | 0.56mA | 5.6mA | 0.672mA | 6.72mA |
| Accuracy | ± 0.05% of (Reading + Range) | | | | | |
| Power Read Back Range (5 Digital) | 4kW | | 5kW | | 6kW | |
| Resolution | 0.01W | | | | | |
| Accuracy[*4] | ± 0.06% of (Reading + Range) | | | | | |
| **General** | | | | | | |
| Typical Short Resistance | 35.73mΩ | | 28.584mΩ | | 23.82mΩ | |
| Maximum Short Current | 280A | | 350A | | 420A | |
| Load ON Voltage | 0.4 – 100V | | | | | |
| Load OFF Voltage | 0 – 99.6V | | | | | |
| Power Consumption | 550VA | | | | | |
| Dimension(H x W x D) | 177mm x 440mm x 745mm | | | | | |
| Weight | 29kg | | | | | |
| Temperature[*8] | 0 – 40°C | | | | | |
| Safety & EMC | CE | | | | | |

Note *1 : The power rating specifications at ambient temperature = 25 °C
Note *2 : The range is automatically or forcing to range II only in CC mode
Note *3 : If the operating current is below range 0.3%, the accuracy specification is 0.1% F.S.
Note *4 : Power range = Vrange x Irange
Note *5 : Turbo mode for up to 1.5X Current rating & Power rating support Surge, Bms, Short /OCP /OPP test function
Note *6 : The best accuracy of OCP /OPP test is Istep /Pstep=1%FS
Note *7 : Bms Test function for Battery Management System Board SHORT, OCCP and OCDP Test
Note *8 : Operating temperature range is 0~40°C, All specifications apply for 25°C±5°C, Except as noted


PEL-5004G-600-280

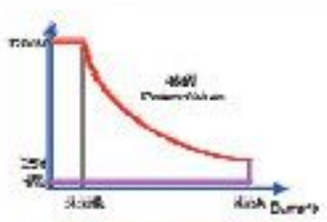

PEL-5005G-600-350

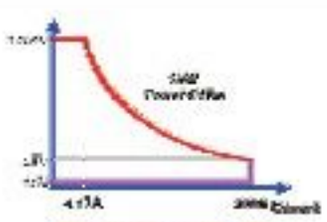

PEL-5006G-600-420

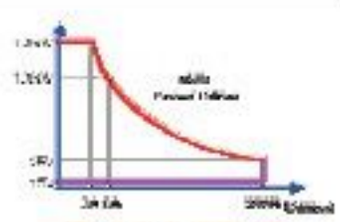
## SPECIFICATIONS

| MODEL | PEL-5004G-1200-160 | | PEL-5005G-1200-200 | | PEL-5006G-1200-240 | |
|---|---|---|---|---|---|---|
| Power*1 | 0 ~ 4kW | 0 ~ 6kW max.*1 | 0 ~ 5kW | 0 ~ 7.5kW max.*1 | 0 ~ 6kW | 0 ~ 9kW max.*1 |
| Current | 0 ~ 160A | 0 ~ 240A max.*1 | 0 ~ 200A | 0 ~ 300A max.*1 | 0 ~ 240A | 0 ~ 360A max.*1 |
| Voltage | 0 ~ 1200V | | 0 ~ 1200V | | 0 ~ 1200V | |
| Min. Operating Voltage | 15V@100A | | 15V@200A | | 15V@240A | |
| **Protections** | | | | | | |
| Over Power Protection(OPP) | 105% | | | | | |
| Over Current Protection(OCP) | 104% | | | | | |
| Over Voltage Protection(OVP) | 105% | | | | | |
| Over Temp Protection(OTP) | 90°C±5°C | | | | | |
| **Constant Current Mode** | | | | | | |
| Range*2 | 0 ~ 16A | 0 ~ 160A | 0 ~ 20A | 0 ~ 200A | 0 ~ 24A | 0 ~ 240A |
| Resolution | 0.256mA | 2.56mA | 0.32mA | 3.2mA | 0.384mA | 3.84mA |
| Accuracy*3 | ± 0.05% of (Setting + Range) | | | | | |
| **Constant Resistance Mode** | | | | | | |
| Range | 450kΩ ~ 7.5Ω | 7.5Ω ~ 0.0937Ω | 360kΩ ~ 6Ω | 6Ω ~ 0.075Ω | 300kΩ ~ 5Ω | 5Ω ~ 0.0625Ω |
| Resolution | 2.2 µS | 125µΩ | 2.8 µS | 100µΩ | 3.3 µS | 83.34µΩ |
| Accuracy | ± 0.1%(Vin / Setting)±0.1% IF.S. | ± 0.1% of (Setting + Range)±0.1% IF.S. | ± 0.1%(Vin / Setting)±0.1% IF.S. | ± 0.1% of (Setting + Range)±0.1% IF.S. | ± 0.1%(Vin / Setting) ±0.1% IF.S. | ± 0.1% of (Setting + Range) ±0.1% IF.S. |
| **Constant Voltage Mode** | | | | | | |
| Range | 0~1200V | | | | | |
| Resolution | 20mV | | | | | |
| Accuracy | ± 0.05% of (Setting + Range) | | | | | |
| **Constant Power Mode** | | | | | | |
| Range | 0 ~ 400W | 400 ~ 4kW | 0~500W | 500~5kW | 0~600W | 600~6kW |
| Resolution | 6.4mW | 64mW | 8mW | 80mW | 9.6mW | 96mW |
| Accuracy*4 | ± 0.2% of (Setting + Range) | | | | | |
| **Constant Voltage Mode + Current Limit Mode** | | | | | | |
| Range | 1200V | 160A | 1200V | 200A | 1200V | 240A |
| Resolution | 20mV | 2.56mA | 20mV | 3.2mA | 20mV | 3.84mA |
| Accuracy*4 | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) |
| **Constant Voltage Mode + Power Limit Mode** | | | | | | |
| Range | 1200V | 4kW | 1200V | 5kW | 1200V | 6kW |
| Resolution | 20mV | 64mW | 20mV | 80mW | 20mV | 96mW |
| Accuracy*4 | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) | ± 0.05% of (Setting + Range) | ± 1.0% of (Setting + Range) |
| **Turbo Mode*5** | **OFF** | **ON** | **OFF** | **ON** | **OFF** | **ON** |
| **Short / OCP / OPP Test Function** | | | | | | |
| Max. Current | 160A | 240A | 200A | 300A | 240A | 360A |
| Max. Power | 4000W | 6000W | 5000W | 7500W | 6000W | 9000W |
| Test Accuracy*6 | ± 1.0% of (Reading + Range) | | | | | |
| Short Time | 100 ~ 10000ms<br>Continuous | 100 ~ 2000ms | 100 ~ 10000ms<br>Continuous | 100 ~ 2000ms | 100 ~ 10000ms<br>Continuous | 100 ~ 2000ms |
| Setting. Accuracy | ±5ms | | | | | |
| Short V Hi | Setting range : 0.25V - 1200.0V / Resolution : 0.02V | | | | | |
| Short V Lo | Setting range : 0.000V - 1200.0V / Resolution : 0.02V | | | | | |
| OCP Time(Tstep) | 100ms | 20ms | 100ms | 20ms | 100ms | 20ms |
| Setting. Accuracy | ±5ms | | | | | |
| OCP ISTAR / ISTEP / ISTOP | Setting range : 0.00A - 160.00A / Resolution : 2.56mA | Setting range : 0.00A - 240.00A / Resolution : 3.84mA | Setting range : 0.00A - 200.00A / Resolution : 3.2mA | Setting range : 0.00A - 300.00A / Resolution : 4.8mA | Setting range : 0.00A - 240.00A / Resolution : 3.84mA | Setting range : 0.00A - 360.00A / Resolution : 5.76mA |
| OCP VTH | Setting range : 0.00V - 1200.00V / Resolution : 0.02V | | | | | |
| OPP Time(Tstep) | 100ms | 20ms | 100ms | 20ms | 100ms | 20ms |
| Setting. Accuracy | ±5ms | | | | | |
| OPP PSTAR / PSTEP / PSTOP | Setting range : 0.00W - 4000.0W / Resolution : 64.0mW | Setting range : 0.00W - 6000.0W / Resolution : 96.0mW | Setting range : 0.00W - 5000.0W / Resolution : 80.0mW | Setting range : 0.00W - 7500.0W / Resolution : 120mW | Setting range : 0.00W - 6000.0W / Resolution : 96mW | Setting range : 0.00W - 9000.0W / Resolution : 144mW |
| OPP VTH | Setting range : 0.00V - 1200.00V / Resolution : 0.02V | | | | | |
| **BMS Test Mode*7** | | | | | | |
| Max. Current | 160A | 240A | 200A | 300A | 240A | 360A |
| Meas. Accuracy*6 | ±3.0% of ( Reading + Range ) | | | | | |
| Short test Time | 0.05ms~10ms / Resolution : 0.01ms | | | | | |
| Meas. Accuracy | ±0.02ms | | | | | |
| Setting Accuracy | ±0.05ms | | | | | |
| Short ITH | Setting range : 0.07A - 80.00A / Resolution : 2.56mA | Setting range : 0.11A - 120.00A / Resolution : 3.84mA | Setting range : 0.09A - 100.00A / Resolution : 3.2mA | Setting range : 0.14A - 150.00A / Resolution : 4.8mA | Setting range : 0.11A - 120.00A / Resolution : 3.84mA | Setting range : 0.17A - 180.00A / Resolution : 5.76mA |
| OCP ISTAR | Setting range : 0.25A - 160.00A / Resolution : 2.56mA | Setting range : 0..38A - 240.00A / Resolution : 3.84mA | Setting range : 0.32A - 200.00A / Resolution : 3.2mA | Setting range : 0..48A - 300.00A / Resolution : 4.8mA | Setting range : 0.38A - 240.00A / Resolution : 3.84mA | Setting range : 0..57A - 360.00A / Resolution : 5.76mA |
| OCP TSTEP | 0.05 ~ 10ms<br>11 ~ 1000ms | 0.05 ~ 10ms | 0.05 ~ 10ms<br>11 ~ 1000ms | 0.05 ~ 10ms | 0.05 ~ 10ms<br>11 ~ 1000ms | 0.05 ~ 10ms |
| Meas. Accuracy | ±0.1ms / ±0.5ms | ±0.5ms | ±0.1ms / ±0.5ms | ±0.5ms | ±0.1ms / ±0.5ms | ±0.5ms |
| OCP ISTEP | Setting range : 0.00A - 160.00A / Resolution : 2.56mA | Setting range : 2.40A - 240.00A / Resolution : 3.84mA | Setting range : 0.00A - 200.00A / Resolution : 3.2mA | Setting range : 3.00A - 300.00A / Resolution : 4.8mA | Setting range : 0.00A - 240.00A / Resolution : 3.84mA | Setting range : 3.60A - 360.00A / Resolution : 5.76mA |
| OCP ISTOP | Setting range : 0.25A - 160.00A / Resolution : 2.56mA | Setting range : 0.38A - 240.00A / Resolution : 3.84mA | Setting range : 0.32A - 200.00A / Resolution : 3.2mA | Setting range : 0.48A - 300.00A / Resolution : 4.8mA | Setting range : 0.38A - 240.00A / Resolution : 3.84mA | Setting range : 0.57A - 360.00A / Resolution : 5.76mA |
| OCP ITH | Setting range : 0.07A - 80.00A / Resolution : 2.56mA | Setting range : 0.11A - 120.00A / Resolution : 3.84mA | Setting range : 0.09A - 100.00A / Resolution : 3.2mA | Setting range : 0.14A - 150.00A / Resolution : 4.8mA | Setting range : 0.11A - 120.00A / Resolution : 3.84mA | Setting range : 0.17A - 180.00A / Resolution : 5.76mA |
| **Surge Test Mode** | | | | | | |
| Surge Current | 0 ~ 240A | | 0 ~ 300A | | 0 ~ 360A | |
| Normal Current | 0 ~ 120A | | 0 ~ 150A | | 0 ~ 180A | |
| Surge Time | 10 ~ 2000ms | | 10 ~ 2000ms | | 10 ~ 2000ms | |
| Surge Step | 1 ~ 5 | | 1 ~ 5 | | 1 ~ 5 | |
| **Unit test Mode** | | | | | | |
| Mode CC | Setting range : 0.00A - 160.00A / Resolution : 2.56mA | | Setting range : 0.00A -200.00A / Resolution : 3.2mA | | Setting range : 0.00A - 240.00A / Resolution : 3.84mA | |
| Mode CP | Setting range : 0.00W - 4000.0W / Resolution : 64.0mW | | Setting range : 0.00W - 5000.0W / Resolution : 80.0mW | | Setting range : 0.00W - 6000.0W / Resolution : 96mW | |
| STOP Voltage (UVP) | Setting range : 0.00V - 1200.00V / Resolution : 0.02V | | | | | |
| STOP TIME | Setting range : OFF 1 ~ 99999s / Resolution : 1s | | | | | |
| STOP CAP.AH | Setting range : OFF 0.1 ~ 19999AH / Resolution : 0.1AH | | | | | |
| STOP CAP.WH | Setting range : OFF 0.1 ~ 19999WH / Resolution : 0.1WH | | | | | |
| **SEQ Load Mode ( remote only )** | | | | | | |
| Load Mode | CC / CP | | | | | |
| Setting STEP | 2 ~ 16 | | | | | |
| Timing | 20 ~ 1000 µs / 2~ 65535ms / 66 ~ 999sec | | | | | |
| Resolution | 10 µs / 1ms / 1sec | | | | | |
| **Dynamic Mode** | | | | | | |
| Timing | | | | | | |
| Thigh & Tlow | 0.010~9.999 / 99.99 / 999.9 / 9999ms | | | | | |
| Resolution | 0.001 / 0.01 / 0.1 / 1ms | | | | | |
| Accuracy | 1 µs / 10 µs / 100 µs / 1ms + 50ppm | | | | | |
| Slew Rate | 0.01024 ~ 0.640A / µs | 0.1024 ~ 6.400A / µs | 0.0128~0.800A / µs | 0.1280~8.000A / µs | 0.01536~0.960A / µs | 0.1536~9.600A / µs |
| Resolution | 0.00256A / µs | 0.0256A / µs | 0.0032A / µs | 0.032A / µs | 0.00384A / µs | 0.0384A / µs |
| Min. Rise Time | 25 µs(typical) | | | | | |
| Accuracy | +| 5% of Setting |+10 µs | | | | | |
| Current | | | | | | |
| Range | 0 ~ 16A | 16 ~ 160A | 0 ~ 20A | 20 ~ 200A | 0 ~ 24A | 42 ~ 240A |
| Resolution | 0.26mA | 2.56mA | 0.32mA | 3.2mA | 0.38mA | 3.84mA |
| **Conf Key Parameter** | | | | | | |
| LDon Voltage | Setting range : 1V - 250.0V / Resolution : 1V | | | | | |
| LDoFF Voltage | Setting range : 0.000V - 249.0V / Resolution : 0.02V | | | | | |
| Average Time | 0 ~ 64 | | | | | |
| CV Res. Speed | 1 ~ 4 (Fastest) | | | | | |
| **Measurement** | | | | | | |
| Voltage Read Back Range (5 Digital) | 0 ~ 120V | 120 ~ 1200V | 0 ~ 120V | 120 ~ 1200V | 0 ~ 120V | 120 ~ 1200V |
| Resolution | 2.00mV | 20.0mV | 2.00mV | 20.0mV | 2.00mV | 20.0mV |
| Accuracy | ± 0.025% of (Reading + Range) | | | | | |
| Current Read Back Range (5 Digital) | 0 ~ 16A | 16 ~ 160A | 0 ~ 20A | 20 ~ 200A | 0 ~ 24A | 24 ~ 240A |
| Resolution | 0.256mA | 2.56mA | 0.32mA | 3.2mA | 0.384mA | 3.84mA |
| Accuracy | ± 0.05% of (Reading + Range) | | | | | |
| Power Read Back Range (5 Digital) | 4kW | | 5kW | | 6kW | |
| Resolution | 0.01W | | | | | |
| Accuracy*6 | ± 0.06% of (Reading + Range) | | | | | |
| **General** | | | | | | |
| Typical Short Resistance | 93.75mΩ | | 75mΩ | | 62.505mΩ | |
| Maximum Short Current | 160A | | 200A | | 240A | |
| Load ON Voltage | 1 ~ 250V | | | | | |
| Load OFF Voltage | 0 ~ 249V | | | | | |
| Power Consumption | 550VA | | | | | |
| Dimension(H x W x D) | 177mm x 440mm x 745mm | | | | | |
| Weight | 29kg | | | | | |
| Temperature*8 | 0 ~ 40°C | | | | | |
| Safety & EMC | CE | | | | | |

Note *1 : The power rating specifications at ambient temperature = 25 °C
Note *2 : The range is automatically or forcing to range II only in CC mode
Note *3 : If the operating current is below range 0.1%, the accuracy specification is 0.1% F.S.
Note *4 : Power range = Vrange x Irange
Note *5 : Turbo mode for up to 1.5X Current rating & Power rating support Surge, Bms, Short /OCP /OPP test function
Note *6 : The best accuracy of OCP /OPP test is Istep /Pstep=1%FS
Note *7 : Bms Test function for Battery Management System Board SHORT, OCCP and OCDP Test
Note *8 : Operating temperature range is 0~40°C, All specifications apply for 25°C±5°C, Except as noted


PEL-5004G-1200-160


PEL-5005G-1200-200


PEL-5006G-1200-240

# ACCESSORIES

| MODEL | DESCRIPTION | APPLICABLE DEVICE |
|---|---|---|
| APS-001 | GPIB Interface Card | APS-7000 Series |
| APS-002 | RS-232/USB Interface Card | APS-7000, APS-1100 |
| APS-003 | Output Voltage Capacity (0~600V/rms) | APS-7000 Series |
| APS-004 | Output Frequency Capacity (45~500Hz) | APS-7000 Series |
| APC-001 | RS-232 Interface Card | APC-7000, APC-7500 |
| APC-002 | Air Inlet Filter | ASR-3000 Series |
| ASR-001 | Air Inlet Filter | ASR-5000 Series |
| ASR-002 | External Temp/Humy Control Unit | ASR-5000 Series, ASR-6000 Series |
| CET-001 | Extended Terminal with max.20A for 300V/600V/1000V models | PSW-Series, PSW-4U(R) Series |
| CET-002 | Extended Terminal with max.15A for 2000/3000V models | PSW-Series, PSW-4U(R) Series |
| CET-003 | Extended Universal Power Socket | ASR-2000 Series |
| CET-004 | Extended European Power Socket | ASR-2000 Series |
| CET-005 | Extended European Terminal with max.20A for 300V/600V/1000V models | PSW-Series, PSW-4U(R) Series |
| CPS-001 | Inrush, Voltage/Current Protection Board | CPS-x100 Series, SPS-1000 |
| CPW-001 | US/CSA Power Cord, 3000mm | PSU Series |
| CPW-002 | VDE Power Cord, 3000mm | PSU Series |
| CPW-003 | PSE Power Cord, 3000mm | PSU Series |
| CPW-005 | Power cord, 5m, 16A, 1φ, IEC/CSA type | ASR-2000 Series |
| CPW-006 | Power cord, 5m, 16A, 1φ, VDE type | ASR-2000 Series |
| CPW-007 | Power cord, 5m, 16A, 1φ, PSE type | ASR-2000 Series |
| GRA-401 | Rack Mount Kit, 19", 4U Size | GPP Series, GPR-M Series, PPE-3323, PPS-3651, PPT Series, PEL-300 |
| GRA-402 | Rack Mount Kit, 19", 4U Size | PSH Series |
| GRA-407 | Rack Mount Kit, 19", 4U Size | PSM Series |
| GRA-408 | Rack Mount Kit, 19", 4U Size | PSE Series |
| GRA-409 | Rack Mount Kit, 19", 8U Size | APS-7400 |
| GRA-410-E | Rack Mount kit (2pcs), 19", 3U Size | PSW-Series, PSW-4U(R) Series |
| GRA-410-J | Rack Mount kit (2pcs), 19", 3U Size | PSW-Series, PSW-4U(R) Series |
| GRA-412-E | Rack Mount Kit (2pcs), 19", 3U Size | PEL-3121/3121-H |
| GRA-412-J | Rack Mount Kit (2pcs), 19", 3U Size | PEL-3121/3121-H |
| GRA-414-E | Rack Mount Kit (2pcs), 19", 3U Size | PEL-3031(H)/3041(H)/3111(H), PEL-3000AE Series |
| GRA-414-J | Rack Mount Kit (2pcs), 19", 3U Size | PEL-3031(H)/3041(H)/3111(H), PEL-3000AE Series |
| GRA-430-E | Rack Mount kit (2pcs), 19", 3U Size | PSB-1000 Series |
| GRA-430-J | Rack Mount kit (2pcs), 19", 3U Size | PSB-1000 Series |
| GRA-419-E | Rack Mount kit (2pcs), 19", 2U Size | PCS-1000 |
| GRA-419-J | Rack Mount kit (2pcs), 19", 2U Size | PCS-1000 |
| GRA-433 | Rack Mount Kit, 19", 3U Size | APS-7000/7000E Series |
| GRA-434 | Rack Mount Kit, 19", 8U Size | PSB-2000 Series |
| GRA-435 | Rack Mount Kit (2pcs), 19", 3U Size | PSP Series |
| GRA-439 | Rack Mount Kit, 7U Size | APS-7400 Series |
| GRA-440 | Rack Mount Kit, 9U Size | APS-7500 Series |
| GRA-441-J | Rack Mount Kit (2pcs) | PPB Series |
| GRA-451-E | Rack Mount Kit (2pcs) | PPB Series |
| GRA-450-J | Rack Mount Kit (2pcs), 19", 3U Size | ASR-2000 Series |
| GRA-439-E | Rack Mount Kit(BAG), 19", 8U Size | ASR-2000 Series |
| GRA-441-J | Rack Mount kit (2pcs), 19", 3U Size | PPG Series |
| GRA-441-E | Rack Mount kit(BAG), 19", 8U Size | PPG Series |
| GRA-445-J | Rack Mount kit (2pcs), 19", 3U Size | ASR-3000 Series |
| GRA-445-E | Rack Mount Kit(BAG), 19", 8U Size | ASR-3000 Series |
| GRA-446-J | Rack Mount Kit (2pcs), 19", 3U Size | GPP Series, GPP-5060(50V) |
| GRA-446-E | Rack Mount Kit (2pcs), 19", 3U Size | GPP Series, GPP-5060(50V) |
| GET-001 | Shielded Cable (0.8m) | PSB-2000 Series |
| GRA-061 | Side Bracket 2pcs/set | PSU Series |
| GTL-104A | Test Lead, U-type to Alligator Test Lead, Max. Current 15A, 1000mm | PPE/PSW/PSP/PSU/PEL/APS/ASR/GPP/GPR/PPT Series, PPS-3651, SPD-3606, PPX Series, GPP-5060(50V) |
| GTL-106A | Test Lead, Alligator to Banana Test Lead, Max. Current 3A, 1000mm | PPE/PEL/PST/GPC/GPD/GPR/GPS/PPT Series, PEL-3000, PPE-3323, SPD-3606, PCS-1000, PPE Series |
| GTL-117 | Test Lead, Banana to Probe Test Lead, 1000mm | PPH-1303/1503C/1506D |
| GTL-120 | Test Lead, U-type to Dinpe Test Lead, Max. 40A, 1000mm | PEL-3000/3000H Series, PEL-2000(B) Series |
| GTL-121 | Sense Lead, Dinpe to Pin Lead, 1000mm | PEL-3000(B) Series |
| GTL-124 | Test Lead, U-type to Alligator Test Lead, Max. Current 60A, 1000mm | PSW Series, GPR-H Series, GPR-M Series |
| GTL-125 | Test Lead, U-type to Dinpe Test Lead, 1000mm | PSW Series, APS-3000 Series, PSB-1000 Series |
| GTL-126 | Test Leads (2 x red, 2 x black), for 2000/3000V models, 1200mm | PSW Series, PEW 4U(R) Series |
| GTL-134 | Test Leads for Rear Panel, 1000mm, 15A, 10 AWG | PPE Series |
| GTL-103 | Output Power unreflected wire, 60AWG 300, 600V, sense wire 15AWG 20A, 600V | ASR-3000 Series |
| GTL-3004 | Ground Lead, Banana to Banana, European Terminal, 200mm | APC-300 Series, PSM Series, GPD Series, GPP Series, GPE-3323 Series, SPD-3606, PPX Series, GPP-3060/6030 |
| GTL-098 | Sense Lead, Banana to Banana Lead, European Terminal, 1000mm | PSM Series |
| GTL-3004 | Test Lead, Banana to Alligator, European Terminal, Max. Current 3A, 1000mm | PSU/PST/GPE/GPR/PPE/PPS Series, SPD-3606, PPH-1303/1506D/1506D, PPX Series |
| GTL-3044 | Test Lead, Banana to Alligator, European Terminal, Max. Current 10A, 1000mm | PPE/PSW/PSP/PSU/GPE/GPR/PPT/PST/GPE/GPR Series, SPD-3606, PPH-1303/1506D/1506D, PPX Series, GPP-3060/6030 |
| GTL-3005 | Temperature Probe Adapter (Thermal Coupling, K Type), (2pcs), 1000mm | PPE Series |
| GTL-3004 | Test Lead, Banana to Probe Test Lead, 800mm | PCS-1000, GSM-020 |
| GTL-054 | Test Lead, U-type to Dinpe Test Lead, Max. 200A, 1000mm | PSU/PSW/PEL-3000 Series |
| GTL-059 | Test Lead, U-type to Dinpe Test Lead, Max. 200A, 3000mm | PSU/PSW/PEL-3000 Series |
| GTL-095 | Test Lead, U-type to B-type Test Lead, Max. 200A, 1000mm | PSU/PSW/PEL-3000 Series |
| GTL-097 | Test Lead, U-type to Dinpe Test Lead, Max. 200A, 3000mm | PSU/PSW/PEL-3000 Series |
| GTL-323 | Test Lead, U-type to Dinpe Test Lead, Max. 400A, 1000mm | PSU/PSW/PEL-3000 Series |
| GTL-324 | Test Lead, U-type to Dinpe Test Lead, Max. 400A, 3000mm | PSU/PSW/PEL-3000 Series |
| GTL-253 | RS-232C Cable, 9pin, F-F Type, null modem, 2000mm | PSU/PSW/PEL Series, APC-7500 Series, PEL-2000(B) Series, ASR-2000 Series, ASR-6000 Series |
| GTL-3044 | RS-232C Cable, 9pin, F-F Type, null modem, 2000mm | PSP Series |
| GTL-254 | RS-232 Cable, 9pin, F-F Type, 2000mm | APS-7050 |
| GTL-256 | RS-232 Cable, 9pin, M-F Type, 1000mm | PEL-300 Series |
| GTL-240 | USB Cable, USB 2.0 A-B Type (2.1pcs), 1200mm | PSW Series, PEU Series, APS-7102A, APS-7100 Series, PCS-1000 |
| GTL-248 | USB Cable, USB 2.0 A-B Type, 1200mm | PPE Series, PEU Series, PEB-2000 Series, PPH-1303/1503C/1506D Series, GPP Series, APS-7102A, APS-7000 Series, PEL-3000/3000H Series, PEL-3000AE Series, PEL-3000A(B) Series, PPX Series, PEL-3000C Series, ASR-5000 Series, GPP-3060/6030, GSM-020/GSM-060, PEL-3000C, ASR-2000 Series |

# ACCESSORIES

| MODEL | DESCRIPTION | APPLICABLE DEVICE |
|---|---|---|
| CTC-2A | GPIB Cable, Double Shielded, 2000mm | PSB-2000 Series, PPH-1503, PEA/PSW/PSB/PSH/PSM/PEL/PFF Series, APS-7000 Series, PEL-3000/3000A Series, PEL-3000E Series, PEL-3000[B] Series, ASR-3000 Series, PEL-3000C Series, ASL-3000 Series, PEL-1000C Series, CDM-3000 |
| CTC-2M | Frame Link Cable, 500mm | PEL-3000A-[B] Series |
| CTC-2S | GPIB Cable, Double Shielded, 1000mm | PSB/PSW-9040, PEL/PSH Series, PEB-2000 Series, APS-7000 Series, PEL-1000C Series, ASL-3000 Series |
| CTC-2T | Frame Link Cable, 300mm | PEL-3000/3000A Series |
| CTC-05 | GPIB Cable, 26 pins Micro-D Connector | PPX Series, PPH Series, ASR-3000 Series, PSB Series |
| CTC-05P | RS-232 Cable with DB9 Connector to RJ45 | PPX Series, PPH Series, PSU Series |
| CTC-06P | RS-485 Cable with DB9 Connector to RJ45 | PPX Series, PPH Series, PSU Series |
| CTC-06T | Serial Master Cable + Terminator, 0.5M | PSU Series, PPX Series, PEU Series, PPX Series |
| CTC-08E | RS-485 Slave Cable | PPX Series, PPX Series, PEU Series |
| CUC-001 | GPIB-USB Adapter, GPIB to USB Adapter | GSS-1000 Series, PSW Series, PSB Multi Series |
| CUR-001A | RS232-USB Cable, 100mm | PSW Series, PSW Multi Series |
| CUR-005A | RS-232 to USB Adapter with 64 dB 6MB Blue Box | PSW Multi Series |
| PFS-001 | Rack Accessory Kit | PFS-1000 |
| PEL-001 | GPIB Card | PEL-3000A-[B] Series |
| PEL-002 | Rack Mount Kit, PEL-3000 Series Rack Mount Kit | PEL-3000A-[B] Series |
| PEL-003 | Panel Cover | PEL-3000A-[B] Series |
| PEL-004 | GPIB 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 | Bond Fiber | PEL-3000/3000H Series, PEL-3000E Series |
| PEL-011 | Load Input Terminal Cover | PEL-3000/3000H Series |
| PEL-012 | Terminal Fixings, Kits | PEL-3000/3000H Series |
| PEL-013 | Flexible Terminal Cover | PEL-3000/3000H Series |
| PEL-014 | 5.5V Protection Plug | PEL-3000/3000H Series |
| PEL-015 | LAN Card | PEL-3000A-[B] Series |
| PEL-016 | LAN Card | PEL-3000/3000H Series |
| PEL-022 | GPIB Card | PEL-3000C Series, ASL-1000 Series, PEL-1000C Series |
| PEL-023 | RS-232 Card | PEL-3000C Series, ASL-1000 Series, PEL-1000C Series |
| PEL-024 | LAN Card | PEL-3000C Series, ASL-1000 Series, PEL-1000C Series |
| PEL-025 | USB Card | PEL-3000C Series, ASL-1000 Series, PEL-1000C Series |
| PEL-026 | Hook Ring | PEL-3000C Series |
| PEL-027-1~4 | Rack Mount Kit | PEL-3000C Series |
| PEL-028 | HANDCEL (U-shaped Handle)(Fixed on the Bracket) | PEL-3000C Series, ASL-1000 Series |
| PEL-029 | HANDCEL Rack Mount Handle(ASL-1002/1003/1004) | ASL-1000 Series |
| PEL-030 | GPIB+RS-232 Card | PEL-3000C Series, ASL-1000 Series, PEL-1000C Series |
| PEL-031 | Rack Mount Kit | PEL-3000L |
| PEL-032 | 5V/1 Current Monitor to Generator + RS232 Interface | PEL-3000L |
| PPX-A | GPIB Interface(Factory Installed) | PPX Series |
| PSB-001 | GPIB Card | PSB-2000 Series, PSB-3000 Series |
| PSB-003 | Parallel Connection Kit (for Horizontal Installation), Kit Includes: (PSB-009 Joint Kit, Horizontal Bus Bar x 2, PSB-008 x1) | PSB-2000 Series, PSB-3000 Series |
| PSB-004 | Parallel Connection Kit (for Vertical Installation) Kit Includes: (PSB-009 Joint Kit, Vertical Bus Bar x 2, PSB-008 x 1). | PSB-2000 Series, PSB-3000 Series |
| PSB-005 | Parallel Connection Signal Cable | PSB-2000 Series, PSB-3000 Series |
| PSB-006 | Serial Connection Signal Cable | PSB-2000 Series, PSB-3000 Series |
| PSB-007 | Joint Kit, Includes 4 Joining Plate, (M4x8 Screw) x 4, (M4 Washer) x 2 | PSB-2000 Series |
| PSB-008 | Vertical Cable (PSB-2000 Only) | PSB-2000 Series |
| PSB-103 | Cable for 2 units of PSB-1000 units in Parallel Mode Connection | PSB-1000 Series |
| PSB-105 | Cable for 3 units of PSB-1000 units in Parallel Mode Connection | PSB-1000 Series |
| PSB-104 | Cable for 4 units of PSB-1000 units in Parallel Mode Connection | PSB-1000 Series |
| PSB-106 | Cable for 2 units of PSB-1000 units in Series Mode Connection | PSB-1000 Series |
| PSB-109 | GPIB Card | PSB-1000 Series |
| PSB-106 | Rack Accessory Kit: (M4 Nominal Screws and Washers x 2, M5 Panhead 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-007 | Front Panel Filter kit (Factory Installed) | PSU Series |
| PSU-016 | Joins a vertical stack of 2 PSU units together. (2U-sized Handles x 2, joining plates x 2) | PSU Series |
| PSU-018 | Bus Bar for 2 units in parallel operation | PSU Series |
| PSU-01C | Cable for 2 units in parallel operation | PSU Series |
| PSU-026 | Joins a vertical stack of 3 PSU units together. (3U-sized Handles x 2, joining plates x 2) | PSU Series |
| PSU-038 | Bus Bar for 3 units in Parallel Operation | PSU Series |
| PSU-03C | Cable for 3 units in Parallel Operation | PSU Series |
| PSU-036 | Joins a Vertical Stack of 4 PSU units Together. (4U-sized Handles x 2 Joining plates x 1 | PSU Series |
| PSU-038 | Bus Bar for 4 units in Parallel Operation | PSU Series |
| PSU-03C | Cable for 4 units in Parallel Operation | PSU Series |
| PSU-042 | RS232 Cable with DB9 Connector kit | PSU Series, PPX Series |
| PSU-405 | RS485 Cable with DB9 Connector kit | PSU Series, PPX Series |
| PSU-GPIB | PSU GPIB Interface Card (Factory Installed) | PSU Series |
| PSU-ISC1 | Isolated Current Remote Control Card (Factory Installed) | PSU Series |
| PSU-ISC10 | Isolated Voltage Remote Control Card (Factory Installed) | PSU Series |
| PSW-001 | Accessory Kits | PSW Series, PSW Multi Series, PSB-1000 Series |
| PSW-002 | Simple IDC Tool | PSW Series, PSW Multi Series, PSB-1000 Series |
| PSW-003 | Contact Removal Tool | PSW Series, PSW Multi Series, PSB-1000 Series |
| PSW-004 | Rack Accessory kit for 80V/80V/160V models | PSW Series, PSW Multi Series |
| PSW-005 | Series Operation Cable for 2 units (80V/80V/160V models only) | PSW Series |
| PSW-006 | Parallel Operation Cable for 2 units | PSW Series |
| PSW-007 | Parallel Operation Cable for 3 units | PSW Series |
| PSW-008 | Rack Accessory Kit for 250V/80W models | PSW Series |
| PSW-009 | Output Terminal Cover for 80V/80V/160V models | PSW Series |
| PSW-010 | Surge Filter (Type II, 6A) | PSW Series |
| PSW-011 | Output Terminal Cover for 250V/80W models | PSW Series |
| PSW-012 | High Voltage Output Terminal for 250V/80W 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-218  |
| GTL-219  | GTL-229/GTL-222  | GTL-221/GTL-223  |
| GTL-232/GTL-232A  | GTL-240  | GTL-248  |
| GTL-248  | GTL-249  | GTL-258  |

# ACCESSORIES

GTL-253



GTL-258



GTL-259



GTL-260



GTL-261



GTL-262



PEL-002 Rack Mount Kit





GRA-401 Rack Mount Kit





GRA-406 Rack Mount Kit





GRA-409 Rack Mount Kit





GRA-403 Rack Mount Kit





GRA-410-J Rack Mount Kit (JIS)





GRA-407 Rack Mount Kit





GRA-410-E Rack Mount Kit (EIA)





GRA-413-J Rack Mount Kit (JIS)





GRA-413-E Rack Mount Kit (EIA)





# ACCESSORIES

### GRA-414-J Rack Mount Kit (JIS)





### GRA-414-E Rack Mount Kit (EIA)





### GRA-418-J Rack Mount Kit (JIS)





### GRA-418-E Rack Mount Kit (EIA)





### GRA-419 Rack Mount Kit (JIS)





### GRA-419 EIA Rack Mount Kit





### GRA-423 Rack Mount Kit





### GRA-424 Rack Mount Kit





### GRA-428 Rack Mount Kit (EIA)





### GRA-429 Rack Mount Kit





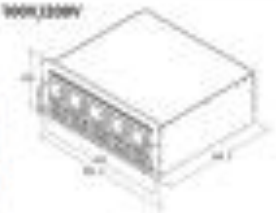
### GRA-430 Rack Mount Kit





### GRA-431-J Rack Mount Kit (JIS) with AC 100V/200V





### GRA-431-E Rack Mount Kit (EIA) with AC 100V/200V





# ACCESSORIES

**GRA-439-J Rack Mount Kit (JIS)**





**GRA-439-E Rack Mount Kit (EIA)**





**GRA-441-J Rack Mount Kit (JIS)**





**GRA-441-E Rack Mount Kit (EIA)**





**GRA-442-J Rack Mount Kit (JIS)**





**GRA-442-E Rack Mount Kit (EIA)**





**GRA-449-J Rack Mount Kit (JIS)**





**GRA-449-E Rack Mount Kit (EIA)**











## DIGITAL MULTIMETER

Digital Multimeters are the most commonly utilized instruments on many engineering workbenches. GW Instek provides a variety of digital multimeters ideal for you to satisfy the requirements of your customers in different situations.

The GDM-9000 series, 6 ½ DMM, has become the best asset for users in R&D verification, production testing and high-end educational institutions by its excellent performance and high-precision design.

The GDM-8200A series is divided into 6 ½ digits and 5 ½ digits. The GDM-8200A series has become the best tool for engineers in various multi-point measurement applications by adopting the design of a plug-in scanner card on the rear panel.

The GDM-8300 series and GDM-8245 feature 5 ½ digits and 4 ¾ digits (50,000 counts). The GDM-8300 series and GDM-8245 have become the best tools for technicians in service and maintenance, production testing and education institutions by the characteristics of low cost, excellent performance and ease of use.

### PRODUCTS

- **Digital Multimeter**

## 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

| MODEL / MAIN FUNCTION | GDM-9061 | GDM-9060 | GDM-8261A | GDM-8255A |
|---|---|---|---|---|
| **Display** | 6 1/2 (1200000 Counts)<br>TFT LCD Dual Measurement | 6 1/2 (1200000 Counts)<br>TFT LCD Dual Measurement | 6 1/2 (1200000 Counts)<br>VFD Dual Measurement | 5 1/2 (199999 Counts)<br>VFD Dual Measurement |
| **Autoranging** | ✓ | ✓ | ✓ | ✓ |
| **DCV Basic Accuracy** | 0.0035% | 0.0075% | 0.0035% | 0.012% |
| **Major Measurement Functions** | AC & DC Voltage<br>AC & DC Current (3A/10A)<br>2- & 4-wires resistance<br>Continuity & Diode<br>Frequency & Period<br>Temperature (RTD/ Thermocouple/Thermistor)<br>Capacitance | AC & DC Voltage<br>AC & DC Current (3A)<br>2- & 4-wires resistance<br>Continuity & Diode<br>Frequency & Period<br>Temperature (RTD/ Thermocouple/Thermistor)<br>Capacitance | AC & DC Voltage<br>AC & DC Current<br>2- & 4-wires resistance<br>Continuity & Diode<br>Frequency & Period<br>Temperature (RTD/Thermocouple) | AC & DC Voltage<br>AC & DC Current<br>2- & 4-wires resistance<br>Continuity & Diode<br>Frequency & Period<br>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) | 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/USBCDC)<br>RS-232C, LAN, Digital I/O<br>USB host | USB device (USBTMC/USBCDC)<br>RS-232C, LAN, Digital I/O<br>USB host | USB device (USBCDC)<br>RS-232C, Digital I/O | USB device (USBCDC)<br>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

| MODEL / MAIN FUNCTION | GDM-8351 | GDM-8342 | GDM-8341 | GDM-8245 |
|---|---|---|---|---|
| **Display** | 5 1/2 (120000 Counts)<br>VFD Dual Measurement | 50000 Counts VFD<br>Dual Measurement | 50000 Counts VFD<br>Dual Measurement | 50000 Counts LED<br>Dual Display |
| **Autoranging** | ✓ | ✓ | ✓ | ✓ |
| **DCV Basic Accuracy** | 0.012% | 0.02% | 0.02% | 0.03% |
| **Major Measurement Functions** | AC & DC Voltage<br>AC & DC Current<br>2- & 4-wires resistance<br>Continuity & Diode<br>Frequency & Period<br>Capacitance<br>Temperature (Thermocouple) | AC & DC Voltage<br>AC & DC Current<br>2- wires resistance<br>Continuity & Diode<br>Frequency & Period<br>Capacitance<br>Temperature (Thermocouple) | AC & DC Voltage<br>AC & DC Current<br>2-wires resistance<br>Continuity & Diode<br>Frequency & Period<br>Capacitance | AC & DC Voltage<br>AC & DC Current<br>2-wires resistance<br>Continuity & Diode<br>Frequency<br>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(USBCDC)<br>USB host | USB device (USBCDC) | – |
| **Optional** | – | GPIB | – | – |
| **Page** | **E11-12** | **E13-14** | **E13-14** | **E15** |

# 6 ½ Digit Dual Measurement Multimeter




## GDM-906X Series

台灣精品
TAIWAN EXCELLENCE

CE | USB Device | USB Host | LAN | RS-232 | GPIB

Digital I/O | PC Software | LabVIEW Driver

## FEATURES

- ✲ 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

GW Instek launches GDM-906X series 6 ½ digit dual measurement multimeter (2 models: GDM-9061 and GDM-9060), featuring high precision DC voltage accuracy, fast sampling rate, 12 measurement functions (DC voltage/current, AC voltage/current, 2-wire/4-wire resistance, frequency, period, diode, continuity beeper, temperature, capacitance), 6 mathematical functions (dB/dBm/Compare/ MX+B/Percent and 1/X) as well as a variety of communications interfaces (USB device/host, RS-232C, LAN, digital I/O and optional GPIB) to provide comprehensive measurement capabilities, higher speed and accuracy.

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.

## SPECIFICATIONS

### DC CHARACTERISTICS

Accuracy : ± ( % of reading + % of range )

**DC Voltage**

| Range | Resolution | Input Resistance | Accuracy(1Year)(TCAL±5°C) | |
|---|---|---|---|---|
| | | | GDM-9061 | GDM-9060 |
| 100.0000 mV | 0.1µV | 10MΩ or >10GΩ | 0.0050 + 0.0035 | 0.0090 + 0.0065 |
| 1.000000 V | 1µV | 10MΩ or >10GΩ | 0.0048 + 0.0007 | 0.0080 + 0.0010 |
| 10.00000 V | 10µV | 10MΩ or >10GΩ | 0.0035 + 0.0005 | 0.0075 + 0.0005 |
| 100.0000 V | 0.1mV | 10MΩ ±1% | 0.0050 + 0.0006 | 0.0085 + 0.0006 |
| 1000.000 V | 1mV | 10MΩ ±1% | 0.0050 + 0.0010 | 0.0085 + 0.0010 |

**Resistance**

| Range | Resolution | Test Current | Accuracy(1Year)(TCAL±5°C) | |
|---|---|---|---|---|
| | | | GDM-9061 | GDM-9060 |
| 100.0000 Ω | 100µΩ | 1mA | 0.010 + 0.004 | 0.014 + 0.007 |
| 1.000000 kΩ | 1mΩ | 1mA | 0.010 + 0.001 | 0.014 + 0.001 |
| 10.00000 kΩ | 10mΩ | 100µA | 0.010 + 0.001 | 0.014 + 0.001 |
| 100.0000 kΩ | 100mΩ | 10µA | 0.010 + 0.001 | 0.014 + 0.001 |
| 1.000000 MΩ | 1Ω | 5µA | 0.010 + 0.001 | 0.014 + 0.001 |
| 10.00000 MΩ | 10Ω | 500nA | 0.040 + 0.001 | 0.040 + 0.001 |
| 100.0000 MΩ | 100Ω | 500nA//10 MΩ | 0.800 + 0.010 | 0.800 + 0.010 |

**DC Current**

| Range | Resolution | Burden Volt. | Accuracy(1Year)(TCAL±5°C) | |
|---|---|---|---|---|
| | | | GDM-9061 | GDM-9060 |
| 100.0000 µA | 100pA | < 0.011 V | 0.05 + 0.025 | 0.05 + 0.025 |
| 1.000000 mA | 1nA | < 0.11 V | 0.05 + 0.006 | 0.05 + 0.006 |
| 10.00000 mA | 10nA | < 0.04 V | 0.05 + 0.020 | 0.05 + 0.020 |
| 100.0000 mA | 100nA | < 0.4 V | 0.05 + 0.005 | 0.05 + 0.005 |
| 1.000000 A | 1µA | < 0.7 V | 0.10 + 0.010 | 0.10 + 0.010 |
| 3.000000 A | 1µA | < 2.0 V | 0.20 + 0.020 | 0.20 + 0.020 |
| 10.00000 A | 10µA | < 0.5 V | 0.15 + 0.010 | ---------- |

**Continuity**

| Range | Resolution | Test Current | Accuracy(1Year)(TCAL±5°C) | |
|---|---|---|---|---|
| | | | GDM-9061 | GDM-9060 |
| 1000.000 Ω | 0.001 Ω | 1 mA | 0.010 + 0.030 | 0.014 + 0.030 |

**Diode Test**

| Range | Resolution | Test Current | Accuracy(1Year)(TCAL±5°C) | |
|---|---|---|---|---|
| | | | GDM-9061 | GDM-9060 |
| 5.000000 V | 1µV | 1 mA | 0.010 + 0.030 | 0.014 + 0.030 |

**DC Ratio**: Accuracy Specification: ± (DC Input accuracy + DC Reference accuracy)

### TEMPERATURE CHARACTERISTICS

**RTD** (Accuracy based on PT100)

| Range | Resolution | Accuracy(1Year)(TCAL±5°C) |
|---|---|---|
| -200 °C ~ -100 °C | 0.001 °C | 0.09 °C |
| -100 °C ~ -20 °C | 0.001 °C | 0.08 °C |
| -20 °C ~ 20 °C | 0.001 °C | 0.06 °C |
| 20 °C ~ 100 °C | 0.001 °C | 0.08 °C |
| 100 °C ~ 300 °C | 0.001 °C | 0.12 °C |
| 300 °C ~ 600 °C | 0.001 °C | 0.22 °C |

**Thermocouples** (Accuracy based on ITS-90)

| Type | Range | Resolution | Accuracy(1Year)(TCAL±5°C) |
|---|---|---|---|
| E | -200 °C ~ +1000 °C | 0.002 °C | 0.2 °C |
| J | -210 °C ~ +1200 °C | 0.002 °C | 0.2 °C |
| T | -200 °C ~ +400 °C | 0.002 °C | 0.3 °C |
| K | -200 °C ~ +1372 °C | 0.002 °C | 0.3 °C |
| N | -200 °C ~ +1300 °C | 0.003 °C | 0.4 °C |
| R | -50 °C ~ +1768 °C | 0.01 °C | 1 °C |
| S | -50 °C ~ +1768 °C | 0.01 °C | 1 °C |
| B | +350 °C ~ +1820 °C | 0.01 °C | 1 °C |

**Thermistor** (2.2kΩ,5kΩ,10kΩ or User Type)

| Range | Resolution | Accuracy(1Year)(TCAL±5°C) |
|---|---|---|
| -80 °C ~ 150 °C | 0.01 °C | 0.01 °C |

### AC CHARACTERISTICS

Accuracy : ± ( % of reading + % of range )

**AC Voltage (True RMS)**

| Range | Resolution | Frequency | Accuracy(1Year)(TCAL±5°C) | |
|---|---|---|---|---|
| | | | GDM-9061 | GDM-9060 |
| 100.0000 mV | 0.1µV | 3Hz ~ 5Hz | 1.00 + 0.04 | 1.00 + 0.04 |
| | | 5Hz ~ 10Hz | 0.35 + 0.04 | 0.38 + 0.04 |
| | | 10Hz ~ 20kHz | 0.06 + 0.04 | 0.09 + 0.04 |
| | | 20kHz ~ 50kHz | 0.12 + 0.05 | 0.15 + 0.05 |
| | | 50kHz ~ 100kHz | 0.60 + 0.08 | 0.63 + 0.08 |
| | | 100kHz ~ 300kHz | 4.00 + 0.50 | 4.00 + 0.50 |




## GDM-906X Series

| SPECIFICATIONS | | | | | |
|---|---|---|---|---|---|
| | 1.000000 V to 750.000 V | 1μV ~ 1mV | 3Hz ~ 5Hz | 1.00 + 0.04 | 1.00 + 0.04 |
| | | | 5Hz ~ 10Hz | 0.35 + 0.04 | 0.38 + 0.04 |
| | | | 10Hz ~ 20kHz | 0.06 + 0.04 | 0.09 + 0.04 |
| | | | 20kHz ~ 50kHz | 0.12 + 0.05 | 0.15 + 0.05 |
| | | | 50kHz ~ 100kHz | 0.60 + 0.08 | 0.63 + 0.08 |
| | | | 100kHz ~ 300kHz | 4.00 + 0.50 | 4.00 + 0.50 |
| **AC Current (True RMS)** | **Range** | **Resolution** | **Frequency** | **Accuracy(1Year)(TCAL±5°C)** | |
| | | | | **GDM-9061** | **GDM-9060** |
| | 100.0000 μA<br>10.00000 mA | 100pA<br>10nA | 3Hz ~ 5Hz | 1.00 + 0.04 | 1.00 + 0.04 |
| | | | 5Hz ~ 10Hz | 0.35 + 0.04 | 0.38 + 0.04 |
| | | | 10Hz ~ 5kHz | 0.10 + 0.04 | 0.13 + 0.04 |
| | | | 5kHz ~ 10kHz | 0.18 + 0.04 | 0.20 + 0.04 |
| | 1.000000 mA<br>100.0000 mA | 1nA<br>100nA | 3Hz ~ 5Hz | 1.00 + 0.04 | 1.00 + 0.04 |
| | | | 5Hz ~ 10Hz | 0.30 + 0.04 | 0.33 + 0.04 |
| | | | 10Hz ~ 5kHz | 0.10 + 0.04 | 0.13 + 0.04 |
| | | | 5kHz ~ 10kHz | 0.15 + 0.04 | 0.18 + 0.04 |
| | 1.000000 A | 1μA | 3Hz ~ 5Hz | 1.00 + 0.04 | 1.00 + 0.04 |
| | | | 5Hz ~ 10Hz | 0.30 + 0.04 | 0.33 + 0.04 |
| | | | 10Hz ~ 5kHz | 0.10 + 0.04 | 0.13 + 0.04 |
| | | | 5kHz ~ 10kHz | 0.15 + 0.04 | 0.18 + 0.04 |
| | 3.000000 A | 1μA | 3Hz ~ 5Hz | 1.00 + 0.04 | 1.00 + 0.04 |
| | | | 5Hz ~ 10Hz | 0.35 + 0.04 | 0.38 + 0.04 |
| | | | 10Hz ~ 5kHz | 0.23 + 0.04 | 0.23 + 0.04 |
| | | | 5kHz ~ 10kHz | 0.23 + 0.04 | 0.23 + 0.04 |
| | 10.00000 A | 10μA | 3Hz ~ 5Hz | 1.10 + 0.04 | ---------- |
| | | | 5Hz ~ 10Hz | 0.35 + 0.04 | ---------- |
| | | | 10Hz ~ 5kHz | 0.15 + 0.04 | ---------- |
| | | | 5kHz ~ 10kHz | 0.35 + 0.04 | ---------- |

| CAPACITANCE CHARACTERISTICS | | | Accuracy : ± ( % of reading + % of range ) |
|---|---|---|---|
| **Capacitance** | **Range** | **Resolution** | **Accuracy(1Year)(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(1Year)(TCAL±5°C)** |
| | 100.0000mV to 750.000V | 3Hz ~ 5Hz | 0.1 |
| | | 5Hz ~ 10Hz | 0.05 |
| | | 10Hz ~ 40Hz | 0.03 |
| | | 40Hz ~ 1MHz | 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 |
| | **Dimensions & 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**

**GDM-90G1** 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
**GBM-01** 4 Wire(kelvin clip) test lead, 90V(max.), approx..1100mm
**GRA-422** Rack Mount Kit, 19" 2U size
**GRA-436** Rack Mount Kit, 19" 2U size for two sets
**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 | Number, Trend Chart, Bar Meter, Histogram | |
| Function | Voltage/Current : AC, DC<br>Resistance : 2-Wire, 4-Wire Diode, Continuity,<br>Temperature Frequency, Period, Capacitance | |
| Math. | REL, dB, dBm, Compare, MX+B, Percent, 1/X | |
| STAT. | Min/Max/Average/ P-P, STDEV | |
| Interface | 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









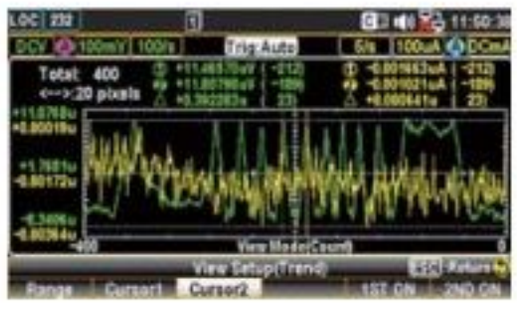




In addition to the standard numeric display mode, it also provides a variety of graphical functions such as bar meter, trend chart and histogram, so that the measurement results are no longer just a series of numbers, but a swift insight into the panoramic measurement.

## 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.

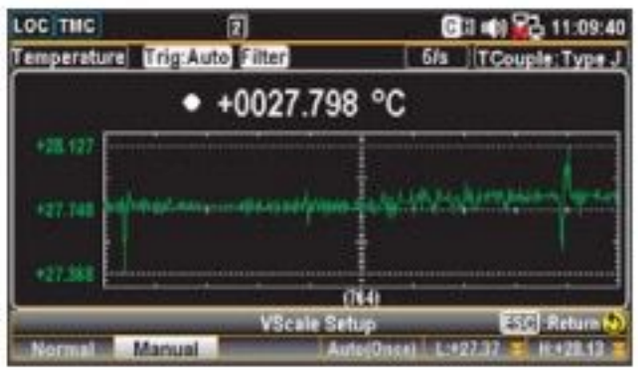
## D. HIGH MEASUREMENT RESOLUTION AND HIGH SAMPLING RATE

| 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 ½ Digit Dual Measurement Multimeter



## GDM-8261A

CE | RS-232 | USB Device | Digital I/O | GPIB | LAN | PC Software | LabVIEW Driver

GDM-8261A is a high precision 6 ½ 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.

## FEATURES

- ☆ 6 ½ 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 : Excel ADD-In, 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



## SPECIFICATIONS

Accuracy : ± ( % of reading + % of range )for 1-hour warm-up at 6 ½ digits, slow mode

**FUNCTION**

| Range (*1) | 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 |
|---|---|---|---|---|---|---|
| **DC VOLTAGE** | | | | | | |
| 100.0000 m V | 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 |
| **RESISTANCE** (*2) | | | | | | |
| 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 |
| **DC CURRENT** | | | | | | |
| 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 |
| **CONTINUITY** | | | | | | |
| 1000.000Ω | 0.001Ω | 1 mA | 0.002 + 0.030 | 0.008 + 0.030 | 0.010 + 0.030 | 0.001 + 0.002 |
| **DIODE TEST** (*3) | | | | | | |
| 1.000000 V | 1 μV | 1 mA (*4) | 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 ½ 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 ½ 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), Calibration key GDM-01 x 1 (for firmware upgrade)

**OPTION**

**GDM-SC1A** Scanner Card (V ch x 16, I ch x 2)
**GDM-82G1** GPIB Card
**GDM-82L1** LAN Card
* Either GPIB or LAN can be installed on each GDM-8261A

**OPTIONAL ACCESSORIES**

**GTL-108A** 4W Type test lead
**GTL-248** GPIB Cable, Approx. 2m
**GTL-205A** Temperature Probe Adaptor with Thermocouple (K type), Approx. 1m
**GTL-232** RS-232C Cable, 9-pin Female to 9-pin, null Modem, Approx. 2m
**GSC-014** Soft Carrying Case for DMM Accessory
**GRA-422** Rack Mount Kit (19" 2U)
**GRA-436** Rack Mount Kit, 19" 2U size for two sets
**GDM-TL1** Test Lead Set for All DMM

**FREE DOWNLOAD**

**PC Software** Excel ADD-In, RS-232C/USB Interface Supported
**Driver** LabVIEW Driver

* 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 ½ Digit Dual Display Digital Multimeter



## GDM-8255A

CE | RS-232 | USB Device | Digital I/O | PC Software | LabVIEW Driver

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.

## FEATURES

* 5 ½ 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.



| SPECIFICATIONS | |
|---|---|
| **FULL SCALE** | |
| | 5 ½ Digits (199,999 Counts Max.) |
| **SAMPLE RATE** | |
| | Slow : 5 1/2 digits, 10 readings/second<br>Medium : 4 1/2 digits, 30 readings/second<br>Fast : 3 1/2 digits, 60 readings/second |
| **DC VOLTAGE** | |
| **Range** | 100mV, 1V, 10V, 100V, 1000V 5 ranges |
| **Accuracy** | 100mV : ±(0.012% rdg + 8 digits)<br>1V – 1000V : ±(0.012% rdg + 5 digits) |
| **Input Resistance** | 10MΩ |
| **AC VOLTAGE True RMS** | |
| **Range** | 100mV, 1V, 10V, 100V, 750V 5 ranges |
| **Accuracy** | 100mV ranges :<br>20Hz – 45Hz : ±(1% rdg + 100 digits)<br>45Hz – 10kHz : ± (0.2% rdg + 100 digits)<br>10kHz – 30kHz : ± (1.5% rdg + 300 digits)<br>30kHz–100kHz : ±(15% rdg + 300 digits)<br>1V, 10V, 100V, 750V ranges :<br>20Hz – 45Hz : ±(1% rdg + 100 digits)<br>45Hz – 10kHz : ± (0.2% rdg + 100 digits)<br>10kHz – 30kHz : ± (1% rdg + 100 digits)<br>30kHz–100kHz : ±(3% rdg + 200 digits) |
| **Input Resistance** | 1.1MΩ in parallel with approx. 100pF |
| **DC CURRENT** | |
| **Range** | 10mA, 100mA, 1A, 10A 4 ranges |
| **Accuracy** | 10mA : ±(0.05% rdg + 15 digits)<br>100mA : ±(0.05% rdg + 5 digits)<br>1A, 10A range : ±(0.2% rdg + 5 digits) |
| **AC CURRENT TRUE RMS** | |
| **Range** | 10mA, 100mA, 1A, 10A 4 ranges |
| **Accuracy** | 10mA , 100mA range :<br>20Hz – 50Hz : ±(1.5% rdg + 100 digits)<br>50Hz – 10kHz : ±(0.5% rdg + 100 digits)<br>10kHz–20kHz : ±(2% rdg + 200 digits)<br>1A , 10A range : 50Hz – 10kHz : ±(1% rdg + 100 digits) |
| **RESISTANCE** | |
| **Range** | 100Ω, 1kΩ, 10kΩ, 100kΩ, 1MΩ, 10MΩ, 100MΩ 7 ranges |
| **2W Accuracy** | 100Ω range : ±(0.1% rdg + 8digits) (*)<br>1kΩ range : ±(0.08% rdg + 5 digits) (*)<br>10kΩ ranges : ±(0.06% rdg + 5digits) (*)<br>100kΩ – 1MΩ ranges : ±(0.06% rdg + 5digits)<br>10MΩ range : ±(0.3% rdg + 5 digits)<br>100MΩ range : ±(3% rdg + 8 digits) |
| **4W Accuracy** | 100Ω range : ±(0.05% rdg + 8 digits)<br>1kΩ – 1MΩ 4 ranges : ±(0.05% rdg + 5 digits)<br>10MΩ range : ±(0.3% rdg + 5 digits)<br>100MΩ range : ±(3% rdg + 8 digits) |




## Rear Panel



# GDM-8255A

| SPECIFICATIONS |
|---|
| **DIODE TEST** |
| Open Circuit Voltage 2.0V, Test Current 0.5mA : Accuracy±(0.025%rdg + 5 digits) |
| **FREQUENCY** |
| 10Hz–100kHz : Sensitivity 0.1V, Accuracy±(0.05%rdg + 15 digits)<br>100Hz–600kHz : Sensitivity 1V, Accuracy±(0.05%rdg + 3 digits)<br>600Hz–800kHz : Sensitivity 2.5V, Accuracy±(0.05%rdg + 3 digits) |
| **CONTINUITY BEEPER** |
| 1 – 1000Ω Define by user : Accuracy±(0.08%rdg + 5 digits) |
| **TEMPERATURE** |
| 0°C – 300°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 ± 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**

| | |
|---|---|
| **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 (19", 2U) |
| **GRA-436** | Rack Mount Kit, 19" 2U size for two sets |
| **GDM-TL1** | Test Lead Set |
| **GSC-014** | Soft Carrying Case for DMM Accessory |

**FREE DOWNLOAD**

| | |
|---|---|
| **PC Software** | DMM-VIEWER |
| **Driver** | LabVIEW Driver<br>USB Driver |

### 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 ½ Digit Dual Measurement Multimeter



## GDM-8351

CE | USB Device | PC Software | RS-232 | LabVIEW Driver | Digital I/O

## FEATURES

- ✲ 5 ½ 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)

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 eatures 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) |
|---|---|---|---|
| **DC VOLTAGE** | | | |
| 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 |
| **RESISTANCE** | | | |
| 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 |
| **DC CURRENT** | | | |
| 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 |
| **CONTINUITY** | | | |
| 1000.00Ω | 10mΩ | 1mA | 0.05 + 5 |
| **DIODE TEST** | | | |
| 6.0000V | 100μV | 1mA@6V | 0.05 + 15 |
| **CAPACITANCE** | | | |
| 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)

**GTL-207A Test Lead**

Approx. 0.8m






## Rear Panel



# GDM-8351

## SPECIFICATIONS (*1)

| Range(*3) | Resolution | Frequency or Etc. | Accuracy 1 Year (23°C±5°C) |
|---|---|---|---|
| **True RMS AC (or AC+DC – AC Coupled) Voltage** | | | |
| 100.000mV | 1μV | 20Hz ~ 45Hz<br>45Hz ~ 10kHz<br>10kHz ~ 30kHz<br>30kHz ~ 100kHz | 1.0 + 100<br>0.3 + 100<br>1.5 + 300<br>5.0 + 300 |
| 1.00000V | 10μV | 20Hz ~ 45Hz<br>45Hz ~ 10kHz<br>10kHz ~ 30kHz<br>30kHz ~ 100kHz | 1.0 + 100<br>0.2 + 100<br>1.0 + 100<br>3.0 + 200 |
| 10.0000V | 100μV | 20Hz ~ 45Hz<br>45Hz ~ 10kHz<br>10kHz ~ 30kHz<br>30kHz ~ 100kHz | 1.0 + 100<br>0.2 + 100<br>1.0 + 100<br>3.0 + 200 |
| 100.000V | 1mV | 20Hz ~ 45Hz<br>45Hz ~ 10kHz<br>10kHz ~ 30kHz<br>30kHz ~ 100kHz | 1.0 + 100<br>0.2 + 100<br>1.0 + 100<br>3.0 + 200 |
| 750.00V | 10mV | 20Hz ~ 45Hz<br>45Hz ~ 10kHz<br>10kHz ~ 30kHz<br>30kHz ~ 100kHz | 1.0 + 100<br>0.2 + 100<br>1.0 + 100<br>3.0 + 200 |
| **True RMS AC (or AC+DC – AC Coupled) Current** | | | |
| 10.0000mA | 100nA | 20Hz ~ 45Hz<br>45Hz ~ 2kHz<br>2kHz ~ 10kHz | 1.5 + 100<br>0.5 + 100<br>2.0 + 200 |
| 100.000mA | 1μA | 20Hz ~ 45Hz<br>45Hz ~ 2kHz<br>2kHz ~ 10kHz | 1.5 + 100<br>0.5 + 100<br>2.0 + 200 |
| 1.00000A | 10μA | 20Hz ~ 45Hz<br>45Hz ~ 2kHz<br>2kHz ~ 10kHz | 1.5 + 100<br>0.5 + 100<br>2.0 + 200 |
| 10.0000A | 100μA | 20Hz ~ 45Hz<br>45Hz ~ 2kHz<br>2kHz ~ 10kHz | 1.5 + 100<br>1.0 + 100<br>------- |
| **FREQUENCY** | | | |
| (Voltage)10Hz – 1MHz<br>(Current)20Hz – 10kHz | -------<br>------- | -------<br>------- | 0.01 + 3<br>0.01 + 3 |
| **TEMPERATURE (Thermocouple)** | | | |
| -200 °C ~ 0 °C<br>0 °C ~ +300 °C | 0.01 °C<br>0.01 °C | J / T / K<br>J / T / K | 0.6 °C(typical)<br>0.3 °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

| | |
|---|---|
| **GTL-108A** | 4Wire Test Lead (Kelvin Clip), Approx. 1100mm |
| **GTL-205A** | Temperature probe adaptor with thermocouple (K-type), Approx. 1000mm |
| **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 (19", 2U) |
| **GDM-TL1** | Test Lead Set |
| **GSC-014** | 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

CE | USB Host | USB Device | PC Software | GPIB | LabVIEW Driver

## 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)** |
| **DC VOLTAGE** | | | |
| 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 |
| **RESISTANCE** | | | |
| 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 |
| **DC CURRENT** | | | |
| 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 |
| **CONTINUITY** | | | |
| 5000.0Ω | 100mΩ | 0.83mA | 0.10 + 5 |
| **DIODE TEST** | | | |
| 5.0000V | 100µV | 0.83mA | 0.05 + 5 |
| **CAPACITANCE** | | | |
| 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)** |
| **True RMS AC (or AC+DC – AC Couple) Voltage (*5*6)** | | | |
| 500.00mV | 10µV | 30Hz – 50Hz<br>50Hz – 10kHz<br>10kHz – 30kHz<br>30kHz – 100kHz | 1.00 + 40<br>0.50 + 40<br>2.00 + 60<br>3.00 + 120 |
| 5.0000V | 100µV | 30Hz – 50Hz<br>50Hz – 10kHz<br>10kHz – 30kHz<br>30kHz – 100kHz | 1.00 + 20<br>0.35 + 15<br>1.00 + 20<br>3.00 + 50 |
| 50.000V | 1mV | 30Hz – 50Hz<br>50Hz – 10kHz<br>10kHz – 30kHz<br>30kHz – 100kHz | 1.00 + 20<br>0.35 + 15<br>1.00 + 20<br>3.00 + 50 |
| 500.00V | 10mV | 30Hz – 50Hz<br>50Hz – 10kHz<br>10kHz – 30kHz<br>30kHz – 100kHz | ----<br>0.50 + 15<br>1.00 + 20<br>3.00 + 50 |
| 750.0V | 100mV | 30Hz – 50Hz<br>50Hz – 10kHz<br>10kHz – 30kHz<br>30kHz – 100kHz | ----<br>0.50 + 15<br>----<br>---- |

### GTL-207A Test Lead

Approx. 0.8m






**Rear Panel**



# GDM-8300 Series

## SPECIFICATIONS (*1*2)

| True RMS AC (or AC+DC – AC Couple) Current (*5*6) | | | |
|---|---|---|---|
| 500.00µA | 10nA | 30Hz – 50Hz<br>50Hz – 2kHz<br>2kHz – 5kHz<br>5kHz – 20kHz | 1.50 + 50<br>0.50 + 40<br>1.50 + 50<br>3.00 + 75 |
| 5.0000mA | 100nA | 30Hz – 50Hz<br>50Hz – 2kHz<br>2kHz – 5kHz<br>5kHz – 20kHz | 1.50 + 40<br>0.50 + 20<br>1.50 + 40<br>3.00 + 60 |
| 50.000mA | 1µA | 30Hz – 50Hz<br>50Hz – 2kHz<br>2kHz – 5kHz<br>5kHz – 20kHz | 1.50 + 40<br>0.50 + 20<br>1.50 + 40<br>3.00 + 60 |
| 500.00mA | 10µA | 30Hz – 50Hz<br>50Hz – 2kHz<br>2kHz – 5kHz<br>5kHz – 20kHz | 1.50 + 40<br>0.50 + 20<br>1.50 + 40<br>3.00 + 60 |
| 5.0000 A | 100µA | 30Hz – 50Hz<br>50Hz – 2kHz | 2.00 + 40<br>0.50 + 30 |
| 10.000A | 1mA | 30Hz – 50Hz<br>50Hz – 2kHz | 2.00 + 40<br>0.50 + 30 |
| **FREQUENCY / PERIOD** | | | |
| 10Hz – 500Hz<br>500Hz – 500kHz<br>500kHz – 1MHz | – | – | 0.01 + 5<br>0.01 + 3<br>0.01 + 5 |
| **TEMPERATURE (THERMOCOUPLE)** | | | |
| -200 °C – +300 °C | 0.1 °C | J / T / K type | 2 °C (*7) |
| **DISPLAY** | | | |
| VFD, Two Colors Display | | | |
| **INTERFACE** | | | |
| USB device, USB Host (GDM-8342 only) | | | |
| **POWER SOURCE** | | | |
| AC 100V/120V/220V/240V ±10%, 50 – 60Hz ; Power Conmsumption : 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.

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.

## 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** *

| | | |
|---|---|---|
| **GDM-83G1** | GPIB Interface | * Factory installed for GDM-8342 only. |

**OPTIONAL ACCESSORIES**

| | |
|---|---|
| **GTL-205A** | Temperature probe adaptor with thermocouple (K-type), Approx. 1000mm |
| **GTL-246** | USB Cable, USB 2.0, A-B Type, 1200mm |
| **GTL-248** | GPIB Cable, Double Shielded, 2000mm |
| **GRA-422** | Rack Mount Kit (19", 2U) |
| **GDM-TL1** | Test Lead Set |
| **GSC-014** | 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 Display Digital Multimeter



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.

## GDM-8245 (50000 Counts)

CE

## 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



| SPECIFICATIONS | |
|---|---|
| **DC VOLTAGE** | |
| Range | 500mV, 5V, 50V, 500V, 1000V 5 ranges |
| Accuracy | ± (0.03% rdg + 4 digits) |
| Input Impedance | 10MΩ |
| **AC VOLTAGE TRUE RMS (AC OR AC + DC TRUE RMS)** | |
| Range | 500mV, 5V, 50V, 500V, 1000V 5 ranges |
| Accuracy | 500mV ~ 50V 3 ranges :<br>20Hz ~ 45Hz : ±(1% rdg + 15 digits)<br>45Hz ~ 2kHz ±(0.5% rdg + 15 digits)<br>2kH~10kHz ±(1% rdg + 15 digits)<br>10kHz ~ 20kHz ±(2% rdg + 30 digits)<br>20kHz ~ 50kHz ±(5% rdg + 30digits)<br>500V,1000V range :<br>45Hz ~ 1kHz ±(0.5% rdg + 15 digits) |
| Input Impedance | 10MΩ |
| **DC CURRENT** | |
| Range | 500µA, 5mA, 50mA, 500mA, 2A, 20A 6 ranges |
| Accuracy | 500µA~500mA 4ranges:±(0.2% rdg+2 digits);2A~20A 2ranges:±(0.3% rdg+2digits) |
| **AC CURRENT TRUE RMS (AC OR AC + DC TRUE RMS)** | |
| Range | 500µA, 5mA, 50mA, 500mA, 2A, 20A 6 ranges |
| Accuracy | 500µA ~ 20A 6 ranges<br>20Hz ~ 45Hz : ±(1% rdg + 15 digits) ; 45Hz ~ 2kHz : ±(0.5%rdg + 15 digits)<br>500µA ~ 50mA 3 ranges<br>2kHz ~ 10kHz : ±(1% rdg + 15 digits) ; 10kHz ~ 20kHz : ±(2% rdg + 15 digits) |
| **RESISTANCE** | |
| Range | 500Ω,5kΩ,50kΩ,500kΩ,5MΩ,20MΩ 6 ranges |
| Accuracy | 500Ω : ± (0.1% rdg + 4 digits); 5kΩ ~ 500kΩ 3 ranges : ± (0.1% rdg + 2 digits)<br>5MΩ : ± (0.2% rdg + 2 digits); 20MΩ : ± (0.3% rdg + 2 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, 5µF, 50µF 5 ranges |
| Accuracy | ± (2% rdg + 4 digits) |
| **FREQUENCY** | |
| Input Level (Sine Wave) | mV range : 10Hz ~ 50kHz : >120mV ; 50k ~ 150kHz : >200mV<br>5V ~ 50V range : 10Hz ~ 200kHz >1.2V ; 500V range : 20Hz ~ 1kHz >12V |
| **FUNCTIONS** | |
| | Auto Manual/Range, Max, Min, dBm, REL, Hold |
| **CONTINUITY BEEPER** | |
| | Built in buzzer sounds when conductance is less than 5Ω |
| **DISPLAY** | |
| Dual Display 0.4" and 0.5", 7 segment LED display | |
| **POWER SOURCE** | |
| AC 100V/120V/230V±10%, 50/60Hz ; Power Consumption : Max. 8VA | |
| **DIMENSIONS & WEIGHT** | |
| 251(W) x 91(H) x 291(D) mm, Approx. 2.6kg | |

## 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

## HAND-HELD DIGITAL MULTIMETER

| MODEL | GDM-541 | GDM-533 | GDM-532 | GDM-531 |
|---|---|---|---|---|
| Max. Display | 22000 | 6000 | 9999 | 6000 |
| Auto Ranging | ✓ | ✓ | ✓ | |
| Analog Bar | ✓ | ✓ | | |
| True RMS | ✓ | ✓ | ✓ | |
| Display Backlight | ✓ | ✓ | ✓ | ✓ |
| Auto Power off | ✓ | ✓ | ✓ | ✓ |
| Curr. Range Protection | PTS & Fuse | PTS & Fuse | Fuse | Fuse |
| DC Voltage | 1000V | 1000V | 999.9V | 600V |
| AC Voltage | 1000V | 1000V | 999.9V | 600V |
| DC Current | 20A | 20A | 9.99A | 10A |
| AC Current | 20A | 20A | 9.99A | |
| Resistance | 220MΩ | 60MΩ | 99.99MΩ | 60MΩ |
| Capacitance | 220mF | 60mF | 9.999mF | 9.999mF |
| Frequency | 220MHz | 10MHz | 9.9MHz | |
| Diode | ✓ | ✓ | ✓ | ✓ |
| Continuity | ✓ | ✓ | ✓ | ✓ |
| Temperature | | ✓ | ✓ | |
| Duty Cycle (%) | ✓ | ✓ | ✓ | |
| Transistor (hFE) | ✓ | | | |
| NCV Function | ✓ | ✓ | ✓ | ✓ |
| REL | ✓ | ✓ | ✓ | |
| Data Hold | ✓ | ✓ | ✓ | ✓ |
| Peak Hold | ✓ | ✓ | | |
| MAX MIN | ✓ | ✓ | | |
| LoZ ACV | | ✓ | | |
| LPF ACV | ✓ | | | |
| Audible / Visual Alarm | ✓ | ✓ | ✓ | ✓ |
| AC+DC Measurement | ✓ | | | |
| Interface | USB | USB | | |
| Safety Rating | CAT III 1000V<br>CAT IV 600V | CAT III 1000V<br>CAT IV 600V | CAT II 1000V<br>CAT III 600V | CAT III 600V |
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# Hand-Held Digital Multimeter



NEW

## GDM-541

CE USB PC Software



NEW

## GDM-533

CE USB PC Software



NEW

## GDM-532

CE

The GDM-500 Series Hand Held DMM are a compact, high precision, battery operated multimeter series designed to meet of service engineers. The GDM-500 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 then NCV (Non-Contact Voltage) function for outdoor use.

The basic functions match the depth of bench-top multimeters: fuse-protected current input, true RMS for accurate AC measurements, Audible/Visual Alarm when Overload, Auto ranging, Duty cycle and Relative mode. The compact, reliable and economical devices are ideal for any engineer.

| SPECIFICATIONS | |
|---|---|
| **DC VOLTAGE** | |
| Range | 220.00mV, 2.2000V, 22.000V, 220.00V, 1000V(GDM-541)<br>60.00mV, 600.0mV, 6.000V, 60.00V, 600.0V, 1000V(GDM-533)<br>9.999mV, 99.99mV, 999.9mV, 9.999V, 99.99V, 999.9V(GDM-532)<br>600.0mV, 6000mV, 60.00V, 600.0V(GDM-531) |
| Best Accuracy | ±(0.05%rdg + 5 digits) for GDM-541; ±(0.5%rdg + 3 digits) for GDM-533<br>±(0.5%rdg + 3 digits) for GDM-532; ±(0.7%rdg + 3 digit) for GDM-531 |
| Input Impedance | 10 MΩ (At mV range : 1GΩ for GDM-541/533; 3GΩ for GDM-532) |
| **AC VOLTAGE** | |
| Range | 220.00mV, 2.2000V, 22.000V, 220.00V, 1000.0V(GDM-541)<br>60.00mV, 600.0mV, 6.000V, 60.00V, 600.0V, 1000V(GDM-533)<br>9.999mV, 99.99mV, 999.9mV, 9.999V, 99.99V, 999.9V(GDM-532)<br>600.0V(GDM-531) |
| Best Accuracy | ±(0.8%rdg + 10 digits) for GDM-541; ±(1.0%rdg + 3 digits) for GDM-533<br>±(0.8%rdg + 3 digits) for GDM-532; ±(1.2%rdg + 3 digits) for GDM-531 |
| Frequency Response | 40Hz-10kHz for GDM-541; 40Hz-1kHz for GDM-533<br>45Hz-400Hz for GDM-532; 40Hz-400Hz for GDM-531 |
| Input Impedance | 10 MΩ |
| **DC CURRENT** | |
| Range | 220.00μA, 2200.0μA, 22.000mA, 220.00mA, 20.000A(GDM-541)<br>600.0μA, 6000μA, 60.00mA, 600.0mA, 6.000A, 20.00A(GDM-533)<br>999.9μA, 999.9mA, 9.999A(GDM-532)<br>600.0μA, 60.00mA, 600.0mA, 10.00A(GDM-531) |
| Best Accuracy | ±(0.5%rdg + 10 digits) for GDM-541; ±(1.0%rdg + 2 digits) for GDM-533<br>±(0.8%rdg + 3 digits) for GDM-532; ±(1.0%rdg + 3 digits) for GDM-531 |
| **AC CURRENT** | |
| Range | 220.00μA, 2200.0μA, 22.000mA, 220.00mA, 20.000A(GDM-541)<br>600.0μA, 6000μA, 60.00mA, 600.0mA, 6.000A, 20.00A(GDM-533)<br>999.9μA, 999.9mA, 9.999A(GDM-532) |
| Best Accuracy | ±(0.8%rdg + 10 digits) for GDM-541; ±(1.2%rdg + 5 digits) for GDM-533<br>±(1.0%rdg + 3 digits) for GDM-532 |
| **RESISTANCE** | |
| Range | 220.00Ω, 2.2000kΩ, 22.000kΩ, 220.00kΩ, 2.2000MΩ, 22.000MΩ, 220.00MΩ(GDM-541)<br>600.0Ω, 6.000kΩ, 60.00kΩ, 600.0kΩ, 6.000MΩ, 60.00MΩ(GDM-533)<br>999.9Ω, 9.999kΩ, 99.99kΩ, 999.9kΩ, 9.999MΩ, 99.99MΩ(GDM-532)<br>600.0Ω, 6000Ω, 60.00kΩ, 600.0kΩ, 60.00MΩ(GDM-531) |
| Best Accuracy | ±(0.5%rdg + 10 digits) for GDM-541; ±(1.0%rdg + 2 digit) for GDM-533<br>±(0.8%rdg + 2 digits) for GDM-532; ±(0.8%rdg + 2 digits) for GDM-531 |
| **CONTINUITY BEEPER** | |
| | Buzzer sounds if conductance less than 50Ω for GDM-541/533<br>Buzzer sounds if conductance less than 30Ω for GDM-532<br>Buzzer sounds if conductance less than 10Ω for GDM-531 |
| **DIODE TEST** | |
| Open Circuit Voltage | GDM-541/533 : 3V (Approx.); GDM-532 : 3.3V (Approx.); GDM-531 : 2.1V (Approx.) |
| **CAPACITANCE** | |
| Range | 22.000nF,220.00nF,2.2000μF,22.000μF,220.00μF,2.2000mF,22.000mF,220.00mF(GDM-541)<br>60.00nF, 600.0nF, 6.000μF, 60.00μF, 600.0μF, 6.000mF, 60.00mF(GDM-533)<br>9.999nF, 99.99nF, 999.9nF, 9.999μF, 99.99μF, 999.9μF, 9.999mF(GDM-532/531) |
| Best Accuracy | ±(3.0%rdg + 5 digits) for GDM-541/533; ±(4.0%rdg + 5 digits) for GDM-532/531 |
| **FREQUENCY** | |
| Range | 10Hz – 220MHz(GDM-541); 10Hz – 10MHz(GDM-533); 99.99Hz – 9.999MHz(GDM-532) |
| Best Accuracy | ±(0.01%rdg + 5 digits) for GDM-541; ±(0.1%rdg + 4 digits) for GDM-533<br>±(0.1%rdg + 5 digits) for GDM-532 |
| Input Amplitude | ≤20Vrms |
| **TEMPERATURE** | |
| Range | -40°C – 1000°C / -40°F – 1832°F |
| Best Accuracy | ±(1.0%rdg + 3 °C) for GDM-533; ±(1.0%rdg + 5 °C) for GDM-532<br>±(1.0%rdg + 4 °F) for GDM-533; ±(1.5%rdg + 5 °F) for GDM-532 |

### GDM-541 FEATURES

- ✻ 22000 Counts Auto/Manual Ranging
- ✲ 46 Segments Analogue Bar
- ✲ ACV Measurement up to 1000V
- ✲ AC+DC Voltage Measurement
- ✲ Current Measurement up to 20A
- ✲ Transistor (hFE) Measurement
- ✲ Audible/Visual Alarm when Overload
- ✲ True RMS/USB Interface

### GDM-533 FEATURES

- ✻ 6000 Counts Auto/Manual Ranging
- ✲ 31 Segments Analogue Bar
- ✲ LoZ ACV Measurement
- ✲ ACV Measurement up to 1000V
- ✲ Current Measurement up to 20A
- ✲ Temperature Measurement
- ✲ Audible/Visual Alarm when Overload
- ✲ True RMS/USB Interface

### GDM-532 FEATURES

- ✻ 9999 Counts Auto/Manual Ranging
- ✲ Display Backlight/Auto Power Off
- ✲ Continuity Beeper/Diode Test
- ✲ Temperature Measurement
- ✲ Non-Contact Voltage (NCV) Detection
- ✲ Data Hold and Relative Mode

## SPECIFICATIONS

| SPECIAL FUNCTION |
|---|
| Auto Ranging(GDM-541/533/532); True RMS(GDM-541/533/532); Analog Bar(GDM-541/533); USB(GDM-541/533/532/531); Display Backlight(GDM-541/533/532/531); NCV Function(GDM-541/533/532/531); Audible/Visual Alarm(GDM-541/533/531); AC+DC Voltage(GDM-541); LPF ACV(GDM-541); hFE Test(GDM-541); LoZ ACV(GDM-533) |
| **LCD DISPLAY** |
| 22000 counts (GDM-541), 6000 counts (GDM-533/531), 9999 counts (GDM-532) |
| **POWER SOURCE** |
| 1.5V AAA x 4 (GDM-541/533); 1.5V AAA x 3 (GDM-532); 1.5V AAA x 2 (GDM-531) |
| **DIMENSIONS & WEIGHT** |
| 89(W) x 186(H) x 49(D) mm, Approx. 400g (GDM-541/533)<br>81(W) x 169(H) x 46(D) mm, Approx. 400g (GDM-532)<br>76.5(W) x 155(H) x 49(D) mm, Approx. 255g (GDM-531) |



NEW

# GDM-531

CE

## ORDERING INFORMATION

| | |
|---|---|
| **GDM-541** | 22000 Counts Hand-Held DMM with True RMS Measurement and USB Interface |
| **GDM-533** | 6000 Counts Hand-Held DMM with True RMS Measurement and USB Interface |
| **GDM-532** | 9999 Counts Hand-Held DMM with True RMS Measurement |
| **GDM-531** | 6000 Counts Hand-Held DMM |

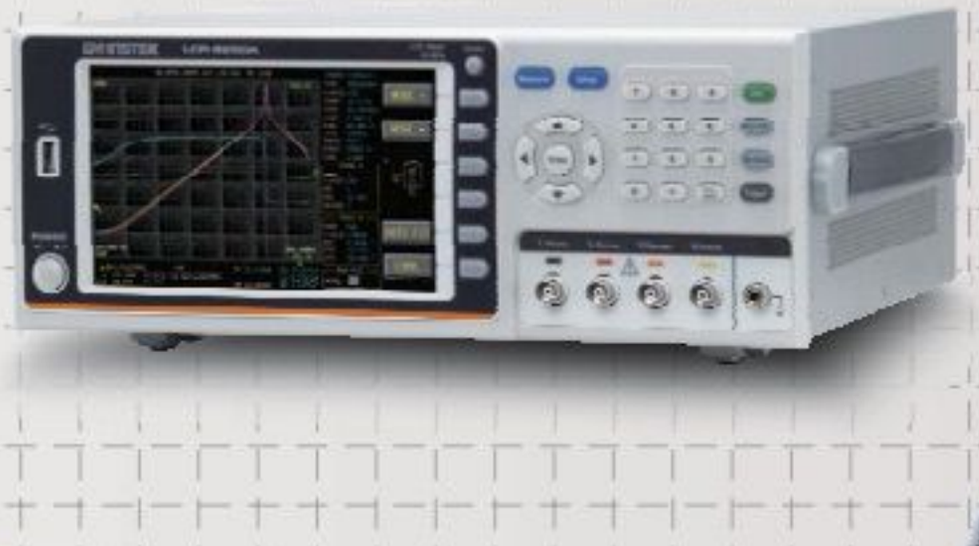
ACCESSORIES :
User manual, Test leads, Battery, USB cable & Adapter socket (GDM-541/533 only),
K-type thermocouple (GDM-533/532 only)

**FREE DOWNLOAD**

| | |
|---|---|
| **GDM-541 PC Software** | Remote Software |
| **GDM-533 PC Software** | Remote Software |

## GDM-531 FEATURES

* **6000 Counts Manual Ranging**
* **Display Backlight/Auto Power Off**
* **Capacitance Measurement**
* **Non-Contact Voltage (NCV) Detection**
* **Data Hold**
* **Audible/Visual Alarm when Overload**








# LCR METERS

GW Instek offers high-precision bench-top LCR meters: the LCR-8200/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-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

## 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, θ (θr or θd) 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-8250A | 50MHz High Frequency LCR Meter | E21-24 |
| LCR-8230A | 30MHz High Frequency LCR Meter | |
| LCR-8220A | 20MHz High Frequency LCR Meter | |
| LCR-8210A | 10MHz High Frequency LCR Meter | |
| LCR-8205A | 5MHz High Frequency LCR Meter | |
| LCR-8230 | 30MHz High Frequency LCR Meter | |
| LCR-8220 | 20MHz High Frequency LCR Meter | |
| LCR-8210 | 10MHz High Frequency LCR Meter | |
| LCR-8205 | 5MHz High Frequency LCR Meter | |
| LCR-8201 | 1MHz High Frequency LCR Meter | |
| LCR-6300 | 10Hz ~ 300kHz Precision LCR Meter | E25-26 |
| 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 | |

### HANDHELD LCR METER

| MODEL | Description (Main Function) | Page |
|---|---|---|
| LCR-916 | 100Hz/120Hz/1k/10k/100kHz Hand Held LCR Meter | E27-28 |
| LCR-915 | 100Hz/120Hz/1k/10kHz Hand Held LCR Meter | |
| LCR-914 | 100Hz/120Hz/1kHz Hand Held LCR Meter | |

# High Frequency LCR Meter



## LCR-8200(A) Series

NEW

CE | USB Device | USB Host | LAN | RS-232 | Handler | Trigger | GPIB | PC Software

## FEATURES

- ✲ **Wide Test Frequency :**
  **LCR-8200A : DC, 10Hz ~ 50/30/20/10/5 MHz**
  **LCR-8200 : DC, 10Hz ~ 30/20/10/5/1 MHZ**
- ✲ **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**
- ✲ **Equivalent Circuit Model Analysis** (LCR-8200A only)
- ✲ **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**

GW Instek's high-frequency LCR tester ~ LCR-8200 (A), which includes two series, LCR-8200A and LCR-8200, has ten models and the maximum test frequency is up to 50MHz. 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 (A) 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, current or bias voltage), horizontal / vertical axis scale (LINEAR / LOG), speed...etc., even adding a bias, can be set and tested according to the actual needs of users. Besides, the LCR-8200A series provides 7 different equivalent circuit models which allows user analysis by 3-components or 4-components combination to characterize the operational characteristics of the circuit. 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 (A) 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 (A) series also provides a Handler interface for system integration of PLCs or sorters.

## OPTIONAL ACCESSORIES SELECTION GUIDE

| ACCESSORY MODEL | BRIEF DESCRIPTION | LCR-8250A | LCR-8230A | LCR-8220A | LCR-8210A | LCR-8205A | – |
|---|---|---|---|---|---|---|---|
| | | – | LCR-8230 | LCR-8220 | LCR-8210 | LCR-8205 | LCR-8201 |
| LCR-05A | Test Fixture for axial & radial lead components (up to 50MHz) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| LCR-06B | Test Lead with Kelvin clip (4 wire type) | △ | △ | △ | △ | △ | ✓ |
| LCR-07 | Test Lead with Alligator clip (2 wire type) | △ | △ | △ | △ | △ | ✓ |
| LCR-08 | Test Fixture (Tweezers) for SMD / Chip components | △ | △ | △ | △ | △ | ✓ |
| LCR-10A | Test Fixture for bottom electrode components (up to 50MHz) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| LCR-12 | Test Lead with Kelvin clip (4 wire type) | △ | △ | △ | ✓ | ✓ | ✓ |
| LCR-15A | Test Fixture for SMD / Chip components (up to 50MHz) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| GTL-234 | RS-232C cable | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| GTL-248 | GPIB Cable | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| GTL-246 | USB Cable | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| GRA-445 | Rack Mount Kit, 19" 4U size | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Note : "△" means the accessories work with a frequency limitation (under 1MHz)

LCR-05A



LCR-06B



LCR-07



LCR-08



LCR-10A



LCR-12



LCR-15A



LCR-DB1






LCR-8200(A) Series

## Rear Panel



## SPECIFICATIONS

| | LCR-8250A | LCR-8230A | LCR-8220A | LCR-8210A | LCR-8205A | – |
|---|---|---|---|---|---|---|
| | – | LCR-8230 | LCR-8220 | LCR-8210 | LCR-8205 | LCR-8201 |
| **TEST FREQUENCY** | | | | | | |
| | DC, 10Hz–50MHz; 6 Digits, ±0.0007% | DC, 10Hz–30MHz; 6 Digits, ±0.0007% | DC, 10Hz–20MHz; 6 Digits, ±0.0007% | DC, 10Hz–10MHz; 6 Digits, ±0.0007% | DC, 10Hz–5MHz; 6 Digits, ±0.0007% | DC, 10Hz–1MHz; 6 Digits, ±0.0007% |
| **OUTPUT IMPEDANCE** | | | | | | |
| | 25Ω / 100Ω SELECTABLE | | | | | |
| **BASIC ACCURACY** | | | | | | |
| | ±0.08% | | | | | |
| **TEST SPEED** | | | | | | |
| | MAX: 2.5ms(>10kHz), FAST: 50ms(>20Hz), MEDIUM: 100ms, SLOW: 300ms, SLOW2: 600ms | | | | | |
| **TEST SIGNAL LEVEL** | | | | | | |
| **AC Voltage**<br>**AC Current**<br>**DCR Voltage** | 10mV – 2Vrms (FREQ. ≦1MHz), 10mV – 1Vrms (FREQ. > 1MHz or FREQ. ≦1MHz and RO=25Ω)<br>100μA – 20mArms (RO=100Ω), 200μA – 40mArms (RO=25Ω)<br>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 (θd / θr), Susceptance (B), DC Resistance (Rdc) | | | | | |
| **LIST MEASUREMENT** | | | | | | |
| **Listed Steps**<br>**Listed Parameters**<br>**Trigger** | 15<br>Freq/Vac/Iac/DC Bias/Comp/BIN<br>AUTO, REPEAT, SINGLE | | | | | |
| **SWEEP MEASUREMENT** | | | | | | |
| **Swept Graphical**<br>**Swept Parameters** | Two of measurement parameters<br>Freq/Vac/Iac/BIAS V, Keep Trace | | | | | |
| **EQUIVALENT CIRCUIT MODEL ANALYSIS ("A" series only)** | | | | | | |
| | 7 different equivalent circuit models, 3-components, 4 types, 4-components, 3 types | | | | | |
| **OTHER FUNCTIONS** | | | | | | |
| **Auto Level Control (ALC)**<br>**DC Bias**<br>**Handler** | Standard<br>0 – ±12V<br>PASS, FAIL and OK, NG or BIN 1-9 | | | | | |
| **OTHER FEATURES** | | | | | | |
| **Correction**<br>**V/I Monitor**<br>**Comparator**<br>**Buzzer**<br>**Average** | Open/Short/HF Load/Load<br>Vac, Iac, Vdc, Idc<br>Value, Δ, Δ%<br>OFF, Pass, Fail<br>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 | | | | | |

* Difference between "A" series and "Non-A" series is only the "A" series provides the equivalent circuit model analysis.

## ORDERING INFORMATION

**LCR-8250A** DC, 10Hz–50MHz High Frequency LCR Meter
**LCR-8230A** DC, 10Hz–30MHz High Frequency LCR Meter
**LCR-8220A** DC, 10Hz–20MHz High Frequency LCR Meter
**LCR-8210A** DC, 10Hz–10MHz High Frequency LCR Meter
**LCR-8205A** DC, 10Hz–5MHz High Frequency LCR Meter
**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
**LCR-8201** DC, 10Hz–1MHz 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

**LCR-05A** Test Fixture for Axial & Radial Lead Components(up to 50MHz)
**LCR-06B** Test Lead with Kelvin clip(4 wire type)
**LCR-07** Test Lead with Alligator clip(2 wire type)
**LCR-08** Test Fixture(Tweezers) for SMD/Chip Components
**LCR-10A** Test Fixture for Bottom Electrode Components(up to 50MHz)
**LCR-12** Test Lead with Kelvin clip(4 wire type)
**LCR-15A** Test Fixture for SMD/Chip components (up to 50MHz)
**LCR-DB1** External DC Bias Voltage Box
**GRA-445** Rack Mount Kit, 19" 4U size
**GTL-234** RS-232C cable
**GTL-248** GPIB Cable
**GTL-246** USB Cable

## A. THE PRESENTATION OF FLEXIBLE MEASUREMENT COMBINATIONS



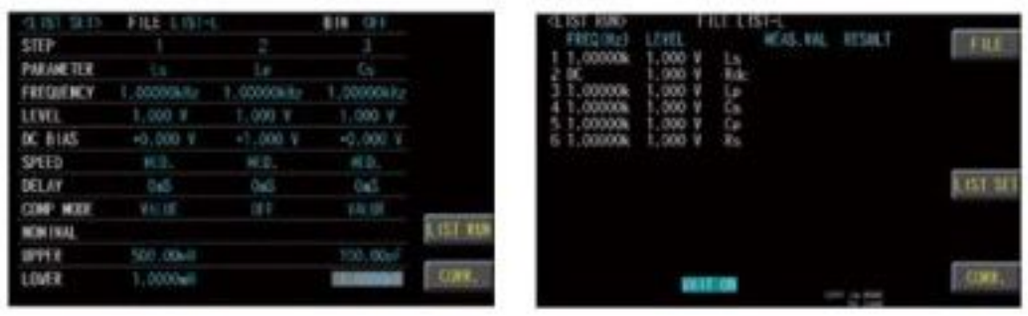

LCR-8200(A) Series allows users to select and arrange measurement parameters. Users can select at least one parameter to maximum four parameters from the 17 measurement parameters according to the measurement requirements and the presentation order can also be arranged in a desired manner. The set parameters 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



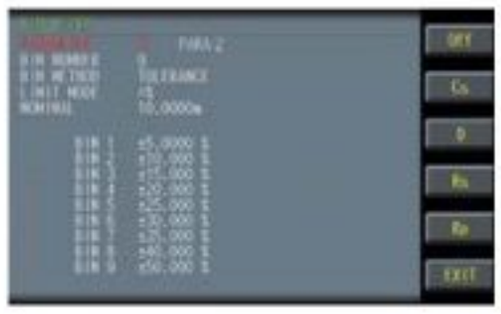

The 15-point LIST measurement mode provides measurement values at a specific frequency or voltage of the DUT, and each set point can set independent comparison and judgement. When the trigger mode is set to "AUTO", the display "WAIT ON" will appear on the measurement screen and LCR-8200(A) Series will detect the contact status of the fixture. When the DUT is connected, the test will start automatically.

## D. TWO-CURVE 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







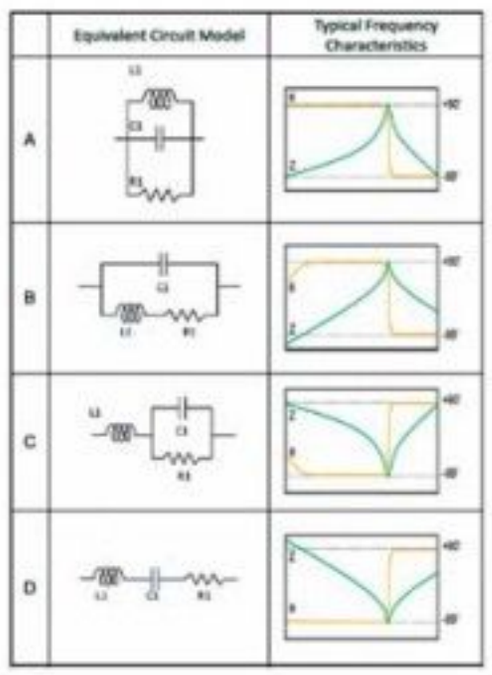
BIN settings for one specific parameter of the selected measurement parameters provide up to 9 BIN positions. Set the judgment basis for individual classifications according to the desired BIN methods (EQUAL/SEQUENTIAL/TOLERANCE/ RANDOM) and limit value mode (VALUE/delta/delta%). The result of this sorting can be obtained through the Handler interface. If directly connected to an external device such as a sorter, an immediate sorting can be performed.

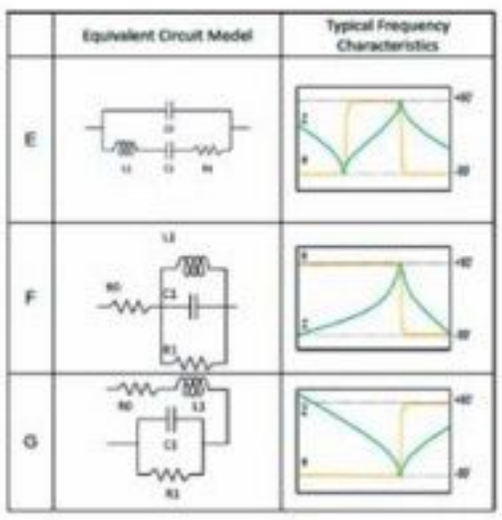
## F. EQUIVALENT CIRCUIT MODEL ANALYSIS










This function, which adopts the algorithm based on resonance theory, consists of 7 different equivalent circuit models. The 3-components analysis model is composed of 4 types, A, B, C and D, whereas the 4-components analysis model covers 3 types, E, F and G. By selecting suitable equivalent circuit model, the instrument will automatically calculate approximate value of each component parameter after measurement, and generate simulated curve (TRACE A/B SIMULATION) to compare with the measured curve (TRACE A/B).

Also, it's available to choose equivalent circuit model followed by directly input value of each component parameter to generate a simulated curve (TRACE A/B SIMULATION) to further compare with the measured curve (TRACE A/B). The parameters of both resonance frequency (SRF) and quality factor (Qm) can be displayed simultaneously.

# Precision LCR Meter



## LCR-6000 Series

CE | PC Software | RS-232 | Handler | LabVIEW Driver | USB Device | USB Host

## 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 (±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 (±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 ±2.5V adjustable voltage or via an optional external bias voltage adapter (±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(±0.01%) (4 digits resolution)<br>LCR-6200 : 10Hz ~ 200kHz(±0.01%) (4 digits resolution)<br>LCR-6100 : 10Hz ~ 100kHz(±0.01%) (4 digits resolution)<br>LCR-6020 : 10Hz ~ 20kHz(±0.01%) (4 digits resolution)<br>LCR-6002 : 10Hz ~ 2kHz(±0.01%) (4 digits resolution) |
| **OUTPUT IMPEDANCE** | |
| | 30Ω / 50Ω / 100Ω selectable |
| **BASIC ACCURACY** | |
| Slow / Med<br>Fast | 0.05%<br>0.1% |
| **TEST SPEED** | |
| | FAST : 25ms / MED : 100ms / SLOW : 333ms |
| **TEST SIGNAL LEVELS** | |
| AC Voltage<br>Current<br>DCR | 10.00mV- 2.00V (±10%) CV : 10.00mV- 2.00V (±6%)<br>100.0μA- 20.00mA (±10%) CC : 100.0μA- 20.00mA(±6%) (@2VMax)<br>±2V, 0.066A(Max),Output impedance fixed 30Ω |
| **DC BIAS** | |
| Internal | ±2.5V (0.5% + 0.005V) |
| **DISPLAY RANGE** | |
| R, X, \|Z\|<br>G, B, \|Y\|<br>L<br>C<br>D<br>Q<br>θ d<br>θ r<br>DCR<br>△% | 0.00001Ω ~ 99.9999MΩ<br>0.01nS ~ 999.999S<br>0.00001μH ~ 9999.99H<br>0.00001pF ~ 9999.99mF<br>0.00001 ~ 9.99999<br>0.00001 ~ 99999.9<br>-179.999° ~ 179.999°<br>-3.14159 ~ 3.14159<br>0.00001Ω ~ 99.9999MΩ<br>-99999% ~ 99999% |
| **TEST MODE** | |
| Combinations<br><br>Monitor Parameter (2 Selectable) | Cs-Rs, Cs-D, Cp-Rp, Cp-D, Lp-Rp, Lp-Q, Ls-Rs, Ls-Q, Rs-Q, Rp-Q, R-X, DCR, Z-θr, Z- θd, Z-D, Z-Q, Auto LCZ<br>Z, D, Q, Vac, Iac, △, △%, θr, θd, R, X, G, B, Y |



## Rear Panel



# LCR-6000 Series

| SPECIFICATIONS | |
|---|---|
| **LISTED MODE** | |
| | 10 steps |
| **BIN FUNCTION** | |
| | Comparator (9BIN,AUX:1BIN) |
| **MEMORY** | |
| **INT – Panel Setting**<br>**INT – Measured Data**<br>**USB Storage** | 10 file name<br>10000 Data(.csv)<br>10 file name for setting, 9999 file name for data, 999 Log file for LCD screen |
| **OTHER FUNCTION** | |
| **Auto Level Control (ALC)**<br>**Average**<br>**Trigger**<br>**Delay**<br>**Judgment**<br>**Screen Capture** | ON/OFF<br>1~256 times<br>INT / MAN / EXT / BUS<br>0ms~60s<br>PASS / FAIL<br>Saving into USB (Bmp form) |
| **DISPLAY** | |
| 3.5" LCD, RGB color (320x240) | |
| **INTERFACE** | |
| RS-232(SCPI), Handler, USB Host/USB Device | |
| **POWER SOURCE** | |
| AC 100V ~ 240V, 50 ~ 60Hz, Max. 15W | |
| **DIMENSIONS & WEIGHT** | |
| 265(W) x 107(H) x 312(D) mm ; Approx. 3kg | |

## 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 |

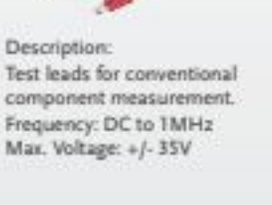
**OPTIONAL ASSESSORIES**

| | |
|---|---|
| **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 |
| **GRA-436** | Rack Mount Kit, 19" 2U size for two sets |

**FREE DOWNLOAD**

| | |
|---|---|
| **PC Software** | LCR-6000 Series |
| **Driver** | LabVIEW Driver |

### 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)

CE USB

## 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 |
| **GTL-253** | USB Cable, USB 2.0 A-mini B type, Approx. 1400mm |

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

## 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 offed by GW Instek, GPT-15000/12000/9900/9800/9600/9500 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

| | |
|---|---|
| **HI-Pot (Withstanding)** | **Purpose:** Make sure users do not receive electrical shocks that might be caused by a breakdown of the electrical insulation when using product.<br>**Method:** 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. |
| **ARC Detection** | **Purpose:** Check potential problems such as loose screws, bad material insulation, etc.<br>**Method:** 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. |
| **Insulation Resistance** | **Purpose:** Check the quality of insulation.<br>**Method:** 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. |
| **Ground Bond** | **Purpose:** 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.<br>**Method:** 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. |
| **Continuity** | **Purpose:** Verifies that an electrical connection exists between the mains power ground and any conductive surface of the product.<br>**Method:** A ground bond test is for measuring the ground path with low voltage and low current. |

## 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.

**Selectable Arc Detection**

An Arc is a short duration (>10uS) current spike occurring due to a dramatic change in voltage or current. The GPT-9900/9800/9600Series 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 TESTERS

## SAFETY TESTING INSTRUMENTS

| MODEL | Description (Main Function) | Page |
|---|---|---|
| GPT-15004 | AC 500VA AC/DC/IR/GB Electrical Safety Analyzer | E33-38 |
| GPT-15003 | AC 500VA AC/DC/IR Electrical Safety Analyzer | E33-38 |
| GPT-15002 | AC 500VA AC/DC Electrical Safety Analyzer | E33-38 |
| GPT-15001 | AC 500VA AC Electrical Safety Analyzer | E33-38 |
| GPT-12004 | AC 200VA AC/DC/IR/GB Electrical Safety Analyzer | E33-38 |
| GPT-12003 | AC 200VA AC/DC/IR Electrical Safety Analyzer | E33-38 |
| GPT-12002 | AC 200VA AC/DC Electrical Safety Analyzer | E33-38 |
| GPT-12001 | AC 200VA AC Electrical Safety Analyzer | E33-38 |
| GPT-9904 | AC 500VA AC/DC Withstanding Voltage/Insulation Resistance/Ground Bond Tester | E39-40 |
| GPT-9903A | AC 500VA AC/DC Withstanding Voltage/Insulation Resistance Tester | E39-40 |
| GPT-9902A | AC 500VA AC/DC Withstanding Voltage Tester | E39-40 |
| GPT-9901A | AC 500VA AC Withstanding Voltage Tester | E39-40 |
| GPT-9804 | AC 200VA AC/DC Withstanding Voltage/Insulation Resistance/Ground Bond Tester | E39-40 |
| GPT-9803 | AC 200VA AC/DC Withstanding Voltage/Insulation Resistance Tester | E39-40 |
| GPT-9802 | AC 200VA AC/DC Withstanding Voltage Tester | E39-40 |
| GPT-9801 | AC 200VA AC Withstanding Voltage Tester | E39-40 |
| GSB-01 | Multiplex Scanner Box – 8CH H.V. | E41-42 |
| GSB-02 | Multiplex Scanner Box – 6CH H.V./2CH G.B. | E41-42 |
| GCT-9040 | AC Ground Bond Tester | E43-44 |
| GPT-9603 | AC 100VA AC/DC Withstanding Voltage/Insulation Resistance Tester | E45-46 |
| GPT-9612 | AC 100VA AC Withstanding Voltage/Insulation Resistance Tester | E45-46 |
| GPT-9602 | AC 100VA AC/DC Withstanding Voltage Tester | E45-46 |
| GPT-9601 | AC 100VA AC Withstanding Voltage Tester | E45-46 |
| GPT-9513 | Multi-Channel Hipot Tester | E47-50 |
| GPT-9503 | Multi-Channel Hipot Tester | E47-50 |
| GLC-10000 | Leakage Current Tester | E51-52 |
| GLC-9000 | Leakage Current Tester | E53-54 |

## GPT-SERIES QUICK SELECTION GUIDE

| | | Functions | | | | | Features | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MODEL | Output Capacity | ACW | DCW | IR | GB | GC | SWEEP | ARC Detect | RAMP Up | RAMP Down | Rear Output | Barcode |
| GPT-15004 | 500VA | ✓* | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| GPT-15003 | 500VA | ✓* | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| GPT-15002 | 500VA | ✓* | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| GPT-15001 | 500VA | ✓* | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 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 | ✓ | | | | | | ✓ | | | | |
| GPT-9513 | 150VA | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | 8CH Scanner | |
| GPT-9503 | 150VA | ✓ | ✓ | ✓ | | ✓ | | ✓ | ✓ | ✓ | 8CH Scanner | |

* Short Current > 200mA

# AC/DC/IR/GB Electrical Safety Analyzer



GPT-15004

NEW



GPT-15003/15002/15001

NEW



GPT-12004

台灣精品 TAIWAN EXCELLENCE



GPT-12003/12002/12001

台灣精品 TAIWAN EXCELLENCE

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

## FEATURES

- ✲ 200VA/500VA AC Test Capacity (500VA short circuit current > 200mA)
- ✲ 7" TFT LCD
- ✲ Comply with IEC 61010-2-034 Design Requirement
- ✲ Manual Test Mode/Auto Test Mode
- ✲ RMS Current Measurement
- ✲ Zero Crossing Turn-on Operation
- ✲ Controllable Ramp-up & Ramp-down Time
- ✲ Statistics & Analysis Function
- ✲ Capacitive Load Testing Capability up to 47μF
- ✲ Sweep Function for DUT Characteristic Analysis
- ✲ Convenience Listed AUTO Mode Easy to Read Result and Judge
- ✲ Internal Storage and USB Storage Available
- ✲ Barcode Function Available
- ✲ Setting Data Export/Import
- ✲ Rear Panel Output Available
- ✲ Standard Interface : RS-232C, USB host/device and Signal I/O
- ✲ Optional Interface : GPIB or LAN
- ✲ Universal Power Input

GW Instek introduces the flagship model (500VA/200VA output capacity) safety analyzer-the GPT-10000 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-10000 Series safety analyzer has eight models: GPT-15004/GPT-12004 features AC/DC withstanding voltage test, insulation resistance test, AC ground bond test and continuity test; GPT-15003/GPT-12003 conducts AC/DC withstanding voltage test, insulation resistance test, and continuity test; GPT-15002/GPT-12002 carries out AC/DC withstanding voltage test and continuity test; GPT-15001/GPT-12001 executes AC withstanding voltage test and continuity test. The entire series 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), DC withstanding voltage test (DC 6kV), insulation resistance test (DC 50V–1200V), ground bond test (AC 32A), and grounding continuity test (DC 100mA fixed). 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 recoded 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-10000 series include 100 sets of manual test as well as 100 sets of auto test memory for the storage of different test conditions and the saved test conditions can be exported to another GPT-10000 through USB flash drive to quick replication and expansion of production line equipment; barcode scanner can be conducted to the front panel USB host of GPT-10000 for managing test condition of DUT and then be able to quick and correctly recall required test condition; 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 or internal memory 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 option GPIB or LAN.

## SPECIFICATIONS

| MODEL | GPT-15000 Series | GPT-12000 Series |
|---|---|---|
| **AC WITHSTANDING** | | |
| Output-Voltage Range | 0.050kV–5.000kV | 0.050kV–5.000kV |
| Output-Voltage Resolution | 1V | 1V |
| Output-Voltage Accuracy | ±(1% of setting + 5V) [no load] | ±(1% of setting + 5V) [no load] |
| Maximum Rated Load | 500 VA (5kV/100mA) | 200 VA (5kV/40mA) |
| Maximum Rated Current | 100mA (0.5kV< V≦5kV);<br>10mA (0.05kV≦ V ≦0.5kV) | 40mA (0.5kV< V≦5kV);<br>10mA (0.05kV≦ V ≦0.5kV) |
| Output-Voltage Waveform | Sine wave | Sine wave |
| Output-Voltage Frequency | 50 Hz / 60 Hz selectable | 50 Hz / 60 Hz selectable |
| Voltage Regulation | ±(1% + 5V) [maximum rated load -- no load] | ±(1% + 5V) [maximum rated load -- no load] |
| Voltmeter Accuracy | ±(1% of reading + 5V) | ±(1% of reading + 5V) |
| Current Measurement Range | 1μA–100.0mA | 1μA–40.00mA |
| Current Best Resolution | 1μA / 10μA / 100μA | 1μA / 10μA |
| Current Measurement Accuracy | ±(1.5% of reading + 30μA) | ±(1.5% of reading + 30μA) |
| Current Offset | 60μA Maximum | 60μA Maximum |
| Window Comparator Method | Yes | Yes |
| ARC Detect | Yes | Yes |
| RAMP UP (Rise Time) | 0.1s–999.9s | 0.1s–999.9s |
| RAMP DOWN (Fall Time) | 0.0s–999.9s | 0.0s–999.9s |
| TIMER (Test Time)✲ | OFF, 0.3s–999.9s | OFF, 0.3s–999.9s |
| WAIT TIME | 0.0s–999.9s | 0.0s–999.9s |
| GND | ON/OFF | ON/OFF |

## SPECIFICATIONS

| MODEL | GPT-15000 Series | GPT-12000 Series |
|---|---|---|
| **DC WITHSTANDING** | | |
| Output-Voltage Range | 0.050kV–6.000kV | 0.050kV–6.000kV |
| Output-Voltage Resolution | 1V | 1V |
| Output-Voltage Accuracy | ±(1% of setting + 5V) [no load] | ±(1% of setting + 5V) [no load] |
| Maximum Rated Load | 100W (5kV/20mA) | 50W (5kV/10mA) |
| Maximum Rated Current | 20mA (0.5kV< V ≦6kV);<br>2mA (0.05kV≦ V ≦0.5kV) | 10mA (0.5kV< V ≦6kV);<br>2mA (0.05kV≦ V ≦0.5kV) |
| Voltage Regulation | ±(1% + 5V) [maximum rated load -- no load] | ±(1% + 5V) [maximum rated load -- no load] |
| Voltmeter Accuracy | ±(1% of reading + 5V) | ±(1% of reading + 5V) |
| Current Measurement Range | 1μA–20.00mA | 1μA–10.00mA |
| Current Best Resolution | 0.1μA /1μA /10μA | 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 | ±(1.5% of reading + 3μA) when I Reading < 1mA ; ±(1.5% of reading + 30μA) when I Reading≧1mA |
| Current Offset | 5μA Maximum | 5μA Maximum |
| Window Comparator Method | Yes | Yes |
| ARC Detect | Yes | Yes |
| RAMP UP (Rise Time) | 0.1s–999.9s | 0.1s–999.9s |
| RAMP DOWN (Fall Time) | 0.0s–999.9s | 0.0s–999.9s |
| TIMER (Test Time)* | OFF, 0.3s–999.9s | OFF, 0.3s–999.9s |
| WAIT TIME | 0.0s–999.9s | 0.0s–999.9s |
| GND | ON/OFF | ON/OFF |
| **INSULATION RESISTANCE** | | |
| Output Voltage | 50V–1200V dc | 50V–1200V dc |
| Output-Voltage Resolution | 50V | 50V |
| Output-Voltage Accuracy | ±(1% of setting + 5V) [no load] | ±(1% of setting + 5V) [no load] |
| Resistance Measurement<br>Test Voltage Display Range | Measurement Range / Accuracy | |
| 50V≦V≦100V 0.001MΩ~10.00GΩ | 0.1MΩ~1MΩ:±(5% of reading+3count);<br>1.1MΩ~50MΩ:±(5% of reading+1count); | 0.1MΩ~1MΩ:±(5% of reading+3count);<br>1.1MΩ~50MΩ:±(5% of reading+1count); |
| 150V≦V≦450V 0.001MΩ~20.00GΩ | 50.1MΩ~2GΩ:±(10% of reading+1count) | 50.1MΩ~2GΩ:±(10% of reading+1count) |
| 500V≦V≦1200V 0.001MΩ~50.00GΩ | 0.1MΩ~1MΩ:±(5% of reading+3count);<br>1.1MΩ~500MΩ:±(5% of reading+1count);<br>500.1MΩ~9.999GΩ:±(10% of reading+1count);<br>10GΩ~50GΩ:±(20% of reading+1count) | 0.1MΩ~1MΩ:±(5% of reading+3count);<br>1.1MΩ~500MΩ:±(5% of reading+1count);<br>500.1MΩ~9.999GΩ:±(10% of reading+1count);<br>10GΩ~50GΩ:±(20% of reading+1count) |
| Voltage Regulation | ±(1% + 5V) [maximum rated load -- no load] | ±(1% + 5V) [maximum rated load -- no load] |
| Voltmeter Accuracy | ±(1% of reading + 5V) | ±(1% of reading + 5V) |
| Short-Circuit Current | 10mA max. | 10mA max. |
| Output Impedance | 2kΩ | 2kΩ |
| Window Comparator Method | Yes | Yes |
| RAMP UP (Rise Time) | 0.1s–999.9s | 0.1s–999.9s |
| RAMP DOWN (Fall Time) | 0.0s–999.9s | 0.0s–999.9s |
| TIMER (Test Time)* | 0.3s–999.9s | 0.3s–999.9s |
| WAIT TIME | 0.0s–999.9s | 0.0s–999.9s |
| GND | ON/OFF | ON/OFF |
| **GROUND BOND** | | |
| Output-Current | 03.00A–32.00A ac | 03.00A–32.00A ac |
| Output-Current Resolution | 0.01A | 0.01A |
| Output-Current Accuracy | 3A≦I≦8A:±(1% of reading+0.2A);<br>8A<I≦32A:±(1% of reading+0.05A) | 3A≦I≦8A:±(1% of reading+0.2A);<br>8A<I≦32A:±(1% of reading+0.05A) |
| Test-Voltage | 8Vac max (open circuit) | 8Vac max (open circuit) |
| Test-Voltage Frequency | 50Hz/60Hz selectable | 50Hz/60Hz selectable |
| Ohmmeter Measurement Range | 1mΩ– 650mΩ | 1mΩ– 650mΩ |
| Ohmmeter Measurement Resolution | 0.1mΩ | 0.1mΩ |
| Ohmmeter Measurement Accuracy | ±(1% of reading + 2 mΩ) | ±(1% of reading + 2 mΩ) |
| Window Comparator Method | Yes | Yes |
| TIMER (Test Time)* | 0.3s–999.9s | 0.3s–999.9s |
| Test Method | Four Terminal | Four Terminal |
| GND | ON/OFF | ON/OFF |
| **CONTINUITY TEST** | | |
| Output-Current | 100mA dc (fixed) | 100mA dc (fixed) |
| Ohmmeter Measurement Range | 0.10Ω– 70.00Ω | 0.10Ω– 70.00Ω |
| Ohmmeter Measurement Resolution | 0.01Ω | 0.01Ω |
| Ohmmeter Measurement Accuracy | ±(10% of reading + 2 Ω) | ±(10% of reading + 2 Ω) |
| Window Comparator Method | Yes | Yes |
| TIMER (Test Time)* | 0.3s–999.9s | 0.3s–999.9s |
| **MEMORY** | | |
| Single Step Memory<br>Automatic Testing Memory | MANU : 100 blocks<br>AUTO : 100 blocks, Manu per auto : 10 | MANU : 100 blocks<br>AUTO : 100 blocks, Manu per auto : 10 |
| **INTERFACE** | | |
| Standard (Front)<br>Standard (Rear)<br>Option | REMOTE, USB host<br>Rear Output, RS-232C, USB device,<br>Signal I/O, GPIB, LAN | REMOTE, USB host<br>Rear Output, RS-232C, USB device,<br>Signal I/O, GPIB, LAN |
| **DISPLAY** | | |
| | 7" color LCD | 7" color LCD |
| **POWER SOURCE** | | |
| | AC 100V–240V ± 10%, 50Hz/60Hz;<br>Power consumption : Max. 1000VA | AC 100V–240V ± 10%, 50Hz/60Hz;<br>Power consumption : Max. 400VA |
| **DIMENSIONS & WEIGHT** | | |
| | GPT-15001/15002/15003:380(W)x148(H)x492(D)mm; Approx.17kg(max.) ;<br>GPT-15004 : 380(W)x148(H)x546(D)mm; Approx. 21kg | GPT-12001/12002/12003:380(W)x148(H) x 436(D) mm; Approx. 11kg (max.) ;<br>GPT-12004 : 380(W)x148(H)x454(D)mm; Approx. 15kg |

Note : * TIMER Accuracy: +/-(100ppm+20ms)

### Interlock Key



### GHT-119 Remote Cable

Approx. 500mm



### GHT-205 High Voltage Test Probe



### GHT-117/GHT-117(EU)
**High Voltage Adapter Box**



### GHT-118/GHT-118(EU)
**High Voltage/Ground Bond Adapter Box**



# AC/DC/IR/GB Electrical Safety Analyzer

GPT-15004/12004 Rear Panel



GPT-15003/15002/15001 Rear Panel
GPT-12003/12002/12001 Rear Panel






GPT-15004

## SELECTION GUIDE

| Model \ Function | Output Capacity | AC | DC | IR | GB | Continuity | Rear Output |
|---|---|---|---|---|---|---|---|
| GPT-15001 | 500VA | ✓ | | | | ✓ | ✓ |
| GPT-15002 | 500VA | ✓ | ✓ | | | ✓ | ✓ |
| GPT-15003 | 500VA | ✓ | ✓ | ✓ | | ✓ | ✓ |
| GPT-15004 | 500VA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| GPT-12001 | 200VA | ✓ | | | | ✓ | ✓ |
| GPT-12002 | 200VA | ✓ | ✓ | | | ✓ | ✓ |
| GPT-12003 | 200VA | ✓ | ✓ | ✓ | | ✓ | ✓ |
| GPT-12004 | 200VA | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Note : GPT-15000 Series ACW short current > 200mA

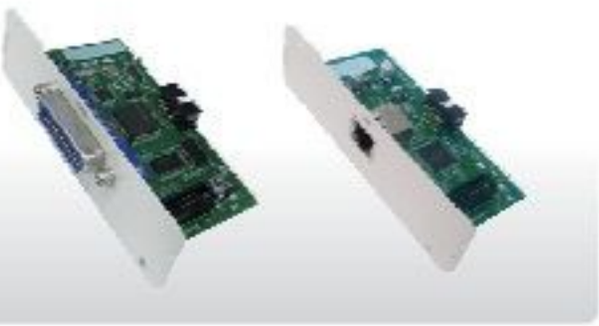
**GHT-115** High Voltage/Contiunity Test Lead



GTL-215 Test Lead



**GPT-10KG1/10KL1** GPIB & LAN card



## ORDERING INFORMATION

**GPT-15004** AC 500VA AC/DC/IR/GB Electrical Safety Analyzer
**GPT-15003** AC 500VA AC/DC/IR Electrical Safety Analyzer
**GPT-15002** AC 500VA AC/DC Electrical Safety Analyzer
**GPT-15001** AC 500VA AC Electrical Safety Analyzer
**GPT-12004** AC 200VA AC/DC/IR/GB Electrical Safety Analyzer
**GPT-12003** AC 200VA AC/DC/IR Electrical Safety Analyzer
**GPT-12002** AC 200VA AC/DC Electrical Safety Analyzer
**GPT-12001** AC 200VA 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-15001/15002/15003/12001/12002/12003, Test lead GHT-115 x 1, GTL-215 x 1 for GPT-15004/12004

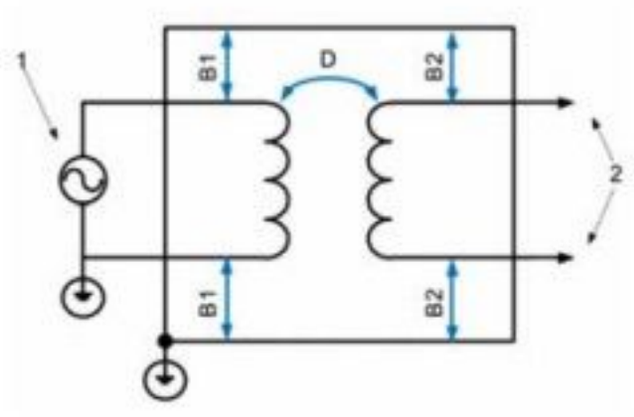
**OPTION**

**GPT-10KG1** GPIB card **GPT-10KL1** LAN card

**OPTIONAL ASSESSORIES**

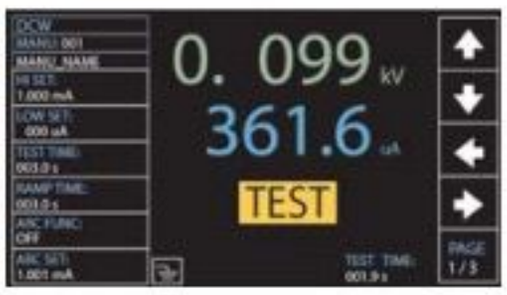
**GHT-117/GHT-117(EU)** High Voltage Adapter Box
**GHT-118/GHT-118(EU)** High Voltage/Ground Bond Adapter Box
**GHT-113** High Voltage Test Pistol
**GHT-205** High Voltage Test Probe
**GTL-232** RS232C Cable, 9-pin Female to 9-pin, null Modem for Computer
**GTL-246** USB Cable, A-B type, approx. 1.2m
**GTL-248** GPIB Cable, approx. 2m
**GTL-264** Signal I/O Converted Cable, 15-pin Male to 9-pin Female. Approx. 200mm
**GRA-440** Rack Adapter Panel (19', 4U)

## 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-10000 Series 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.

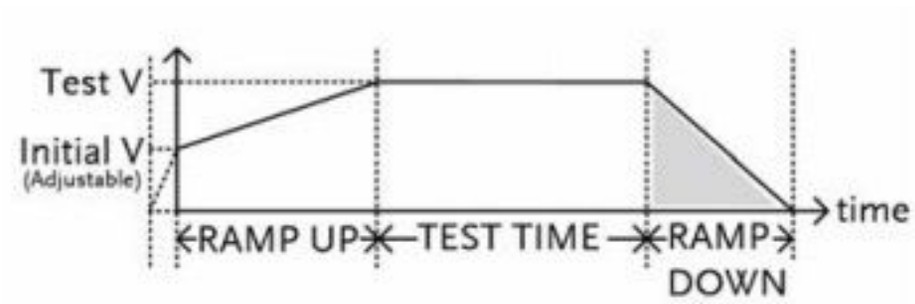
## B. HIGH ACCURACY AND HIGH RESOLUTION TESTING PERFORMANCE




**High Adjustment & Measurement Resolution**

For production tests and characteristic verification, the GPT-10000 Series provides a withstand voltage test voltage (AC 5kV/DC 6kV) that can be adjusted in 1V steps with current measurement resolutions up to 1μA (ACW) or 0.1μA (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 0.1MΩ. Since most safety regulations require AC power supply for ground bond test, the GPT-10000 Series provides 8Vac (open) and 3A to 32Aac current for ground bond test with a resistance measurement resolution of 0.1mΩ. The entire series provides the continuity grounding test function with a 100mAdc (fixed) test source and a measurement resolution of 0.01Ω 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**

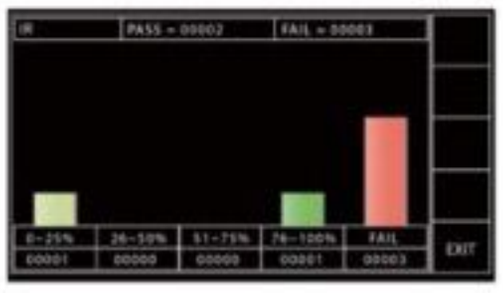
To make tests compliant with the test requirements of relevant safety regulations, the GPT-10000 Series provides a more flexible output sequence setting starting from the start point of the test. Taking the AC/DC withstand voltage test as an example, the initial voltage can be set. Users determine the 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. STATISTIC AND ANALYSIS



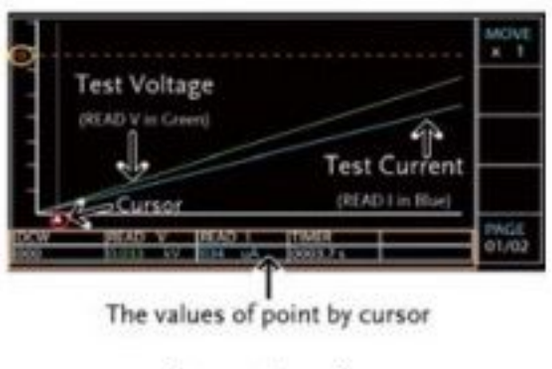

**Statistic**



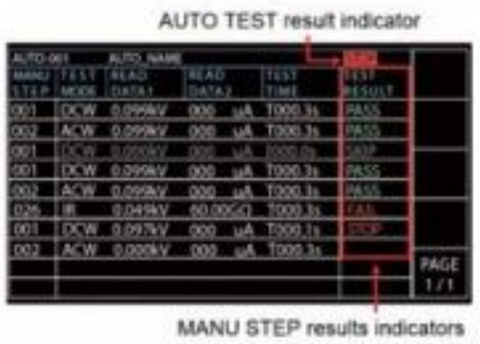

**Analysis**

The GPT-10000 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.

## E. SWEEP AND TABULAR AUTOMATIC TEST




**Sweep Function**




**Tabular Automatic Test**

The GPT-10000 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, uses 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. BARCODE FUNCTION



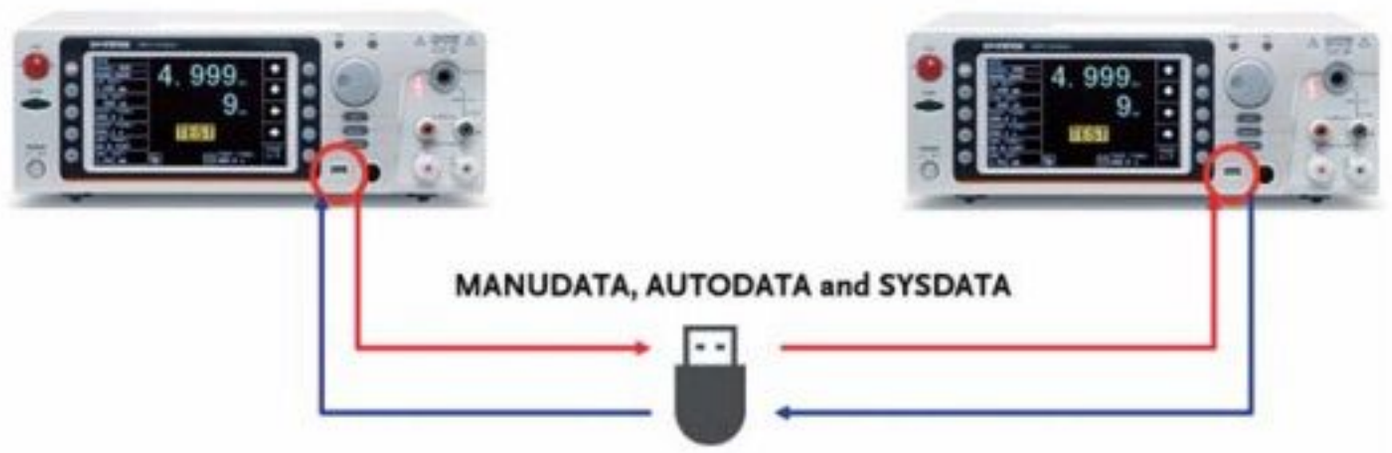

**Barcode Setting**




**Barcode Execute**

GPT-10000 Series supports the connection mechanism of the barcode machine. Users can manage the test conditions of each DUT through the use and setting of the barcode machine, which is especially suitable for mixed-type production lines. By scanning the barcode of the DUT, GPT-10000 Series can automatically reveal the corresponding test conditions, which can avoid using wrong conditions and causing damage to the DUT.

## G. SETTING DATA EXPORT / IMPORT MECHANISM




**Setting Data Export / Import**

In order to expedite the deployment of the production line and achieve the consistency of test conditions, GPT-10000 Series provides a mechanism that can replicate test conditions. Users only need to set test conditions for one unit, and all settings can be copied via a USB flash drive. Other than the rapid setting of consistent test conditions, it can also avoid the difference while conducting settings.

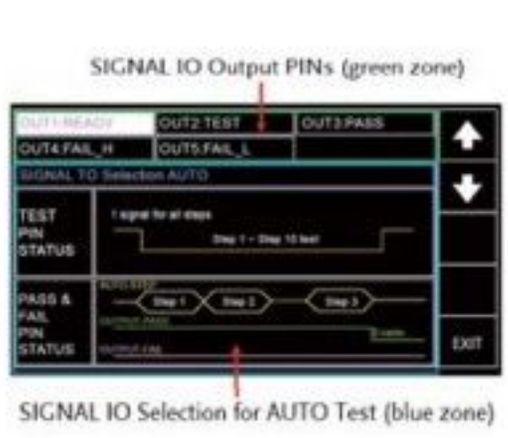
## H. COMPLETE TEST DATA RETRIEVAL INTERFACE




**Storage Function**

In order to facilitate users to analyze the results of the safety test, GPT-10000 Series 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. When there is no USB flash drive available, users can turn on the internal memory storage function (up to 30,000 lots) to store the results of each test in theinternal memory first, and then transfer them to an external device via a USB flash drive when available. Besides, the entire series is equipped with RS-232C and USB device (GPIB or LAN is optional) for easy retrieval of test data and results by connecting a PC.

## I. USER DEFINED SIGNAL I/O




**Self-defined Signal I/O**

For interface connections, the GPT-10000 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.

# AC/DC Withstanding Voltage/Insulation Resistance/Ground Bond Tester



GPT-9904



GPT-9903A/9902A/9901A



GPT-9804



GPT-9803/9802/9801

CE | USB Device | RS-232 | GPIB | PC Software | Remote Terminal | Signal I/O | Rear-Panel Output | LabVIEW Driver

## 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
- ✲ RMS Current Measurement
- ✲ High Resolution : 1μ A 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 "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 150 μ s) 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 |
|---|---|---|
| **AC WITHSTANDING** | | |
| 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)<br>10mA (0.05kV≦ V≦ 0.5kV) | 100mA (0.5kV< V≦5kV)<br>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<br>±(1.5% of rdg+3counts)when HI SET ≧1.11mA | ±(1.5% of rdg+30counts)when HI SET <1.11mA<br>±(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 |
| **DC WITHSTANDING** | | |
| 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)<br>2mA (0.05kV≦V≦0.5kV) | 20mA (0.5kV< V≦6kV)<br>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<br>±(1.5% of rdg+3counts)when HI SET ≧1.11mA | ±(1.5% of rdg+30counts)when HI SET<1.11mA<br>±(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 | 1MΩ – 9500MΩ | | 0.001GΩ – 50.00GΩ | |
| Test Voltage | Measurable Range | Accuracy | Measurable Range | Accuracy |
| 50V≤V≤450V | 1 – 50MΩ<br>51 – 2000MΩ | ±(5% of rdg+1count)<br>±(10% of rdg+1count) | 0.001–0.050GΩ<br>0.051–2.000GΩ | ±(5% of rdg+1count)<br>±(10% of rdg+1count) |
| 500V≤V≤1000V | 1 – 500MΩ<br>501 – 9500MΩ | ±(5% of rdg+1count)<br>±(10% of rdg+1count) | 0.001–0.500GΩ<br>0.501–9.999GΩ<br>10.00–50.00GΩ | ±(5% of rdg+1count)<br>±(10% of rdg+1count)<br>±(20% of rdg+1count) |
| Window Comparator Method | Yes | | Yes | |
| Output Impedance | 600kΩ | | 600kΩ | |
| 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),<br>8A< I≤30A : ±(1% of setting+0.05A) | | 3A≤I≤8A : ±(1% of setting+0.2A),<br>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 | 10mΩ – 650.0mΩ | | 10mΩ–650.0mΩ | |
| Resistance Measurement Resolution | 0.1mΩ | | 0.1mΩ | |
| Resistance Measurement Accuracy | ±(1% of rdg + 2mΩ) | | ±(1% of rdg + 2mΩ) | |
| 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<br>Automatic Testing Memory | MANU : 100 blocks<br>AUTO : 100 blocks, menu per auto:16 | | MANU : 100 blocks<br>AUTO : 100 blocks, menu per auto:16 | |
| **INTERFACE** | | | | |
| Rear Output | NOT Support | | Standard | |
| RS-232C | Standard | | Standard | |
| USB | Standard | | Standard | |
| GPIB | 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;<br>Power Consumption : Max. 500VA | | AC100V/120V/220V/230V±10%,50/60Hz;<br>Power Consumption : Max. 1000VA | |
| **DIMENSIONS & WEIGHT** | | | | |
| | 330(W) x 148(H) x 452(D) mm<br>Approx. 19kg max. | | 330(W)x148(H)x482(D)mm(GPT-9902A/9901A/9903A);<br>330(W)x148(H)x587(D)mm(GPT-9904);<br>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-215 x 1 for GPT-9904/9804

### OPTION

| | | | |
|---|---|---|---|
| **GPT-9KG1** | GPIB card | **GSB-02** | Multiplex Scanner Box(6CH H.V./2CH G.B.) |
| **GSB-01** | Multiplex Scanner Box(8CH H.V.) | | |

### OPTIONAL ASSESSORIES

| | | | |
|---|---|---|---|
| **GHT-113** | High Voltage Test Pistol | **GTL-247** | USB Cable, A-A type, approx. 1.8m |
| **GHT-117/GHT-117(EU)** | High Voltage Adapter Box | **GTL-232** | RS-232C Cable, 9-pin Female to 9-pin null Modem for Computer |
| **GHT-118/GHT-118(EU)** | High Voltage/Ground Bond Adapter Box | **GRA-417** | Rack Mount Kit |
| **GHT-205** | High Voltage Test Probe | **GRA-433** | Rack Mount Kit for GPT-9904 only |
| **GTL-248** | GPIB Cable, approx. 2m | | |

### FREE DOWNLOAD

**PC Software** GPT-9000

### Interlock Key



### GHT-119 Remote Cable

Approx. 500mm



### GHT-114 Clip High Voltage Probe

Approx. 1m



### GTL-215 Test Lead

Approx. 1m



### GHT-117/GHT-117(EU)
**High Voltage Adapter Box**



### GHT-118/GHT-118(EU)
**High Voltage/Ground Bond Adapter Box**



# Multiplex Scanner Box

ZL201420282101.8



## GSB-01/02

CE RS-232

### 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

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 ±10%, 50/60Hz; Power Consumption : Max. 50VA | |
| DIMENSIONS & WEIGHT | | |
| | GSB-01 : 330(W) x 101(H) x 399(D) mm<br>GSB-02 : 330(W) x 101(H) x 413(D) mm<br>Approx. 5.5kg | |

### GTL-235 Communication Cable

Approx. 700mm



### 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

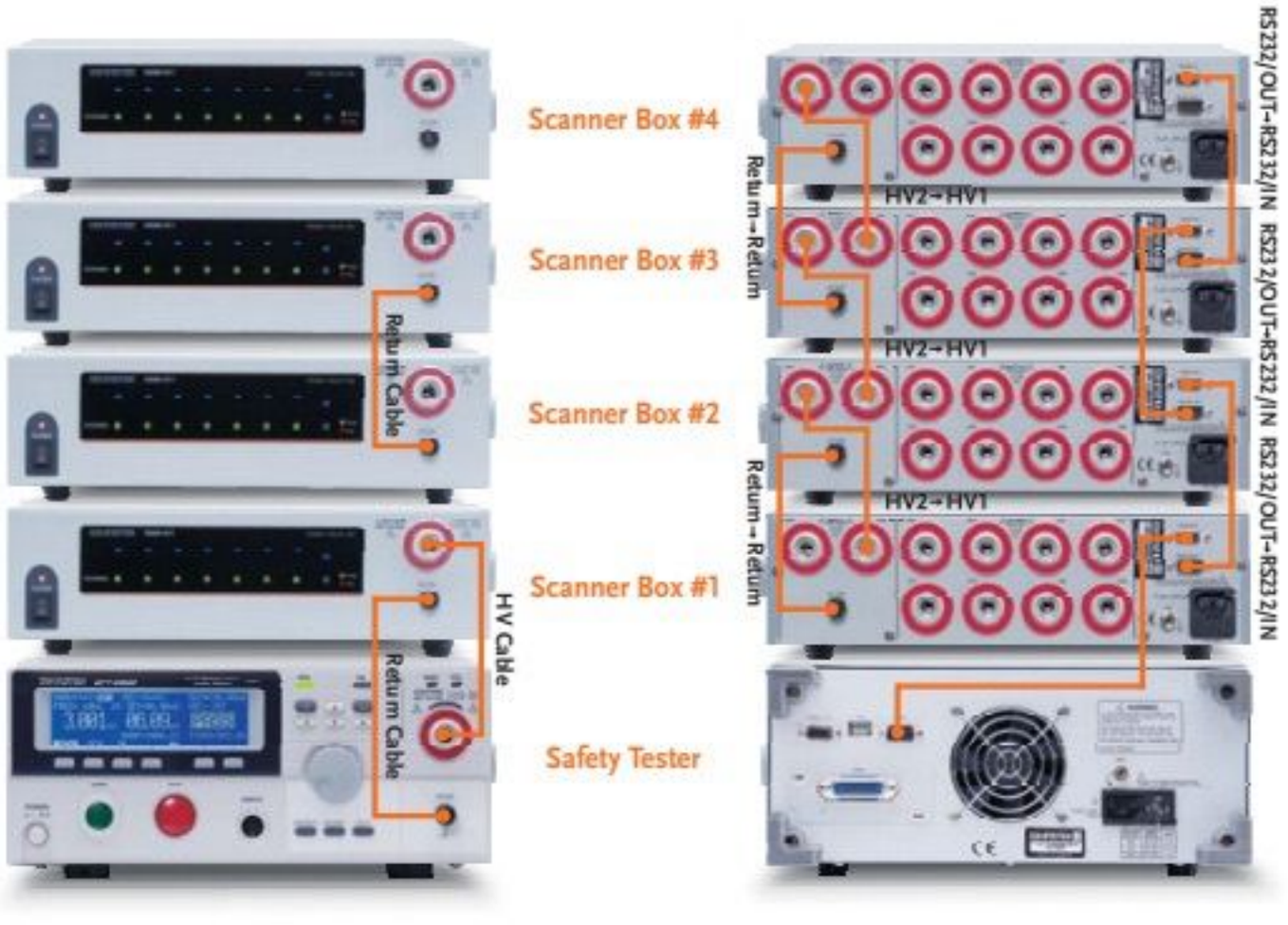
OPTIONAL ASSESSORIES
**GRA-438** Rack Mount Kit



GSB-01



GSB-02




GSB-01 Rear Panel



GSB-02 Rear Panel



GHT-108 H.V. Wiring Lead

Approx. 500mm



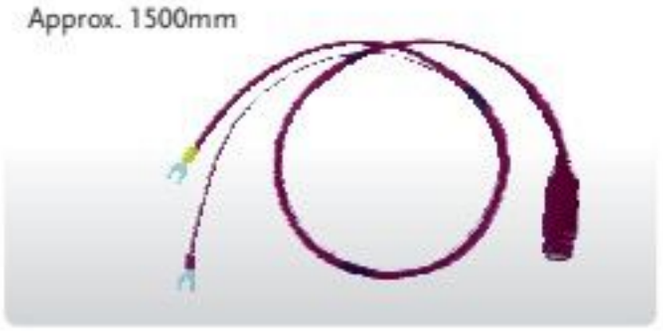
GHT-109 G.B Wiring Lead

Approx. 450mm



GTL-116R Test Lead

Approx. 1500mm



GTL-116B Test Lead

Approx. 1500mm



# AC Ground Bond Tester



## GCT-9040

CE | USB Device | LINK | GPIB | Remote Terminal | Signal I/O

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.

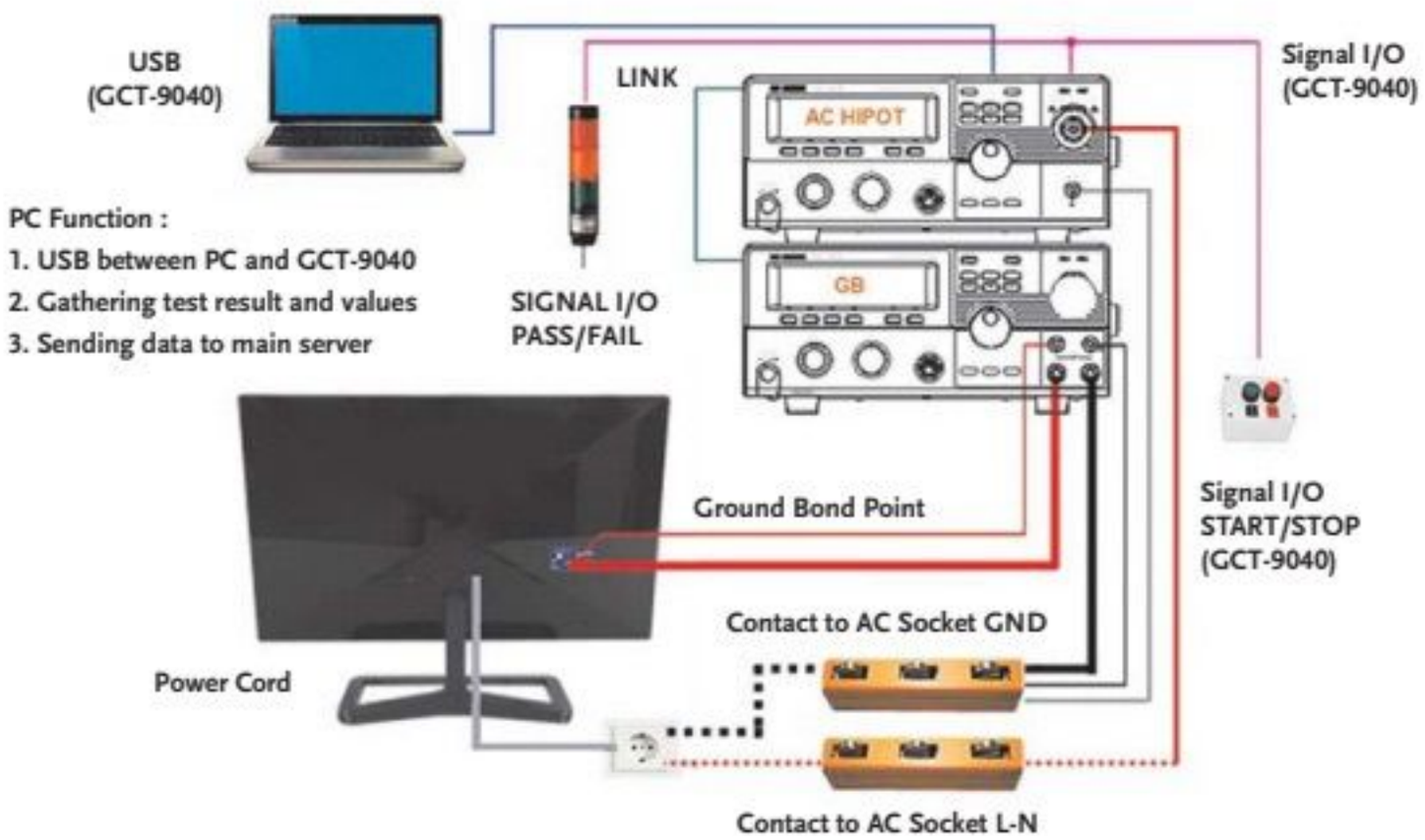
Additionally, after the safety tester system has been assembled, not only the sequential test function for the original all-in-one models can be executed, but also the simultaneous output test can be conducted. The simultaneous output test allows two testers to simultaneously test DUT so as to shorten 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.

### FEATURES

- ✲ AC 40A Ground Bond Tester
- ✲ Measuring Resistance from 1mΩ~650mΩ
- ✲ 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)

### SIMULTANEOUS TEST (SCHEMATIC DIAGRAM FOR CONNECTION)






# GCT-9040

| 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)<br>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 |
| **INTERFACE** | |
| LINK | For system connection |
| USB | Standard |
| GPIB | 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. | |

## 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**

**GPT-9KG1** GPIB card

**OPTIONAL ASSESSORIES**

**GTL-248** GPIB Cable, approx. 2m

**GRA-417** Rack Mount Kit

### Rear Panel



### GHT-119 Remote Cable

Approx. 500mm



### GTL-215 Test Lead



### GTL-132 LINK Cable



# AC/DC Withstanding Voltage/Insulation Resistance Tester



## GPT-9600 Series

CE | Remote Terminal | Signal I/O

### FEATURES

- 100VA AC Test Capacity
- 240 x 48 Ice Blue Dot Matrix LCD
- 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+10 counts)when HI SET<1.00mA ;<br>±(2.0% of rdg+3counts)when HI SET≥1.00mA | |
| **Current Judgment Accuracy** | ±(3.0% of setting+10 counts)when HI SET<1.00mA ;<br>±(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+10 counts)when HI SET<1.00mA<br>±(2.0% of rdg+3counts)when HI SET≥1.00mA | |
| **Current Judgment Accuracy** | ±(3.0% of setting+10 counts)when HI SET<1.00mA<br>±(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** | | |
| **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<br>51 ~ 2000MΩ | ±(5% of rdg + 2MΩ)<br>±(10% of rdg + 2MΩ) |
| **500V/1000V** | 1 ~ 500MΩ<br>501 ~ 2000MΩ | ±(5% of rdg + 2MΩ)<br>±(10% of rdg + 2MΩ) |




# GPT-9600 Series

| SPECIFICATIONS | |
|---|---|
| **Window Comparator Method** | Yes |
| **Output Impedance** | 600kΩ |
| **RAMP (Ramp-Up Time)** | 0.1s fixed |
| **TIMER (Test Time)** | OFF, 1s–180s |
| **GND** | OFF (fix) |
| **TEST MODE** * | |
| **Single** | ACW, DCW, IR |
| **Auto** | AC-IR, IR-AC, DC-IR, IR-DC |
| **INTERFACE** | |
| **Remote Terminal (Front)** | Standard |
| **Signal I/O** | Standard |
| **DISPLAY** | |
| | 240 x 48 Ice Blue Dot matrix LCD |
| **POWER SOURCE** | |
| | AC100V~120V/220V~240V±10% , 50/60Hz |
| **POWER CONSUMPTION** | |
| | 400VA Max. |
| **DIMENSIONS & WEIGHT** | |
| | 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
**GHT-117/GHT-117(EU)** High Voltage Adapter Box
**GHT-205** High Voltage Test Probe
**GRA-417** Rack Mount Kit

### Rear Panel



### Interlock Key



### GHT-119 Remote Cable

Approx. 500mm



### GHT-114 Clip High Voltage Probe

Approx. 1m



### GHT-117/GHT-117(EU)
**High Voltage Adapter Box**



# Multi-Channel Hipot Tester



NEW

## GPT-9500 Series

CE | USB Host | USB Device | RS-232 | Signal I/O

GW Instek introduces a new multi-channel withstanding voltage tester-the GPT-9500 series. This series has 2 models and each model has a built-in 8-channel scanner. The series meets safety regulations: IEC, EN, UL, CSA, GB, JIS and other safety regulations. The series aims at the needs of the main test items of general electronic components or winding components during routine tests.

The GPT-9500 series is a three-in-one multi-channel tester, providing AC withstanding voltage (5kV max.), DC withstanding voltage (6kV max.), and insulation resistance (1000V max.). The design of the series conforms to the latest IEC-61010-2-034 standard requirements and it is built on the output platform of AC 150VA. The status of the 8 channels of GPT-9513 can be set to H, L or X according to the test requirements, especially suitable for winding components such as transformers to perform mutual testing of multiple points of single components. The status of the 8 channels of GPT-9503 only provides the setting of H or X, which is more suitable for general components such as passive components for high-voltage testing between two points.

## FEATURES

- **150VA AC Test Capacity**
- **3 in 1 Tester : AC, DC, IR**
- **Built-in 8 Channel Scanner**
- **480 x 272 Color TFT LCD**
- **Test Parameter Export/Import Through USB Host**
- **Statistics (Counter) Function**
- **Insulation Resistance Measurement up to 10GΩ**
- **Open/Short Check (OSC)**
- **ARC Detection**
- **Multi-language : Traditional/Simplified Chinese, English**
- **Interface : RS-232C, USB Host/Device and Signal I/O**

The GPT-9500 series adopts 4.3' color LCD (480 x 272 resolution), which provides users with complete measurement information and a user-friendly operation interface, making operation and setting parameters easier and more convenient. AUTO test supports tabular display, therefore, there is unnecessary to switch the screen to see all the test results. At the same time, the series provides the statistical counting function. Users can quickly obtain the total number of tests and the number of NO-GOs without connecting an external counter. All scanning channels are all configured on the rear panel of the tester. Other than being relatively esthetic when the tester is mounted on the rack, the design can also avoid personal injury by preventing accidental contact during the output process. The disconnection detection function is provided for the series to avoid the misjudgment of the test caused by the disconnection of the wire.

Other functions and features of the GPT-9500 series include the export/import function of setting parameters, which can copy the settings of one tester to the same model testers on the production line through a USB flash drive. By so doing, the test stations of the production lines can be quickly expanded and the risk of errors caused by repeated inputs can also be avoided; the zero start function, which avoids the impact of instantaneous voltage on the DUT; the interlock function, which is a safety protection hardware structure to allow users to connect external protection devices; display in 3 languages, which include English, Traditional Chinese and Simplified Chinese; and the Signal I/O terminal and RS-232C/USB device on the rear panel, which can be used for external control and monitoring or measurement data acquisition.

| Model | GPT-9513 | GPT-9503 |
|---|---|---|
| Channel | 8 CH | 8 CH |
| Channel Status | H, L or X | H or X |

## 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 | 150 VA (5kV/30mA) |
| Maximum Rated Current | 30mA; 0.001mA – 10mA (0.05kV≦V≦0.5kV) ; 0.001mA – 30mA (0.5kV< V≦5kV) |
| Output-Voltage Waveform | Sine wave |
| Voltage Regulation | ±(1% + 5V) [maximum rated load → no load] |
| Output-Voltage Frequency | 50 Hz / 60 Hz selectable |
| Voltmeter Accuracy | ±(1% of reading + 5V) |
| Current Measurement Range | 0.001mA – 30.00mA |
| Current Best Resolution | 1 μA (0.001mA – 9.999mA) ; 10 μA (10.00mA – 30.00mA) |
| Current Measurement Accuracy | ±(1.5% of reading + 50 μA) |
| Current Offset | 80 μA maximum |
| ARC Detect | Yes |
| RAMP TIME (Rise Time) | 0.1s–999.9s |
| FALL Time | OFF–999.9s |
| WAIT Time | OFF–999.9s |
| TIMER (Test Time) | CONT[2], 0.3s–999.9s |
| TIMER Accuracy | ±(100ppm + 20ms) |
| 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 ; 0.001mA – 2mA (0.05kV≦ V ≦0.5kV); 0.001mA – 10mA (0.5kV< V ≦6kV) |
| Voltmeter Accuracy | ±(1% of reading + 5V) |
| Voltage Regulation | ±(1% + 5V) [maximum rated load → no load] |
| Current Measurement Range | 0.001mA – 10.00mA |
| Current Best Resolution | 0.1 μA (0.1 μA – 999.9 μA) ; 1 μA (1 μA – 9.999mA) ; 10 μA (10.00mA) |
| Current Measurement Accuracy | ±(1% of reading + 3 μA) when I Reading < 1mA ; ±(1% of reading + 10 μA) when I Reading≧1mA |
| Current Offset | 5 μA maximum |
| ARC Detect | Yes |
| RAMP TIME (Rise Time) | 0.1s–999.9s |
| FALL Time | OFF–999.9s |
| WAIT Time | OFF–999.9s |
| TIMER (Test Time) | CONT[2], 0.3s–999.9s |
| TIMER Accuracy | ±(100ppm + 20ms) |
| GND | ON/OFF |




# GPT-9500 Series

## SPECIFICATIONS

| | |
|---|---|
| **INSULATION RESISTANCE** | |
| **Output Voltage** | 0.050kV–1.000kV dc |
| **Output-Voltage Resolution** | 1V |
| **Output-Voltage Accuracy** | ± (1% of setting + 5V) [no load] |
| **Resistance Measurement** | 0.1MΩ–10GΩ |
| **Test Voltage** | Measurement Range / Accuracy |
| **50V≦V<500V** | 0.1MΩ–10MΩ : ± (5% of reading + 3% fs)<br>10.1MΩ–50MΩ : ± (5% of reading + 1% fs)<br>50.1MΩ–2GΩ : ± (10% of reading + 1% fs) |
| **500V≦V≦1000V** | 0.1MΩ–10MΩ : ± (5% of reading + 3% fs)<br>10.1MΩ–500MΩ : ± (5% of reading + 1% fs)<br>500.1MΩ–10GΩ : ± (10% of reading + 1% fs) |
| **Voltage Regulation** | ± (1% + 5V) [maximum rated load → no load] |
| **Voltmeter Accuracy** | ± (1% of reading + 5V) |
| **Short-Circuit Current** | 10mA max. |
| **Output Impedance** | 2kΩ |
| **RAMP TIME (Rise Time)** | 0.1s–999.9s |
| **FALL Time** | OFF–999.9s |
| **WAIT TIME** | OFF–999.9s |
| **TIMER (Test Time)** | 0.3s–999.9s |
| **TIMER Accuracy** | ±(100ppm + 20ms) |
| **GND** | ON/OFF |
| **CONTINUITY TEST** | |
| **Output-Current** | 100mA dc |
| **Ohmmeter Measurement Accuracy** | ±(10% of reading+2Ω), ON/OFF |
| **INTERFACE** | |
| **Signal I/O** | Standard |
| **RS-232C** | Standard |
| **USB (Device)** | Standard |
| **USB (Host)** | Standard (for Parameter/LCD Hardcopy) |
| **Rear Output** | Scanner |
| **DISPLAY** | |
| | 4.3" Color LCD |
| **POWER SOURCE** | |
| | AC 100V–240V ±10%, 50Hz/60Hz |
| **POWER CONSOMPTION** | |
| | 400VA Max. |
| **DIMENSIONS & WEIGHT** | |
| | 320(W) x 120(H) x 435(D) mm; Approx. 11kg |

* The specifications apply when the GPT-9500 is powered on for at least 30 minutes under +15°C~+35°C.

## ORDERING INFORMATION

**GPT-9513** AC 150VA Multi-Channel Hipot Tester
**GPT-9503** AC 150VA Multi-Channel Hipot Tester

ACCESSORIES :
Quick Start Guide x 1, CD x 1 (Complete User Manual), Power Cord x 1,
Test Leads GHT-115 x 1, GHT-116B x 1, GHT-116R x 8

**OPTIONAL ASSESSORIES**

| | |
|---|---|
| **GTL-236** | RS-232C Cable, 9-pin F-M type, approx. 2m |
| **GTL-246** | USB Cable, A-B type, approx. 1.2m |

### Rear Panel



### GTL-236 RS-232C Cable



### GHT-115 High Voltage/Contiunity Test Lead



### GHT-116R Test Lead

Approx. 1500mm



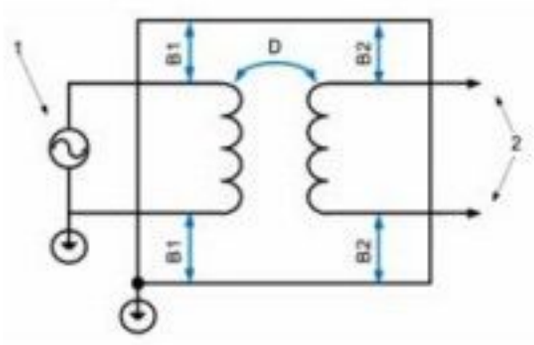
### GHT-116B Test Lead

Approx. 1500mm



# AC Multi-Channel Hipot Tester

## A. MEETS IEC 61010-2-034 DESIGN REQUIREMENTS




Meets IEC 61010-2-034 Design Requirements

GPT-9500 is the world's first multi-channel hipot tester 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. FRIENDLY USER INTERFACE




4.3' Color LCD, High-brightness Indicator and Function Keys

Operation design in simplicity is incorporated into the tester through configuring the function keys at the bottom of the LCD screen to easily change the test function by just pressing the function keys, or by rotating the knob to change the measurement value, which greatly improves the convenience of operation; updating various status indicators on the front panel immediately according to the status on the display, which not only provides users with a more comprehensive control of the test status, but also avoids unnecessary operation risks. For example, when the output is executed, the high-voltage output indicator will keep flashing.



## C. COMPLETE INFORMATION PRESENTATION




Rich Information

The large-sized LCD clearly and simultaneously displays the test voltage, test parameters, test status, measurement value and judgment result. The channel usage status and statistical counting results (the total number of tests and the number of FAILs) can be




AUTO Mode Listed Result

displayed simultaneously, hence, users can easily obtain complete information without switching the screen or connecting an external counter. In addition, AUTO mode also supports tabular testing, which greatly improves the convenience of observation.

## D. CONVENIENT PARAMETER DUPLICATION




**Export/Import of Setting Parameters**

The GPT-9500 series supports the export/import of setting parameters via a USB flash drive. Users only need to set one tester, and the settings can be quickly and massively copied to all testers on production lines that not only improves the efficiency of production testing, but also avoids errors caused by repeated inputs.

## E. SETTING DATA EXPORT / IMPORT MECHANISM



**Channels Configured on the Rear Panel**

The channel outputs of the GPT-9500 series are all configured on the rear panel. Other than the aesthetics of the system configuration, it is more important to effectively reduce the possibility of accidental contact by personnel. Each channel provides disconnection detection to avoid performing an invalid test.

# Leakage Current Tester



## GLC-10000

NEW

CE | RS-232 | GPIB | USB Device | USB Host | LAN | Signal I/O

## FEATURES

- Suitable for Medical Electrical & General Electrical of Leakage Current Measurement
- 7" Touch Pane with Color LCD
- 11 Different Measurement Network to Simulate the Resistance of Human Body (Including IEC 60601-1:2020 3.2rd)
- The Measurement of Maximum Allowable Leakage Current is Up to 50mA
- External Terminal for Extension MD Connection
- MD OUT Terminal can be Connected to an Oscilloscope for Convenient Comparison of Measured Waveforms
- 30 Sets Memories for Test Parameter; 1000 Sets Memories for Measured Data.
- Test Parameter Export/Import Function Through USB Host
- USB Storage for Measurement Data/ Screen Capture
- Various Standard Interfaces: RS-232C, USB Host & Device, LAN, Signal I/O and GPIB (Optional)

### GTL-207A Test Lead

Approx. 0.8m



### GLC-01 Alligator Clips



### GLC-02 Foil Probe



GW Instek launches a new leakage current tester–GLC-10000, which features 11 simulated human impedance networks that comply with related safety regulations so as to conduct leakage current test for electric equipment under normal condition or single fault condition. These 11 simulated human impedance networks are comprised of networks for medical electric equipment and general electric and electronic equipment to ensure that the product design and manufacture are in compliance with requirements of safety regulations including IEC, EN, UL, etc.

GLC-10000 provides test requirements for most IT products, household appliances and other electronic and electric equipment, and even medical electronics in the measurement of leakage current (or touch current), including the required measurement network, measurement bandwidth of various current forms are all in compliance with the requirements of the latest version of the applicable regulations. Furthermore, in order to comply with the leakage current flow paths under different regulations, GLC-10000 provides 20 measurement options to meet the requirements of the old and latest versions of the standards.

GLC-10000 is equipped with a 7-inch TFT LCD touch screen, which makes the operation more convenient and fast, and the large screen allows setting information and test results to be displayed on the LCD at the same time, improving the readability of information observation. In addition, users can select the front socket output (10A max.) or the rear terminal block output (up to 20A) to measure the leakage current according to the current consumption of the DUT. 30 sets of internal memory can be used to store the measurement settings of users' products. In addition, 1000 sets of measurement results can be stored to conduct subsequent analysis.

For the rear panel configuration, GLC-10000 also provides a reserved MD external terminal block (EXT+/EXT-), and users can self-define the required simulated impedance networks (only applicable to parallel RC combination) to measure the leakage current to meet the requirements of new MD in future regulations. In addition, GLC-10000 provides a variety of standard interfaces, such as RS-232C, USB device, LAN and Remote I/O, and even GPIB (optional) to meet the needs of system control and data acquisition.

**SPECIFICATIONS**

| Ranges | Range | Resolution | Accuracy | | |
|---|---|---|---|---|---|
| **DC** | | | | | |
| 50.00mA | 4.00mA~50.00mA | 10μA | ±(2%rdg+6dgt) | | |
| 5.000mA | 0.400mA~5.000mA | 1μA | ±(2%rdg+6dgt) | | |
| 500.0μA | 40.0μA~500.0μA | 0.1μA | ±(2%rdg+6dgt) | | |
| 50.00μA | 4.00μA~50.00μA | 0.01μA | ±2.0%fs | | |
| **AC / AC+DC** | | | | | |
| | | | 0.1Hz≤f≤15Hz | 15Hz< f≤100kHz | 100kHz< f≤1MHz |
| 50.00mA | 4.00mA~50.00mA | 10μA | ±(4.0%rdg+10dgt) | ±(2.0%rdg+6dgt) | ±(2.0%rdg+10dgt) |
| 5.000mA | 0.400mA~5.000mA | 1μA | ±(4.0%rdg+10dgt) | ±(2.0%rdg+6dgt) | ±(2.0%rdg+10dgt) |
| 500.0μA | 40.0μA~500.0μA | 0.1μA | ±(4.0%rdg+10dgt) | ±(2.0%rdg+6dgt) | ±(2.0%rdg+10dgt) |
| 50.00μA | 4.00μA~50.00μA | 0.01μA | ±4.0%fs | ±2.0%fs | ±2.0%fs |
| **AC PEAK** | | | | | |
| | | | 15Hz≤f≤ 10kHz | 10kHz<f≤100kHz | 100kHz<f≤1MHz |
| 75.0mA | 5.0mA~75.0mA | 100μA | ±(2.0%rdg+6dgt) | ±5.0%fs | ±15%fs |
| 7.500mA | 0.500mA~7.500mA | 1μA | ±2.5%fs | ±5.0%fs | ±15%fs |
| 750.0μA | 40.0μA~750.0μA | 0.1μA | ±4%fs | ±5.0%fs | ±20%fs |
| **EUT Voltage/Current Monitor** | | | | | |
| 300V<br>20A | 85V~300V<br>0.5A~20A | 0.1V<br>0.1A | ±(5%rdg+10dgt)<br>±(2%rdg+5dgt) | | |
| **POWER SUPPLY** | | | | | |
| For GLC-10000 | AC 100V~240V±10%, 50/60Hz ; Power consumption : Max. 50VA | | | | |
| For EUT IN | AC 100V~240V±10%, 50/60Hz, 20A | | | | |
| EUT OUT (Front) | AC 100V~240V, 50/60Hz, 10A | | | | |
| EUT OUT (Rear) | AC 100V~240V, 50/60Hz, 20A | | | | |
| **INTERFACE** | | | | | |
| RS-232C, USB host & device, LAN, Signal I/O and GPIB (Optional) | | | | | |
| **DIMENSIONS & WEIGHT** | | | | | |
| 342 (W) x 133.87 (H) x 348.51 (D) mm; Approx. 7.5kg | | | | | |



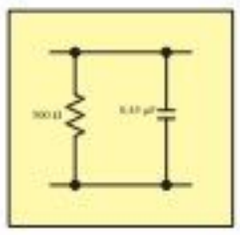
## Rear Panel



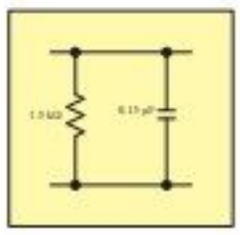
# GLC-10000

## MEASUREMENT NETWORK (MD)

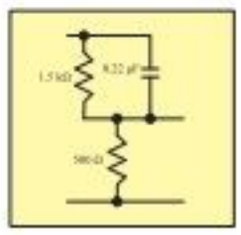
**MD-A**
*UL1563*



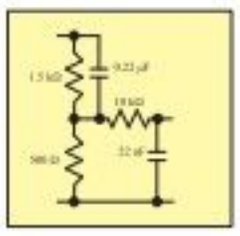
**MD-B**
*UL1492/1310*



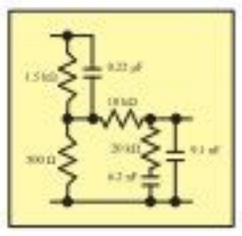
**MD-C1**
*IEC60990/61010-1*



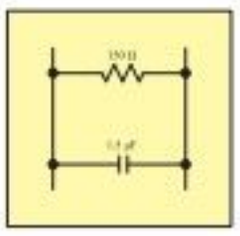
**MD-C2**
*IEC60990/60598-1*



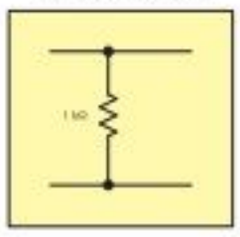
**MD-C3**
*IEC60990/62368-1*



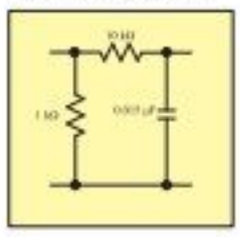
**MD-D**
*IEC60598-1/GB7000.1*



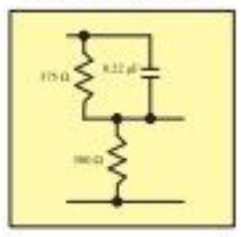
**MD-E**
*General application*



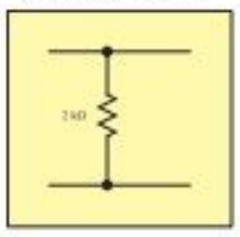
**MD-F**
*IEC60601-1/UL2601-1*



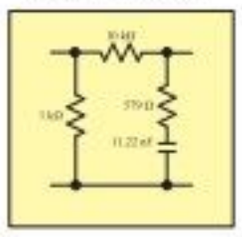
**MD-G**
*IEC61010-1/GB4793.1*



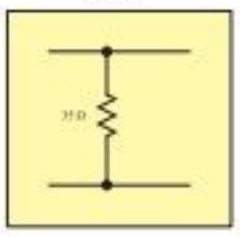
**MD-H**
*IEC61010-1/62368-1*



**MD-I**
*JIS B8561/UL554NP*



*PCC*



Note : 1. The standard numbers that are listed are only example; the MD can be used with all applicable standards.
2. PCC is for Meter mode only.

## 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.

## ORDERING INFORMATION

**GLC-10000** Leakage Current Tester

ACCESSORIES :
Power cord x 1, Test lead(GTL-207A) x 2, CD x 1(Complete user manual), Alligator clips(GLC-01) x 1(Red x 2/Black x 2), Foil probe(GLC-02) x 1, Power Cord for EUT (GLC-03) x 1, Input & output terminal cover (GLC-04) x 1

**OPTIONAL**

**GLC-10KG1** GPIB Card

**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-03 Power Cord for EUT

Approx. 1.8m



### GLC-04 Input & Output Terminal Cover



# Leakage Current Tester



## GLC-9000

CE | RS-232 | GPIB | USB Device | USB Host | EXT I/O

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.

## 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



**SPECIFICATIONS**

| | Ranges | Range | Resolution | Accuracy |
|---|---|---|---|---|
| **DC** | | | | |
| | 25.00mA | 5.00mA ~ 25.00mA | 10 μA | ±(0.2%rdg+3dgt) |
| | 5.000mA | 0.500mA ~ 5.000mA | 1 μA | ±(0.2%rdg+3dgt) |
| | 500.0 μA | 50.0 μA ~ 500.0 μA | 0.1 μA | ±1.0%fs |
| | 50.00 μA | 4.00 μA ~ 50.00 μA | 0.01 μA | ±1.0%fs |
| **AC or AC+DC** | | | | 10Hz<f ≤100kHz / 100kHz<f ≤1MHz |
| | 25.00mA | 5.00mA ~ 25.00mA | 10 μA | ±(2.0%rdg+6dgt) / ±(2.0%rdg+10dgt) |
| | 5.000mA | 0.500mA ~ 5.000mA | 1 μA | ±(2.0%rdg+6dgt) / ±(2.0%rdg+10dgt) |
| | 500.0 μA | 50.0 μA ~ 500.0 μA | 0.1 μA | ±(2.0%rdg+6dgt) / ±(2.0%rdg+10dgt) |
| | 50.00 μA | 4.00 μA ~ 50.00 μA | 0.01 μA | ±2.0%fs / ±2.0%fs |
| **AC PEAK** | | | | 20Hz<f ≤1kHz / 1kHz<f≤ 10kHz |
| | 75.0mA | 10.0mA ~ 25.0mA | 100μ A | ±(2.0%rdg+2dgt) / ±(5.0%rdg+10dgt) |
| | 10.00mA | 1.00mA ~ 10.00mA | 10 μA | ±(2.0%rdg+2dgt) / ±(5.0%rdg+10dgt) |
| | 1.000mA | 500μ A ~ 1.000mA | 1 μA | ±2.5%fs / ±5.0%fs |
| | 500.0 μA | 40.0 μA ~ 500.0 μA | 0.1 μA | ±4.0%fs / ±5.0%fs |
| **EUT (V/I CHECK)** | | | | |
| Voltage | 300V | 85V ~ 300V | 0.1V | ±(2%rdg+10dgt) |
| Current | 10A | 0.5A ~ 10A | 0.1A | ±(2%rdg+5dgt) |
| **METER MODE** | | | | |
| | AC/DC | 10.0 ~ 300.0V | 0.1V | ±(3%rdg+2V) |
| | AC+DC | 10.0 ~ 300.0V | 0.1V | ±(3%rdg+2V) |
| | AC Peak | 15.0 ~ 430.0V | 0.1V | ±(3%rdg+2V) |
| **INTERFACE** | | | | |
| RS-232C, GPIB, USB Host & Device, EXT I/O | | | | |
| **POWER SOURCE** | | | | |
| For GLC-9000: AC 100V/120V/220V/230V±10%, 50/60Hz; Power Consumption: Max. 30VA<br>For EUT: AC 85V ~ 250V, 50/60Hz (264V Max.) | | | | |
| **DIMENSIONS & WEIGHT** | | | | |
| 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-207A) 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) |



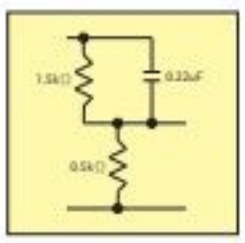
## Rear Panel



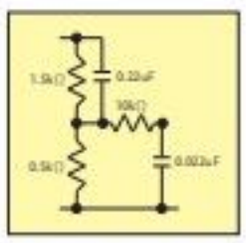
# GLC-9000

## MEASUREMENT NETWORK (MD)

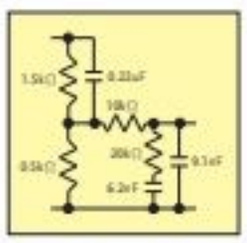
**MD-A**



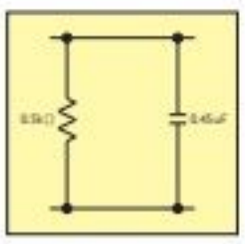

**MD-B**



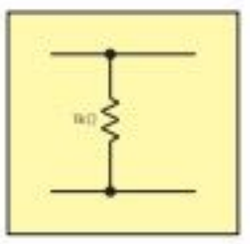

**MD-C**



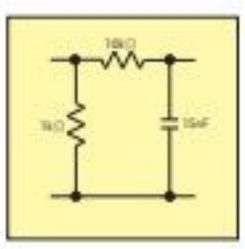

**MD-D**



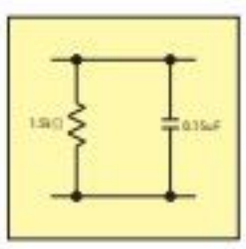

**MD-E**



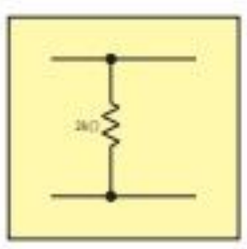

**MD-F**



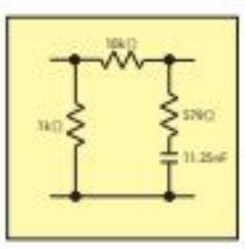

**MD-G**




**MD-H**




**MD-I**

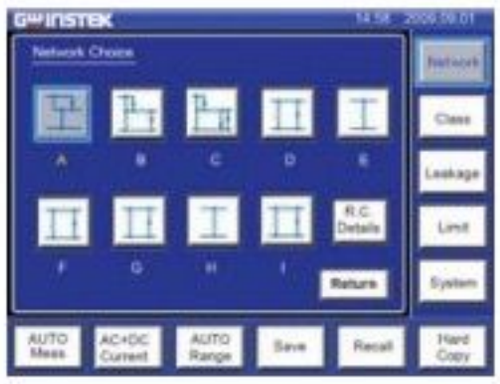



## A. SIMPLE AND INTUITIVE SYSTEM




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 power related measurement, the GPM-8310/8213 (A.C./D.C.) digital power meters are suitable for middle to high-end application such as stand-by power measurements, SPEC Power® and other low-level power measurements. If you need to measure the resistance of material components, the GOM-800 Series D.C. milli-ohm meter is your ideal tool. As for audio signals related measurement, GW Instek provides GAD-201G automatic distortion meter and GVT-427B/417B A.C. millivolt meters. We also supply two models of the GBM-3000 Series battery meters with ranges of 300V and 80V. 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.

### PRODUCTS

- DC Milli-Ohm Meter
- Battery Meter
- Digital Power Meter
- Automatic Distortion Meter
- AC Millvolt Meter
- Precision Current Shunt Meter

# OTHER APPLICATION METERS

## COMPONENTS TESTING INSTRUMENT

| MODEL | Description (Main Function) | Page |
|---|---|---|
| GOM-805 | DC Milli-Ohm Meter 5mΩ ~ 5MΩ | E57-59 |
| GOM-804 | DC Milli-Ohm Meter 5mΩ ~ 5MΩ | |

## BATTERY METER

| MODEL | Description (Main Function) | Page |
|---|---|---|
| GBM-3300 | 300V Battery Meter (including RS-232C/USB device/host and HANDLER interface) | E60-62 |
| GBM-3080 | 80V Battery Meter (including RS-232C/USB device/host and HANDLER interface) | |

## POWER RELATED INSTRUMENT

| MODEL | Description (Main Function) | Page |
|---|---|---|
| GPM-8330 | DC and 0.1Hz~100kHz, Max. direct input of up to 1000V and 20A, 5" TFT LCD<br>3 input element model, Total 10 parameters display, waveform display for V / I / P,<br>Harmonic measurement & analysis | E63-68 |
| GPM-8320 | DC and 0.1Hz~100kHz, Max. direct input of up to 1000V and 20A, 5" TFT LCD<br>2 input element model, Total 10 parameters display, waveform display for V / I / P,<br>Harmonic measurement & analysis | E63-68 |
| GPM-8310 | DC and 0.1Hz~100kHz, Max. Direct Input of up to 600V and 20A, 5" TFT LCD<br>Total 10 Parameters Display, Waveform Display for V / I / P, Harmonic<br>Measurement & Analysis | E69-74 |
| GPM-8213 | DC and 45Hz~6kHz, Max. Direct Input of up to 600V and 20A, 4" TFT LCD<br>Total 8 Parameters Display | E75-76 |

## AUDIO RELATED INSTRUMENT

| MODEL | Description (Main Function) | Page |
|---|---|---|
| GAD-201G | 20Hz ~ 20kHz Automatic Distortion Meter | E77 |
| GVT-427B/417B | AC Millivolt Meter (2CH/1CH) | E78 |

## PRECISION CURRENT SHUNT METER

| MODEL | Description (Main Function) | Page |
|---|---|---|
| PCS-1000I | Max. Voltage, AC 600V/DC 1000V, Max. Current, AC 300A/DC 300A | E79-82 |

# D.C. Milli-Ohm Meter




## GOM-804/805

CE | RS-232 | USB Device | GPIB | Handler | SCAN | EXT I/O | LabVIEW Driver

## FEATURES

- ✲ 50,000 Counts Display
- ✲ 3.5" (320 x 240) TFT LCD Display
- ✲ High Accuracy of 0.05% Precision
- ✲ 1Amp Test Current, 0.1μΩ 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(Option)

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**

| | GOM-804 | GOM-805 |
|---|---|---|
| **DISPLAY** | | |
| | 50,000 counts | |
| **SAMPLING RATE** | | |
| Slow<br>Fast | 10 readings / s<br>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<br>Accuracy<br>Resolution | -50°C ~ 399.9°C<br>-10°C ~ 40°C : 0.3%±0.5°C ; Other : 0.3%±1.0°C<br>0.1°C | |
| **DRY CIRCUIT** | | |
| | – | Open circuit less than 20mV;<br>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 |
| **GPIB** | 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

| | |
|---|---|
| **GOM-805** | D.C. Milliohm Meter(Handler/RS-232C/USB Device/GPIB) |
| **GOM-804 with GPIB** | D.C. Milliohm Meter(Handler/RS-232C/USB Device/Opt.01 GPIB) |
| **GOM-804** | 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 | |
|---|---|
| **GOM-801G1** | GPIB Card (only for GOM-804 and must be installed at factory before shipment) |

| OPTIONAL ACCESSORIES | |
|---|---|
| **PT-100** | Platinum Temperature Probe |
| **GTL-232** | RS-232C cable 9-pin, F-F type, approx. 2000mm |
| **GTL-246** | USB cable, A-B type, approx. 1200mm |
| **GTL-248** | GPIB cable approx. 2000mm |
| **GTL-309** | Test lead, approx. 3m |

| FREE DOWNLOAD | |
|---|---|
| **Driver** | LabView Driver |

### 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



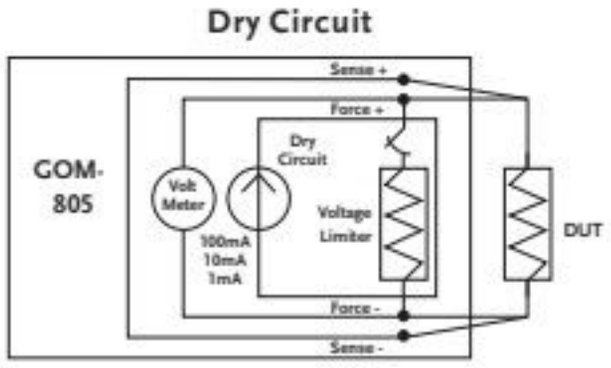
In terms of the basic functionalities and specifications, GOM-804/805 can absolutely replace the existing model_GOM-802. All GOM-802 functionalities can be found from GOM-804/805, including resistance measurement range, 1A test current (maximum), four wire measurement method, temperature probe (option, 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



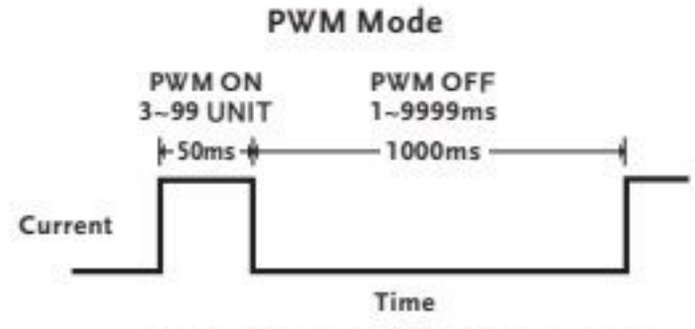

GOM-804/805 has two measurement speed selections, which are Fast reaching 60 readings per second, and Slow 10 readings per second. A major departure from the past, users, in the past, had to juggle between speed and display resolution. GOM-804/805 will not affect resolution despite of any speed selections 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



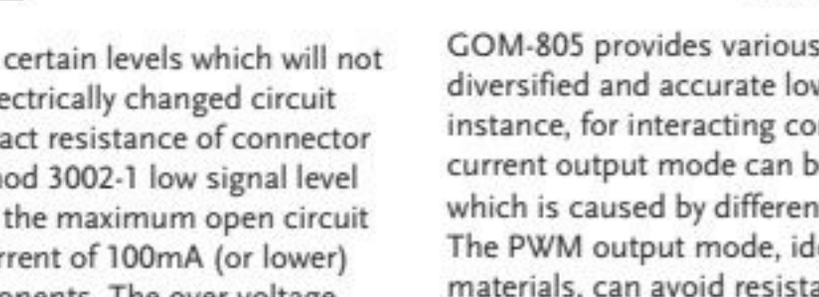

Dry circuit is to limit test voltage and current to certain levels which will not cause contact points to produce physically or electrically changed circuit and its most frequently used application is contact resistance of connector measurement. Based upon MIL-STD-1344 method 3002-1 low signal level 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.

# Battery Meter



## GBM-3300/3080

CE | USB Host | USB Device | RS-232 | 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 ± (0.01% reading + 3 digits), and measurement resolution is up to 10μV (at 8V). For resistance measurement, the accuracy reaches ± (0.5% reading + 5 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.

## 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

## SPECIFICATIONS

### DISPLAY

| | |
|---|---|
| Screen | 3.5"(320 x240) 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 (±0.5Hz) Fixed |
| Input Impedance | 3mΩ~ 300mΩ: 99kΩ, 3Ω ~ 3kΩ: 2MΩ |

**Range**

| Range No. | Range | Max. scale | Resolution | Test Current | Open-circuit Voltage (Vpp,Max) |
|---|---|---|---|---|---|
| 0 | 3mΩ | 3.1000mΩ | 0.1μΩ | 100mA | 8V |
| 1 | 30mΩ | 31.000mΩ | 1μΩ | 100mA | 8V |
| 2 | 300mΩ | 310.00mΩ | 10μΩ | 10mA | 7V |
| 3 | 3Ω | 3.1000Ω | 100μΩ | 1mA | 3V |
| 4 | 30Ω | 31.000Ω | 1mΩ | 100μA | 2V |
| 5 | 300Ω | 310.00Ω | 10mΩ | 10μA | 1.5V |
| 6 | 3kΩ | 3200.0Ω | 100mΩ | 10μA | 1.5V |

**Accuracy**

| Range No. | Speed | Accuracy | Temperature Coefficient |
|---|---|---|---|
| 0 | Slow | ±0.5%rdg ± 10dgt | (±0.05%rdg ±1dgt)/°C |
| | Medium | ±0.5%rdg ± 15dgt | |
| | Fast | ±0.5%rdg ± 20dgt | |
| | EX. Fast | ±0.5%rdg ± 40dgt | |
| 1–6 | Slow | ±0.5%rdg ± 5dgt | (±0.05%rdg ± 0.5dgt)/°C |
| | Medium | ±0.5%rdg ± 7dgt | |
| | Fast | ±0.5%rdg ± 7dgt | |
| | EX. Fast | ±1.0%rdg ± 8dgt | |

Rear Panel





GBM-3300/3080

**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 |
| **GRA-436** | Rack Mount Kit, 19" 2U size for two sets |

## 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.

# Digital Power Meter



## GPM-8320/8330

NEW

CE | USB Host | USB Device | LAN | RS-232 | GPIB | DA12

## FEATURES

- 5" TFT LCD
- Voltage/Current Meter Test Freq. Bandwidth: DC, 0.1Hz ~ 100kHz
- Waveform Display : V (Voltage), I (Current), P (Wattage)
- Distorted wave Current/Voltage Measurement: Full Range for CF=3, and Half Range for CF=6 (or 6A)
- Meeting IEC 61000-4-7 Harmonic Measurement (50/60Hz)
- Wiring Selecting Button (1P3W, 3P3W, 3P4W, 3V3A)
- Harmonic Measurement & Analysis up to 50 Orders
- Auto Ranging Function for Integration Mode
- Screen Capture Through USB Host
- Provide External Current Sensor Input (EXT1/ EXT2)
- Standard Interface: RS-232C, USB Device/ Host, LAN
- Optional Interface: GPM-DA12 - GPIB + Digital I/O (Factory Installed Only)

**GPM-002** Terminal Cover



**GTL-209** Test lead



**GTL-212A** Test lead



**GTL-214** DA12 Cable



GW Instek GPM-8320/8330 are digital power meters designed specifically for measuring power in three-phase AC power sources, making it suitable for most electrical and electronic product testing applications (GPM-8320 provides 2 modules, and GPM-8330 provides 3 modules). These models have a testing bandwidth of DC, 0.1Hz–100 kHz and feature 16-bit A/D converters and a sampling rate of 300 kHz. A 5-inch TFT LCD display, 5 digits of measurement readings, 25 different power measurement parameters, and high precision measurement capabilities are also provided. GPM-8320/8330 also feature waveform display capabilities (voltage/current/power), the integration measurement function, harmonics measurement and analysis of multiple orders (50/60Hz measurement complies with IEC61000-4-7 requirements), external sensor input terminals, and a variety of communications interfaces. These features help users achieve clear, convenient, and accurate power measurements, making them the most fully-featured and cost-effective power meters in the same category.

GPM-8320/8330 provide multiple input voltage configuration wiring modes (1P3W/3P3W/3P4W/3V3A). Users can choose the wiring mode according to their specific requirements to measure parameters for specific wiring methods, and even calculate efficiency. In addition, for a rated input voltage of 1000V and an input current of 20A, they support a minimum current range of 0.5A (resolution of 0.1mA), power measurement resolution of 0.1mW, crest factor of 3 (for half range, the CF can reach up to 6 or 6A), and voltage/current/power measurement accuracy of ±0.1% reading ±0.05% range. Users can select different measurement modes (AC+DC/ AC/ DC/ V-MEAN) to provide up to 25 related parameters for power measurement. These parameters include voltage (Vrms/ Vac/ Vdc/ Vmn/ V+pk / V-pk), current (Irms/ Iac/ Idc/ 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), maximum current ratio (MCR), and MATH calculation function. Therefore, they provide the best range and accuracy support for measuring the power consumption of electrical and electronic products.

GPM-8320/8330 also effectively utilize the advantages of TFT LCD display, providing results of parameter measurements in both numerical and graphical formats. In terms of numerical display, it offers a general mode and a multiple mode. The general mode includes 4 tabs (page1~page4), and each tab can display 10 measurement parameters (2 main measurements + 8 monitoring measurements). Users can freely combine these parameters to display the results of measurements from various modules. The multiple mode can simultaneously display the measurement results of three modules, which is particularly suitable for comparing differences in measurements between modules, such as unbalanced three-phase. This mode also offers 4 tabs, and each tab can display 8 measurement parameters. In terms of graphical display, they offer a simple oscilloscope mode to display voltage, current, and power parameters in waveform format. Additionally, the display provides numerical or bar chart display for the measurement and analysis of harmonics signals at various orders that not only satisfies the need for accuracy and clear readability in process testing, but also meets the diverse measurement application requirements for research and development, design and quality verification.

GPM-8320/8330 have comprehensive mechanisms and functions for auxiliary measurements. For applications that require measuring high voltage, they provide VT rate settings that can be used with external potential transformers. For measuring large current, it depends on the type of current transformer, whether it is a voltage output type or a current output type. If it is a current output type, it can be directly locked onto the meter's rear panel and used with CT rate settings for measurement. If it is a voltage output type, it can be measured through the external current sensor input terminals (EXT1/EXT2) provided by GPM-8320/8330. Automatic range switching can be customized to the required range to save unnecessary time spent on range switching. The internal memory of 10,000 data logs can store measurement data at the update rate set by GPM-8320/8330 or at a user-defined time interval for future analysis.

In terms of data acquisition and storage, GPM-8320/8330 offer a variety of communications interfaces, including RS-232C/USB device (virtual COM)/LAN, or optional GPIB. Users can choose to write programs to read measurement results according to their habits or in collocation with existing system interfaces. The USB host can support screen capture, internal data logging, and firmware updates for GPM-8320/8330. For those with the needs of using external signal control or data recorder for data recording, GPM-8320/8330 also offer an optional Digital I/O (DA12) interface (must be installed at the factory), which can be connected to external controllers such as PLC or data recorders to meet the needs of automated measurements or long recording applications.

## ORDERING INFORMATION

| | |
|---|---|
| **GPM-8320** | Digital Power Meter (RS-232C/USB device & Host/LAN) |
| **GPM-8320** (with GPM-DA12) | Digital Power Meter (RS-232C/USB device & Host/LAN and opt. GPIB+DA12) |
| **GPM-8320** | Digital Power Meter (RS-232C/USB device & Host/LAN) |
| **GPM-8320** (with GPM-DA12) | Digital Power Meter (RS-232C/USB device & Host/LAN and opt. GPIB+DA12) |

ACCESSORIES :
Safety Instruction Sheet x 1, Power cord x 1, Test lead GTL-209 x 2, Test lead GTL-212A x 2 (for GPM-8320), Test lead GTL-209 x 3, Test lead GTL-212A x 3 (for GPM-8330), CD x 1 (including complete user manual and USB driver), DA12 cable GTL-214 (available for GPM-8320/8330 with GPM-DA12 only), GPM-002 Terminal Cover

**OPTIONAL**

**GPM-DA12** GPIB+DA12 Interface (including cable, GTL-214)
Note : The option is 2-in-1 interface and must be installed in factory.

**OPTIONAL ACCESSORIES**

| | |
|---|---|
| **GTL-209** | Test Lead, Banana to Bare-wire, Approx. 1000mm |
| **GTL-212A** | Test Lead, O-Type to Bare-wire, Approx. 1000mm |
| **GTL-214** | DA4 Cable, Approx. 1000mm |
| **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 |
| **GTL-258** | GPIB Cable, 25-pin Micro-D Connector, Approx. 1900mm |
| **GRA-452** | Rack Mount Kit, 19" 3U size |

## SPECIFICATIONS

### INPUT

| Item | Specifications | | |
|---|---|---|---|
| **Input Type** | Voltage / Current | | Floating input through resistive voltage divider; Floating input through shunt |
| **Measure Range** | Voltage | | 15V, 30V, 60V, 150V, 300V, 600V, 1000V |
| | Current | Direct input | 0.5A, 1A, 2A, 5A, 10A, 20A |
| | | Sensor input | EXT 1: 2.5 V, 5 V, 10 V; EXT 2: 50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V |
| **Input Impedance** | Voltage | | Input resistance: approach 2 MΩ |
| | Current | Direct input range 0.5A ~ 20A | Input resistance: approach 5 mΩ |
| | Sensor | Input range 2.5V ~ 10V (EXT1) | Input resistance: approach 100 kΩ |
| | | Input range 50mV ~ 2V (EXT2) | Input resistance: approach 20 kΩ |
| **Continuous Maximum Allowable Input** | Voltage | | peak value of 1.5kV or RMS value of 1kV, whichever is less |
| | Current | Direct input range 0.5A ~ 20A | peak value of 100A or RMS value of 30A, whichever is less |
| | | Sensor input | peak value less than or equal to 5 times of the rated range |
| **Input Bandwidth** | DC, 0.1 Hz ~ 100kHz | | |
| **Continuous Maximum Common-mode Voltage** | 600 Vrms, CAT II | | |
| **Line Filter** | select OFF or ON (cut off frequency of 500 Hz) | | |
| **Frequency Filter** | select OFF or ON (cut off frequency of 500 Hz) | | |
| **A/D Converter** | Simultaneous conversion voltage and current inputs; Resolution 16bits; Maximum conversion rate Approx. 300kHz | | |
| **Display Update Interval** | When the data update interval is 100 ms the numeric display 10 items display update interval is 200 ms. When the data update interval is 100 ms or 250ms and the numeric value display is set to Matrix or ALL Items display update interval is 500 ms. The waveform display update intervals are approximately 1s. | | |

### VOLTAGE AND CURRENT ACCURACY

| Item | Specifications | |
|---|---|---|
| **Requirements** | Temperature | 23 ± 5℃ |
| | Humidity | 30~75% RH |
| | Input waveform | Sine wave crest factor = 3 |
| | common-mode voltage | 0 V |
| | Number of displayed digits | 5 digits |
| | Frequency filter | Turn on to measure voltage or current of 200 Hz or less |
| | After 30 minutes after warm-up time has passed; After measurement range is changed (zero-level compensation); Update interval is 250 ms | |
| **Accuracy** | DC | ± (0.1% of reading + 0.2% of range) |
| | 0.1 Hz ≤ f < 45 Hz | ± (0.1 % of reading + 0.2 % of range) |
| | 45 Hz ≤ f ≤ 66 Hz | ± (0.1 % of reading + 0.05 % of range) |
| | 66 Hz < f ≤ 1 kHz | ± (0.1 % of reading + 0.2 % of range) |
| | 1 kHz < f ≤ 10 kHz | ± (0.07 *f) % of reading + 0.3% of range) |
| | 10 kHz < f ≤ 100 kHz | ± (0.5 % of reading + 0.5 % of range) ± [{0.04x(f-10)}% of reading] |
| | Values for voltage in excess of 750V for which 30kHz < f < 100kHz are reference only. | |
| **Temperature Coefficient** | Add | ±0.03% of reading/°C within the range 5 to 18°C or 28 to 40°C. |
| **When the Line Flter is Turned ON** | 45 – 66 Hz | Add 0.3 % of reading |
| | < 45 Hz | Add 0.1 % of reading |
| **Accuracy When the Crest Factor is Sset to 6 or 6A** | accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3 | |
| **Accuracy Changes Caused by Data Update Interval** | When the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy. | |
| **Influence of Temperature Changes After Zero-level Compensation or Range Change** | Add 0.02% of range/°C to the DC voltage accuracy. | |
| | Add the following value to the DC current accuracies. | |
| | 5 mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges | 5 µA/°C |
| | 0.5 A/1 A/2 A/5 A/10 A/20 A ranges | 500 µA/°C |
| | External current sensor input (/EXT1) | 1 mV/°C |
| | External current sensor input (/EXT2) | 50 µV/°C |
| **Accuracy When the Crest Factor is Set to 6 or 6A** | accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3 | |
| **Accuracy Changes Caused by Data Update Interval** | When the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy. | |

### ACTIVE POWER ACCURACY

| Item | Specifications | |
|---|---|---|
| **Requirements** | same as the conditions for voltage and current. | |
| | Power factor | 1 |
| **Accuracy** | DC | (0.1 % of reading + 0.2 % of range) |
| | 0.1Hz ≤ f < 45 Hz | ± (0.3 % of reading + 0.2 % of range) |
| | 45 Hz ≤ f ≤ 66 Hz | ± (0.1 % of reading + 0.05 % of range) |
| | 66 Hz < f ≤ 1kHz | ± (0.2 % of reading + 0.2 % of range) |
| | 1 kHz < f ≤ 10 kHz | ± (0.1 % of reading + 0.3 % of range) ± [{0.067x(f-1)}% of reading] |
| | 10 kHz < f ≤ 100 kHz | ± (0.5 % of reading + 0.5 % of range) ± [{0.09x(f-10)}% of reading] |
| **Influence of Power Factor** | when power factor (λ) = 0 (S: apparent power) | |
| | ± 0.1 % of S for 45 Hz ≤ f ≤ 66 Hz | |
| | ± {(0.1 + 0.15 × f) % of S } for up to 100 kHz as reference data | |
| | •f is frequency of input signal in kHz | |
| | when 0 < λ < 1 (Φ: phase angle of the Voltage and current) | |
| | (power reading ) × [(power reading error%) + (power range %) × (power range / indicated apparent power value) + {tanΦ × (influence when λ=o)%}] | |
| **When The Line Filter is Turned ON** | 45 ~ 66 Hz | Add 0.3 % of reading |
| | < 45 Hz | Add 1 % of reading |
| **Temperature Coefficient** | same as the temperature coefficient for voltage and current | |

| SPECIFICATIONS | |
|---|---|
| **Accuracy When The Crest Factor is Set to 6 or 6A** | accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3 |
| **Accuracy of Apparent Power S** | voltage accuracy + current accuracy |
| **Accuracy of Reactive Power Q** | accuracy of apparent power + ($\sqrt{}$ 1.0004 - λ2) - ($\sqrt{}$ 1 - λ2) ×100 % |
| **Accuracy of Power Factor Λ** | ± [(λ-λ/1.0002)+ \|λcosø-cos{ø+sin-1 (influence from the power factor when λ = 0%/100)} \| ] ±1 digit when voltage and current are at the measurement range rated input |
| **Accuracy of Phase Difference Φ** | ± [ \| ø-cos-1(λ/1.0002) \| + sin-1 (influence from the power factor when λ = 0 % / 100)] ± 1 digit when voltage and current are at the measurement range rated input |
| **Accuracy When The Crest Factor is Set to 6 or 6A** | accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3 |
| **Accuracy Changes Caused by Data Update Interval** | When the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy. |

| VOLTAGE, CURRENT AND ACTIVE POWER MEASUREMENTS | | | | |
|---|---|---|---|---|
| **Item** | Specifications | | | |
| **Measurement Method** | Digital sampling method | | | |
| **Crest Factor** | 3 or 6 (6A) | | | |
| **Wiring System** | Single-phase, two-wire (1 P2 W) | | | |
| **Range Select** | Select manual or auto ranging | | | |
| **Auto Range** | Auto-range increase: The range is upped when any of the following conditions is met.<br>Crest factor 3 — Vrms or Irms exceeds 130% of the currently set measurement range.<br>Vpk, Ipk value of the input signal exceeds 300% of the currently set measurement range.<br>Crest factor 6 — Vrms or Irms exceeds 130% of the currently set measurement range.<br>Vpk, Ipk value of the input signal exceeds 600% of the currently set measurement range.<br>Crest factor 6A — Vrms or Irms exceeds 260% of the currently set measurement range.<br>Vpk, Ipk value of the input signal exceeds 600% of the currently set measurement range.<br>Auto-range decline: The range is downed when all of the following conditions are met.<br>Crest factor 3 — Vrms or Irms is less than or equal to 30% of the measurement range.<br>Vrms or Irms is less than or equal to 125% of the next lower measurement range.<br>Vpk, Ipk value of the input signal exceeds 300% of the currently set measurement range.<br>Crest factor 6 or 6A — Vrms or Irms is less than or equal to 30% of the measurement range.<br>Vrms or Irms is less than or equal to 125% of the next lower measurement range.<br>Vpk, Ipk value of the input signal exceeds 600% of the currently set measurement range. | | | |
| **Display Mode Switching** | Vrms (the true RMS value of voltage and current)<br>VOLTAGE MEAN (the rectified mean value calibrated to the RMS value of the voltage and the true RMS value of the current)<br>AC<br>DC | | | |
| **Measurement Synchronization Source** | Select voltage, current, or off In the case of Auto Update Rate, select the voltage or current from the equipped element. | | | |
| **Line Filter** | Select OFF or ON (cutoff frequency at 500 Hz). | | | |
| **Peak Measurement** | Measures the peak (max, min) value of voltage, current or power from the instantaneous voltage, instantaneous current or instantaneous power that is sampled. | | | |
| **Zero-level Compensation** | Removes the internal offset of the measure unit (After measurement range is changed) | | | |
| **Measurement Parametersl** | Voltage — Vrms , Vmn, Vdc , Vac<br>Current — Irms , Idc , Iac<br>Active Power — P<br>Apparent Power — VA<br>Reactive power — VAR<br>Power Factor — PF<br>Crest Factor — CFI, CFV<br>Phase Angle — DEG | | Frequency — IHz and VHz<br>Voltage Peak — V+pk and V-pk<br>Current Peak — I+pk and I-pk<br>Active Power Peak — P+pk and P-pk<br>Total Harmonic Distortion — THDI and THDV<br>Mathematical Computation — MATH<br>Maximum Current Ratio — MCR | |

| FREQUENCY MEASUREMENT | | |
|---|---|---|
| **Item** | Specifications | |
| **Measurement Item** | Voltage and current | |
| **Measurement Frequency Range** | Data update interval | Measurement Frequency Range |
| | 0.1 s | 20 Hz ≤ f ≤ 100 kHz |
| | 0.25 s | 10 Hz ≤ f ≤ 100 kHz |
| | 0.5 s | 5 Hz ≤ f ≤ 100 kHz |
| | 1 s | 2.0 Hz ≤ f ≤ 100 kHz |
| | 2 s | 1.0 Hz ≤ f ≤ 100 kHz |
| | 5 s | 0.5 Hz ≤ f ≤ 100 kHz |
| | 10 s | 0.2 Hz ≤ f ≤ 100 kHz |
| | 20 s | 0.1 Hz ≤ f ≤ 100 kHz |
| | Auto ( * ) | 0.1 Hz ≤ f ≤ 100 kHz |
| | ( * ) Limit of the measurement lower limit frequency by the Timeout setting | |
| | Timeout | lower limit frequency |
| | 1 s | 2.0 Hz |
| | 5 s | 0.5 Hz |
| | 10 s | 0.2 Hz |
| | 20 s | 0.1 Hz |
| **Measurement Range** | Auto switching among six types: 100mHz, 1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, and 100 kHz. | |
| **Frequency Filter** | Select OFF or ON (cut off frequency of 500 Hz) | |
| **Accuracy** | Requirements | When the input signal level is 30% or more of the measurement range If the crest factor is set to 3.<br>(60% or more if the crest factor is set to 6 or 6A)<br>• Frequency filter is ON when measuring voltage or current of 200 Hz or less. |
| | ± (0.06% of reading) | |

## SPECIFICATIONS

### INTEGRATION

| Item | Specifications |
|---|---|
| Mode | Select manual integration mode, standard integration mode, or repetitive integration mode. |
| Timer | Automatically stop integration by setting a timer.<br>Selectable range: 0 hours 00 minutes 00 seconds to 9999 hours 59 minutes 59 seconds |
| Accuracy | ±(Power accuracy (or current accuracy) + 0.1% of reading) (fixed range) |
| Range Setting | Auto range or fixed range is available for Integration |
| Timer Accuracy | ±0.02% |
| Remote Control | Start, stop and reset operations are available using an external remote signal. (option) |

### HARMONIC MEASUREMENT

| Item | Specifications |
|---|---|
| Measured Item | Voltage, Current, Power |
| Measured Method | Zero-cross simultaneous calculation method |
| Frequency Range | 10 Hz to 1.2 kHz. |
| FFT Data Length<br>Sample rate, window width, and upper limit of Analysis orders* | 4096 (Auto switch when both 50Hz/60Hz and update rate must be greater than or equal to 0.5s)<br>Fundamental Frequency — Sample rate — Window Width — upper limit of Analysis orders<br>45 Hz to 55 Hz — f×512 — 10 — 50<br>54 Hz to 66 Hz — f×512 — 12 — 50 |
| FFT Data Length<br>Sample rate, window width, and upper limit of Analysis orders* | 1024<br>Fundamental Frequency — Sample rate — Window Width — upper limit of Analysis orders<br>10 Hz to 67 Hz — f × 1024 — 1 — 50<br>67 Hz to 150 Hz — f×512 — 2 — 32<br>150 Hz to 300 Hz — f × 256 — 4 — 16<br>300 Hz to 600 Hz — f × 128 — 8 — 8<br>600 Hz to 1200 Hz — f × 64 — 16 — 4 |

**Accuracy**

| Frequency | Voltage | Current | Power |
|---|---|---|---|
| 10 Hz ≤ f < 45 Hz | 0.15% of reading + 0.35% of range | 0.15% of reading + 0.35% of range | 0.35% of reading + 0.50% of range |
| 45 Hz ≤ f < 440 Hz | 0.15% of reading + 0.35% of range | 0.15% of reading + 0.35% of range | 0.25% of reading + 0.50% of range |
| 440 Hz ≤ f < 1.2kHz | 0.20% of reading + 0.35% of range | 0.20% of reading + 0.35% of range | 0.40% of reading + 0.50% of range |

* 50Hz/60Hz Compliant IEC61000-4-7 (update rate must be > 0.5s)
* Harmonic calculation: FFT method in which FFT data length is divided into 2 types: 1024 and 4096.
* FFT data length automatically switches in accord with the Frequency and Update Rate of measured signal.

### D/A OUTPUT (OPTIONS)

| Item | Specifications |
|---|---|
| Output Voltage | ±5 V FS (approach ±7.5 V maximum) against each rated value. |
| Number Of Output Channels | 12 |
| Output Items | Set for each channel: V, I, P, VA, VAR, PF, DEG, VHZ, IHZ, Vpk, Ipk, WP, WP±, q, q±, Off |
| Accuracy | ±(accuracy of each measurement item + 0.2% of FS) (FS = 5 V) |
| D/A Conversion Resolution | 16 bits |
| Minimum Load | 100 kΩ |
| Update Interval | Same as the data update interval.<br>In the case of Auto Update Rate, update interval is equal to signal interval. More than 100ms. |
| Temperature Coefficient | ±0.05%/°C of FS |

### REMOTE CONTROL INPUT/OUTPUT SIGNAL (OPTIONS)

| Item | Specifications |
|---|---|
| Remote Control Input Signal | EXT HOLD, EXT TRIG, EXT START, EXT STOP, EXT RESET |
| Remote Control Output Signal | INTEG BUSY |
| I/O Level | TTL |
| I/O Logic Format | Negative logic, Falling edge |

* Q (VAR), S (VA), λ (PF) and Φ (DEG) are originated from the measured values including voltage, current and active power which go through computation process. In respect to distorted signal input, accordingly, the value acquired from other instruments, which employ different methods, may differ from that acquired from GPM-8320/8330 unit.
* "Zero" will be shown for S or Q and "--" will be displayed for λ and Φ when either current or voltage is less than 0.5% of the rated range (less than or equivalent to 1% when crest factor is set 6)

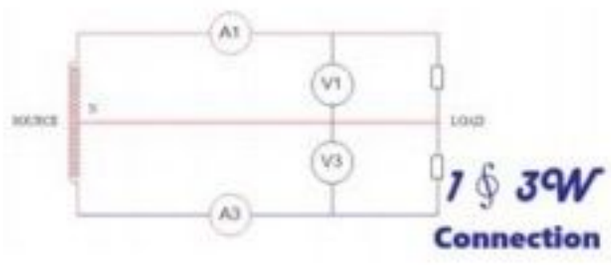
### GENERAL

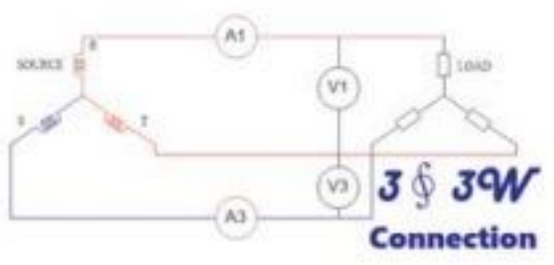
| | |
|---|---|
| Note | The below are the basic conditions required to operate the GPM-8320/8330 within specifications:<br>• 1-year Calibration: Yearly<br>• Operating Environment: 18–28 °C (64.4–82.4°F)<br>• Humidity: <80%RH,<br>• Accuracy: ± (% of reading + % of range)<br>• The specifications apply when it warmed up for at least 30 minutes and operates in the slow rate.<br>• The power supply cable must be grounded to ensure accuracy.<br>• Input voltage and current must be standard sine wave.<br>• The power factor must be 1.<br>• The crest factor must be 3.<br>• The common-mode voltage must be zero. |
| Specification Condition | Temperature: 23°C±5°C; Humidity: <80%RH(non-condensing) |
| Operation Condition | Temperature 0°C ~ 40°C, • 30 ~ 40°C, Relative Humidity < 70%RH (non-condensing) • >40°C, Relative Humidity < 50%RH (non-condensing)<br>Indoor use only Altitude: < 2000 meters Pollution degree 2 |
| Storage Condition | Temperature −40°C ~ 70°C; Humidity: < 90%RH (non-condensing) |
| Power Source | AC 100-240V, 50–60Hz ; Consumption Max. 35VA |
| Dimensions | 220(W) x 132(H) x 402.5(D)mm(w/t bumpers) |
| Weight | Approx. 3.85kg |

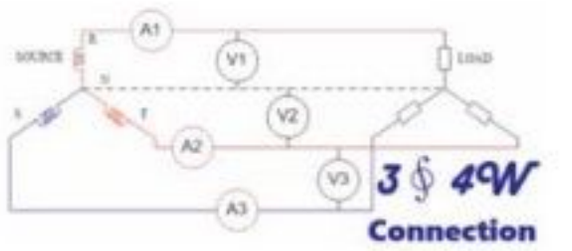
## A. WIRING SELECTION

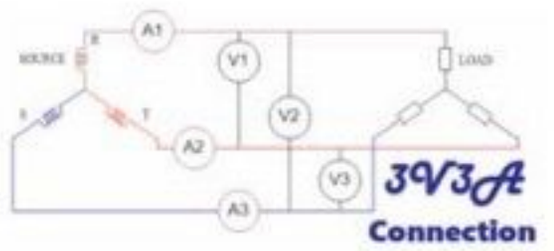



GPM-8320/8330 provide multiple input voltage configuration wiring modes (1P3W/3P3W/3P4W/3V3A). Users can choose the wiring mode according to their specific requirements to measure parameters for specific wiring methods, and even calculate efficiency.



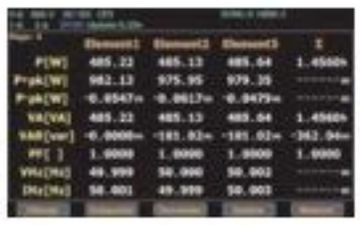




## B. VARIOUS DISPLAY MODES



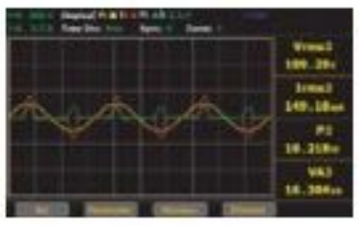

Numerical (Single) Mode



Numerical (Multiple) Mode




Numerical (Simple) ModeMode



Waveform Mode



Harmonics (Bar Graph) Measurement



Harmonics (List) Measurement

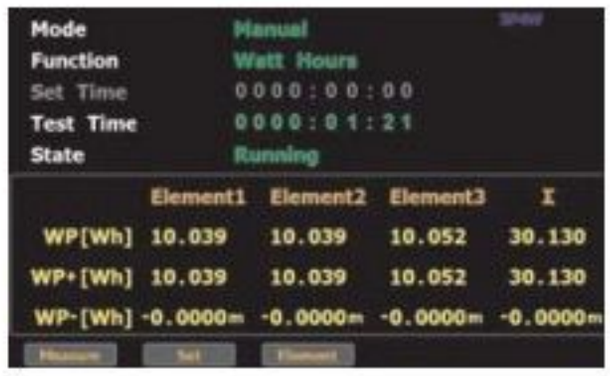
GPM-8320/8330 provide two display modes, numerical and graph, which help users maximize the benefits of their measurements. In numerical mode, there are two options: single and multiple. In single mode, there are four tabs that can be customized with the module's measurement settings, and each tab can display up to 10 measurement parameters (2 main and 8 secondary measurements). In multiple mode, there are also four tabs, and users can simultaneously observe the same 8 measurement parameters from three different modules. Parameters in both modes can be arranged and customized as needed, and a simple mode that displays only the first four parameters is also available regardless of which tab is selected. In graph mode, there is a simple oscilloscope function that displays the waveforms of three parameters: voltage, current, and power. The horizontal scale can be adjusted (from 50us/div to 10ms/div depending on the set data update rate), and three waveform observation magnification ratios are available. When measuring harmonics, the harmonics measurement results of each order can be displayed in a bar chart, and a specific observation order can be specified. Additionally, all relevant values for harmonics of each order (voltage/current/power voltage distortion percentage/current distortion percentage/power distortion percentage/voltage phase angle/current phase angle) can be fully recorded and presented.



## C. RICH MEASUREMENT PARAMETERS

| Measurement Items | Symbols |
|---|---|
| Voltage | Vrms, V+pk, V-pk, Vac*, Vdc*, Vmn* |
| Current | Irms, I+pk, I-pk, Iac*, 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 |
| Mathematical Computation | MATH |
| Maximum Current Ratio | MCR |
| Integration | WP, WP+, WP-, q, q+, q-, Vac, Iac |

* : Only applicable to specific measurement modes and available for selection



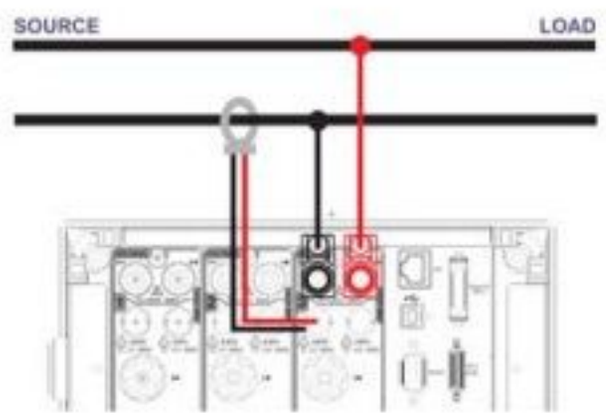

GPM-8320/8330 provide a variety of measurement items, including voltage, current, frequency, active power, apparent power, reactive power, power factor, crest factor, total harmonic distortion, and even the ability to measure maximum current ratio. Additionally, GPM-8320/8330 are equipped with measurement functions for power or current time integration specific to the DUT. Users set a period of time to perform instantaneous power integration during this time, and then divide by the time to obtain the average power of the DUT. Moreover, during integration measurements, GPM-8320/8330 support automatic range switching function to obtain the most complete integration results in response to the power changes of the DUT in different time periods.

## D. SUPERB MEASUREMENT ASSISTANCE




### Ratio Configuration

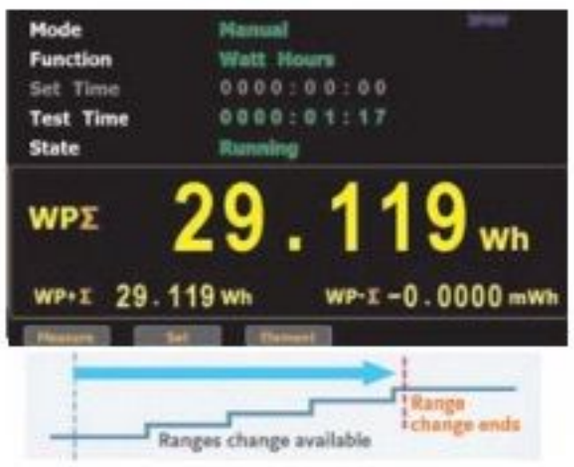
In terms of measurement support, GPM-8320/8330 perform exceptionally well. Firstly, in the measurement of high voltage/power, they provide voltage/power ratio settings to restore the attenuation rate to the true value. In addition, for large current measurement, other than the current ratio setting, there are also terminals (EXT1/EXT2) for external current sensors that can be connected to voltage output type current transformers, making large current measurement more convenient.




### External Current Sensor Input

Furthermore, GPM-8320/8330 provide 4 sets of panel settings for storage/recall and a memory that can store up to 10,000 measurements. The measurement storage can record the measurement results according to the update rate or a user-defined time interval for later analysis. The USB host on the front panel supports screen capture, measurement value storage, and firmware updates.

## E. FLEXIBLE LEVEL-CHANGING MECHANISM




### Automatic level-changing under the integration function

GPM-8320/8330 offer automatic range switching mode for integral measurement, allowing users to calculate the total value of the DUT's power variation from the start to the end of the integration period. In




### Self-defined automatic level-changing mechanism

addition, GPM-8320/8330 also support a customizable range switching mechanism. Users can select the desired range, which not only saves time wasted during range switching but also speeds up the testing process.

## F. CONVENIENT AND PRACTICAL INTERFACE



### Practical Interface

GPM-8320/8330 offer a comprehensive and diverse set of communications interfaces, including RS-232/USB/LAN/GPIB (optional), suitable for users to remotely control and collect measurement results through command sets to program computer software. The optional Digital I/O (DA12) interface provides two different modes according to users' settings: including external control and DA12 output. When the setting is external control mode, users can activate, stop, trigger, or reset the integration measurement function through external signals.




### DA12 Interface Mechanism

When it is set to DA12 output mode, users can define 12 measurement parameter values from the provided 17 measurement parameters (even the result of integration measurement) to output in a fixed range (full scale +5V) or manual range (full scale ±5V) and receive the results in collocation with a data recorder.

# Digital Power Meter



## GPM-8310

CE | USB Host | USB Device | LAN | RS-232 | GPIB | DA4

台灣精品 TAIWAN EXCELLENCE

## FEATURES

- ✲ 5" TFT LCD
- ✲ DC, 0.1Hz ~ 100kHz Voltage/Current Test Bandwidth
- ✲ Two Numerical Display Modes
  - General Mode: Displays 2 Main Test Items + 8 Secondary Test Items
  - Simple Mode: Displays the Test Values of 4 Main Test Items
- ✲ Waveform Display: V (voltage), I (current), P (power)
- ✲ The Current/Voltage can be Measured to a Deformed Wave with CF of 3, and the Half-range CF can Reach 6 or 6A
- ✲ Meeting the IEC 61000-4-7 Harmonics Measurement Requirements (50/60Hz)
- ✲ 50th Order of Harmonic Measurement and Analysis (value and bar graph)
- ✲ Integration Function Supports Automatic Level-changing
- ✲ External Current Sensor Input Terminals (EXT1/EXT2)
- ✲ Standard Interfaces: RS-232C, USB Device/ Host, LAN, GPIB
- ✲ Optional Interface: Digital I/O (DA4) (must be installed before leaving the factory)
- ✲ Optional Accessory: GPM-001

GW Instek GPM-8310 is a digital power meter for single-phase (1P/2W) AC power measurement. Features include DC, 0.1Hz~100kHz test bandwidth, 16bits A/D, and 300 kHz sampling rate. It adopts 5" TFT LCD screen with a five-digit measurement display and provides 25 power measurement related parameters, and has a high-precision measurement capability. It also features the ability to display waveform (voltage/current/power), the integration measurement function, harmonic measurement and analysis of each order (meeting the IEC 61000-4-7 harmonics measurement requirements at 50/60Hz), external sensor input terminals, and various communication interfaces, etc., to help users achieve clear, convenient and accurate power measurements. This power meter is a most cost-effective power meter with most complete functionalities among the products of the same category.

The rated direct input voltage of GPM-8310 is 600V and the input current is 20A. The minimum current level is 5mA (resolution up to 0.1μA) and the power measurement resolution is 1μW. The crest factor can reach 3 (half measurement range can reach 6 or 6A), and the voltage/current/power measurement capability can reach (±0.05% reading ±0.1% level). Different measurement modes can be selected according to ( AC+DC/ AC/DC/V-MEAN), providing up to 25 relevant parameters for power measurement, including voltage (Vrms/Vac/Vdc/Vmn/V+pk/V-pk), current (Irms/Iac/Idc/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 rate (THDV/THDI), maximum current ratio (MCR), and the MATH calculation function. Hence, for the measurement of low current/low power such as standby power consumption, or the measurement of power consumption of general products, this power meter provides the best range and accuracy support.

GPM-8310 also makes good use of the advantages of the TFT LCD to display the results of parameter measurement by using numerical and graphical methods. In terms of numerical values, the general mode and the simple mode are provided. The general mode can display 10 measurement parameters (2 main measurements + 8 monitoring measurements), and the simple mode can display four measurement parameters. These displayed parameters can be arbitrarily selected from 25 power parameters according to the needs of users. In terms of graphic display, a simple oscilloscope mode is provided to display waveforms for three parameters including voltage, current and power. In addition, the measurement and analysis of each harmonic order of the measurement signal can be completely displayed by numerical values or bar graphs. This power meter not only meets the needs of accuracy and legibility in process testing, but also meets the needs of diverse measurement applications in R&D design and quality verification.

In addition, the performance of GPM-8310 in auxiliary measurement mechanism/function is also comprehensive. For the application of measuring large voltage, the VT rate setting can be used with an external voltage Potential Transformer. For the measurement of large current, the type of current transformer ~ voltage output type or current output type will determine the applied method. If it is a current output type, it can be directly locked to the rear panel of the instrument and collocated with the CT rate setting to conduct measurement. If it is a voltage output type, measurement can be conducted through the external current sensor input terminals (EXT1/EXT2) provided by GPM-8310. Automatic level-changing can self-define the required level to save level-changing time. 10,000 lots of internal memories can be used to store measurement data according to the update rate set by GPM-8310 or a user-defined time interval for subsequent analysis.

In terms of data retrieval and storage, GPM-8310 provides a variety of communication interfaces including RS-232C/ USB device (virtual COM)/LAN/GPIB. Users can write programs to read the measurement results according to their habits or with existing system interfaces and there is no need to procure interfaces. USB host supports GPM-8310 screen capture, internal record data access, and firmware update. For the needs of external signal control or the use of data recorder to record data, GPM-8310 also provides an optional Digital I/O (DA4) interface (must be installed before leaving the factory), which can be connected to an external controller such as PLC or a data recorder to meet the application of automatic measurement or long recording.

## SPECIFICATIONS

### INPUT

| Item | Specifications | |
|---|---|---|
| **Input Type** | Voltage | Floating input through resistive voltage divider |
| | Current | Floating input through shunt |
| **Measure Range** | Voltage | 15V, 30V, 60V, 150V, 300V, 600V |
| | Current | |
| | Direct input | 5mA, 10mA, 20mA, 50mA, 100mA, 200mA, 0.5A, 1A, 2A, 5A, 10A, 20A |
| | Sensor input | EXT 1: 2.5 V, 5 V, 10 V |
| | | EXT 2: 50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V |
| **Input Impedance** | Voltage | Input resistance: approach 2 MΩ |
| | Current | |
| | Direct input range 5mA ~ 200mA | Input resistance: approach 505 mΩ |
| | Direct input range 0.5A ~ 20A | Input resistance: approach 5 mΩ |
| | Sensor input | |
| | Input range 2.5V – 10V (EXT1) | Input resistance: approach 100 kΩ |
| | Input range 50mV – 2V (EXT2) | Input resistance: approach 20 kΩ |
| **Continuous Maximum Allowable Input** | Voltage | peak value of 1.5kV or RMS value of 1kV, whichever is less |
| | Current | |
| | Direct input range 5mA ~ 200mA | peak value of 30 A or RMS value of 20A, whichever is less |
| | Direct input range 0.5A ~ 20A | peak value of 100A or RMS value of 30A, whichever is less |
| | Sensor input | peak value less than or equal to 5 times of the rated range |
| **Input Bandwidth** | DC, 0.1 Hz – 100kHz | |
| **Continuous Maximum Common-mode Voltage** | 600 Vrms, CAT Ⅱ | |
| **Line Filter** | select OFF or ON (cut off frequency of 500 Hz) | |
| **Frequency Filter** | select OFF or ON (cut off frequency of 500 Hz) | |
| **A/D Converter** | Simultaneous conversion voltage and current inputs<br>Resolution 16bits<br>Maximum conversion rate Approx. 300kHz | |




GPM-8310

## Rear Panel



## SPECIFICATIONS

### VOLTAGE AND CURRENT ACCURACY

| Item | Specifications | |
|---|---|---|
| **Requirements** | Temperature | 23 ± 5℃ |
| | Humidity | 30–75% RH |
| | Input waveform | Sine wave crest factor = 3 |
| | common-mode voltage | 0 V |
| | Number of displayed digits | 5 digits |
| | Frequency filter | Turn on to measure voltage or current of 200 Hz or less |
| | After 30 minutes after warm-up time has passed<br>After measurement range is changed (zero-level compensation)<br>Update interval is 250 ms | |
| **Accuracy** | DC | ± (0.1% of reading + 0.2% of range) |
| | 0.1 Hz ≤ f < 45 Hz | ± (0.1 % of reading + 0.2 % of range) |
| | 45 Hz ≤ f ≤ 66 Hz | ± (0.1 % of reading + 0.05 % of range) |
| | 66 Hz < f ≤ 1 kHz | ± (0.1 % of reading + 0.2 % of range) |
| | 1 kHz < f ≤ 10 kHz | ± (0.07 *f) % of reading + 0.3% of range) |
| | 10 kHz < f ≤ 100 kHz | ± (0.5 % of reading + 0.5 % of range) ± [{0.04x(f-10)}% of reading] |
| **Temperature Coefficient** | Add | ±0.03% of reading/°C within the range 5 to 18°C or 28 to 40°C. |
| **When the Line Filter is Turned ON** | 45 ~ 66 Hz | Add 0.2 % of reading |
| | < 45 Hz | Add 0.5 % of reading |
| **Accuracy When the Crest Factor is Sset to 6 or 6A** | accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3 | |
| **Accuracy Changes Caused by Data Update Interval** | When the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy. | |
| **Influence of Temperature Changes After Zero-level Compensation or Range Change** | Add 0.02% of range/°C to the DC voltage accuracy.<br>Add the following value to the DC current accuracies. | |
| | 5 mA/10 mA/20 mA/50 mA/100 mA/200 mA ranges | 5 µA/°C |
| | 0.5 A/1 A/2 A/5 A/10 A/20 A ranges | 500 µA/°C |
| | External current sensor input (/EXT1) | 1 mV/°C |
| | External current sensor input (/EXT2) | 50 µV/°C |
| **Accuracy When the Crest Factor is Set to 6 or 6A** | accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3 | |
| **Accuracy Changes Caused by Data Update Interval** | When the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy. | |

### ACTIVE POWER ACCURACY

| Item | Specifications | |
|---|---|---|
| **Requirements** | same as the conditions for voltage and current. | |
| | Power factor | 1 |
| **Accuracy** | DC | (0.1 % of reading + 0.2 % of range) |
| | 0.1Hz ≤ f < 45 Hz | ± (0.3 % of reading + 0.2 % of range) |
| | 45 Hz ≤ f ≤ 66 Hz | ± (0.1 % of reading + 0.05 % of range) |
| | 66 Hz < f ≤ 1kHz | ± (0.2 % of reading + 0.2 % of range) |
| | 1 kHz < f ≤ 10 kHz | ± (0.1 % of reading + 0.3 % of range) ± [{0.067x(f-1)}% of reading] |
| | 10 kHz < f ≤ 100 kHz | ± (0.5 % of reading + 0.5 % of range) ± [{0.09x(f-10)}% of reading] |
| **Influence of Power Factor** | when power factor (λ) = 0 (S: apparent power)<br>± 0.1 % of S for 45 Hz ≤ f ≤ 66 Hz<br>± {(0.1 + 0.15 × f) % of S } for up to 100 kHz as reference data<br>•f is frequency of input signal in kHz<br>when 0 < λ < 1 (Φ: phase angle of the Voltage and current)<br>(power reading ) × [(power reading error%) + (power range %) × (power range / indicated apparent power value) + {tanΦ × (influence when λ=o)%}] | |
| **When The Line Filter is Turned ON** | 45 ~ 66 Hz | Add 0.3 % of reading |
| | < 45 Hz | Add 1 % of reading |
| **Temperature Coefficient** | same as the temperature coefficient for voltage and current | |
| **Accuracy When The Crest Factor is Set to 6 or 6A** | accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3 | |
| **Accuracy of Apparent Power S** | voltage accuracy + current accuracy | |
| **Accuracy of Reactive Power Q** | accuracy of apparent power + (√1.0004 - λ2) - (√1 - λ2) ×100 % | |
| **Accuracy of Power Factor Λ** | ± [(λ-λ/1.0002)+ \|λcosø-cos{ø+sin-1 (influence from the power factor when λ = 0%/100)} \| ]<br>±1 digit when voltage and current are at the measurement range rated input | |
| **Accuracy of Phase Difference Φ** | ± [ \| ø-cos-1(λ/1.0002) \| + sin-1 (influence from the power factor when λ = 0 % / 100)] ± 1 digit when voltage and current are at the measurement range rated input | |
| **Accuracy When The Crest Factor is Set to 6 or 6A** | accuracy obtained by doubling the measurement range error for the accuracy when the crest factor is set to 3 | |
| **Accuracy Changes Caused by Data Update Interval** | When the data update interval is 100 ms, and Auto, add 0.05% of reading to the 0.1 Hz to 1 kHz accuracy. | |

## GPM-001 Test Fixture/Test Fixture(EU)



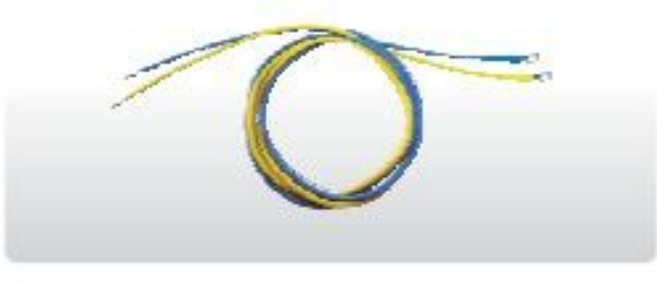
## GTL-209 Test Lead



## GTL-210 Test Lead



## GTL-212 Test Lead



## GTL-213 Test Lead



## SPECIFICATIONS

### VOLTAGE, CURRENT AND ACTIVE POWER MEASUREMENTS

| Item | Specifications |
|---|---|
| **Measurement Method** | Digital sampling method |
| **Crest Factor** | 3 or 6 (6A) |
| **Wiring System** | Single-phase, two-wire (1 P2 W) |
| **Range Select** | Select manual or auto ranging |
| **Auto Range** | Auto-range increase<br>The range is upped when any of the following conditions is met.<br>Crest factor 3 Urms or Irms exceeds 130% of the currently set measurement range.<br>Upk, Ipk value of the input signal exceeds 300% of the currently set measurement range.<br>Crest factor 6 Urms or Irms exceeds 130% of the currently set measurement range.<br>Upk, Ipk value of the input signal exceeds 600% of the currently set measurement range.<br>Crest factor 6A Urms or Irms exceeds 260% of the currently set measurement range.<br>Upk, Ipk value of the input signal exceeds 600% of the currently set measurement range.<br><br>Auto-range decline<br>The range is downed when all of the following conditions are met.<br>Crest factor 3 Urms or Irms is less than or equal to 30% of the measurement range.<br>Urms or Irms is less than or equal to 125% of the next lower measurement range.<br>Upk, Ipk value of the input signal exceeds 300% of the currently set measurement range.<br>Crest factor 6 or 6A Urms or Irms is less than or equal to 30% of the measurement range.<br>Urms or Irms is less than or equal to 125% of the next lower measurement range.<br>Upk, Ipk value of the input signal exceeds 600% of the currently set measurement range. |
| **Display Mode Switching** | Vrms (the true RMS value of voltage and current)<br>VOLTAGE MEAN (the rectified mean value calibrated to the RMS value of the voltage and the true RMS value of the current)<br>AC<br>DC |
| **Measurement Synchronization Source** | Select voltage, current, or off<br>In the case of Auto Update Rate, select the voltage or current from the equipped element. |
| **Line Filter** | Select OFF or ON (cutoff frequency at 500 Hz). |
| **Peak Measurement** | Measures the peak (max, min) value of voltage, current or power from the instantaneous voltage, instantaneous current or instantaneous power that is sampled. |
| **Zero-level Compensation** | Removes the internal offset of the measure unit (After measurement range is changed) |
| **Measurement Parameters** | Voltage Vrms , Vmn, Vdc , Vac<br>Current Irms , Idc , Iac<br>Active Power P<br>Apparent Power VA<br>Reactive power VAR<br>Power Factor PF<br>Crest Factor CFI, CFV<br>Phase Angle DEG<br>Frequency IHz and VHz<br>Voltage Peak V+pk and V-pk<br>Current Peak I+pk and I-pk<br>Active Power Peak P+pk and P-pk<br>Total Harmonic Distortion THDI and THDV<br>Maximum Current Ratio MCR |

### FREQUENCY MEASUREMENT

| Item | Specifications |
|---|---|
| **Measurement Item** | Voltage and current |
| **Measurement Frequency Range** | Data update interval — Measurement Frequency Range<br>0.1 s — 20 Hz ≤ f ≤ 100 kHz<br>0.25 s — 10 Hz ≤ f ≤ 100 kHz<br>0.5 s — 5 Hz ≤ f ≤ 100 kHz<br>1 s — 2.0 Hz ≤ f ≤ 100 kHz<br>2 s — 1.0 Hz ≤ f ≤ 100 kHz<br>5 s — 0.5 Hz ≤ f ≤ 100 kHz<br>10 s — 0.2 Hz ≤ f ≤ 100 kHz<br>20 s — 0.1 Hz ≤ f ≤ 100 kHz<br>Auto ( * ) — 0.1 Hz ≤ f ≤ 100 kHz<br>( * ) Limit of the measurement lower limit frequency by the Timeout setting<br>Timeout — lower limit frequency<br>1 s — 2.0 Hz<br>5 s — 0.5 Hz<br>10 s — 0.2 Hz<br>20 s — 0.1 Hz |
| **Measurement Range** | Auto switching among six types: 100mHz, 1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, and 100 kHz. |
| **Frequency Filter** | Select OFF or ON (cut off frequency of 500 Hz) |
| **Accuracy** | Requirements: When the input signal level is 30% or more of the measurement range If the crest factor is set to 3.<br>(60% or more if the crest factor is set to 6 or 6A)<br>• Frequency filter is ON when measuring voltage or current of 200 Hz or less.<br>± (0.06% of reading) |

## SPECIFICATIONS

### INTEGRATION

| Item | Specifications |
|---|---|
| Mode | Select manual integration mode, standard integration mode, or repetitive integration mode. |
| Timer | Automatically stop integration by setting a timer.<br>Selectable range: 0 hours 00 minutes 00 seconds to 9999 hours 59 minutes 59 seconds |
| Accuracy | ±(Power accuracy (or current accuracy) + 0.1% of reading) (fixed range) |
| Range Setting | Auto range or fixed range is available for Integration |
| Timer Accuracy | ±0.02% |
| Remote Control | Start, stop and reset operations are available using an external remote signal. (option) |

### HARMONIC MEASUREMENT

| Item | Specifications | | | |
|---|---|---|---|---|
| Measured Item | Voltage, Current, Power | | | |
| Measured Method | Zero-cross simultaneous calculation method | | | |
| Frequency Range | 10 Hz to 1.2 kHz. | | | |
| FFT Data Length | 1024<br>4096 (Auto switch when both 50Hz/60Hz and update rate > 0.1s conditions are met) | | | |
| Sample Rate, Window Width, and Upper Limit of Analysis Orders* | Fundamental Frequency | Sample rate | Window Width | upper limit of Analysis orders |
| | 10 Hz to 44 Hz | f × 1024 | 1 | 50 |
| | 45 Hz to 55 Hz | f x 512 | 10 | 50 |
| | 54 Hz to 66Hz | f x 512 | 12 | 50 |
| | 67 Hz to 150 Hz | f × 512 | 2 | 32 |
| | 150 Hz to 300 Hz | f × 256 | 4 | 16 |
| | 300 Hz to 600 Hz | f × 128 | 8 | 8 |
| | 600 Hz to 1200 Hz | f × 64 | 16 | 4 |
| Accuracy | Frequency | Voltage | Current | Power |
| | 10 Hz ≤ f < 45 Hz | 0.15% of reading + 0.35% of range | 0.15% of reading + 0.35% of range | 0.35% of reading + 0.50% of range |
| | 45 Hz ≤ f < 440 Hz | 0.15% of reading + 0.35% of range | 0.15% of reading + 0.35% of range | 0.25% of reading + 0.50% of range |
| | 440 Hz ≤ f < 1.2kHz | 0.20% of reading + 0.35% of range | 0.20% of reading + 0.35% of range | 0.40% of reading + 0.50% of range |

* 50Hz/60Hz Compliant IEC61000-4-7

### D/A OUTPUT (OPTIONS)

| Item | Specifications |
|---|---|
| Output Voltage | ±5 V FS (approach ±7.5 V maximum) against each rated value. |
| Number Of Output Channels | 4 |
| Output Items | Set for each channel: V, I, P, VA, VAR, PF, DEG, VHZ, IHZ, Vpk, Ipk, WP, WP±, q, q±, Off |
| Accuracy | ±(accuracy of each measurement item + 0.2% of FS) (FS = 5 V) |
| D/A Conversion Resolution | 16 bits |
| Minimum Load | 100 kΩ |
| Update Interval | Same as the data update interval.<br>In the case of Auto Update Rate, update interval is equal to signal interval. More than 100ms. |
| Temperature Coefficient | ±0.05%/°C of FS |

### REMOTE CONTROL INPUT/OUTPUT SIGNAL (OPTIONS)

| Item | Specifications |
|---|---|
| Remote Control Input Signal | EXT HOLD, EXT TRIG, EXT START, EXT STOP, EXT RESET |
| Remote Control Output Signal | INTEG BUSY |
| I/O Level | TTL |
| I/O Logic Format | Negative logic, Falling edge |

### DIGITAL IO SIGNAL (OPTIONS)

| Item | Specifications |
|---|---|
| I/O Control Output Signal | OUT1, OUT2, OUT3, OUT4 |
| I/O Level | TTL |
| I/O Sink Current | Max 100mA (per/ch) |

* Q (VAR), S (VA), λ (PF) and Φ (DEG) are originated from the measured values including voltage, current and active power which go through computation process. In respect to distorted signal input, accordingly, the value acquired from other instruments, which employ different methods, may differ from that acquired from GPM-8310 unit.
* "Zero" will be shown for S or Q and "--" will be displayed for λ and Φ when either current or voltage is less than 0.5% of the rated range (less than or equivalent to 1% when crest factor is set 6).

### GENERAL

| | |
|---|---|
| ⚠ Note | The below are the basic conditions required to operate the GPM-8310 within specifications:<br>• 1-year Calibration: Yearly<br>• Operating Environment: 18~28 °C (64.4~82.4 °F)<br>• Humidity: <80%RH,<br>• Accuracy: ± (% of reading + % of range)<br>• The specifications apply when it warmed up for at least 30 minutes and operates in the slow rate.<br>• The power supply cable must be grounded to ensure accuracy.<br>• Input voltage and current must be standard sine wave.<br>• The power factor must be 1.<br>• The crest factor must be 3.<br>• The common-mode voltage must be zero. |
| Specification Condition | Temperature: 23°C±5°C<br>Humidity: <80%RH(non-condensing) |
| Operation Condition | Temperature 0°C ~ 40°C,<br>• 30 ~ 40°C, Relative Humidity < 70%RH (non-condensing)<br>• >40°C, Relative Humidity < 50%RH (non-condensing)<br>Indoor use only<br>Altitude: < 2000 meters<br>Pollution degree 2 |
| Storage Condition | Temperature −40°C ~ 70°C<br>Humidity: < 90%RH (non-condensing) |
| Power Source | AC 100-240V, 50~60Hz ; Consumption Max. 30VA |
| Dimensions | 268(W) x 107(H) x 379(D) mm (w/t bumpers) |
| Weight | Approx. 2.9kg |

# Digital Power Meter

## ORDERING INFORMATION

**GPM-8310** Digital Power Meter
with RS-232C/USB device & host/LAN/GPIB

**GPM-8310 with DA4** Digital Power Meter
with RS-232C/USB device & host/LAN/GPIB and opt. DA4

ACCESSORIES :

Safety Instruction Sheet x 1, Power cord x 1, Test lead GTL-209 x 1, Test lead GTL-212 x 1, CD x 1 (including complete user manual and USB driver) DA4 cable GTL-214 (available for GPM-8310 with DA4 only)

**OPTIONAL**

**GPM-DA4** DA4 Interface (including cable, GTL-214)
Note : Optional DA4 interface must be installed in factory.

**OPTIONAL ACCESSORIES**

| | | | |
|---|---|---|---|
| **GPM-001** | Test Fixture (including GTL-210 x 2, GTL-213 x 1) | **GTL-248** | GPIB Cable, Approx. 2000mm |
| **GPM-001(EU)** | Test Fixture (including GTL-210 x 2, GTL-213 x 1) | **GRA-422** | Rack Mount Kit, 19" 2U size |
| **GTL-209** | Test Lead, Banana to Bare-wire, Approx. 1000mm | | |
| **GTL-210** | Test Lead, Banana to Banana, Approx. 1000mm | | |
| **GTL-212** | Test Lead, O-Type to Bare-wire, Approx. 1000mm | | |
| **GTL-213** | Test Lead, O-Type to Banana, Approx. 1000mm | | |
| **GTL-214** | DA4 Cable, Approx. 1000mm | | |
| **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 | | |

## A. VARIOUS DISPLAY MODES




**Numerical (General) Mode**




**Numerical (Simple) Mode**



**Waveform Mode**



**Harmonic (Bar Graph) Measurement**



**Harmonic (Table Column) Measurement**

GPM-8310 provides the numerical value display mode and the waveform display mode, which help users to maximize the benefit of their measurement. Under the numerical mode, there are the general mode and the simple mode. The general mode has related measurement settings and can simultaneously display 10 measurement parameters (2 main measurements and 8 secondary measurements). The simple mode displays only 4 measurement parameter results. The parameters in each mode can be arranged and combined as required. Under the graphic mode, a simple oscilloscope function is provided to display the waveforms of three parameters including voltage, current and power. The horizontal scale can be adjusted (from 25us/div ~ 1s/div according to the set data update rate), and 3 magnification rates for waveform observation are also provided for users to select. In the harmonic measurement, the measurement results of each order of harmonics can be displayed by bar graphs, and a specific observation order can be specified. The relevant values of each order of harmonics (voltage/current/power/voltage distortion ratio/current distortion ratio/power distortion ratio/voltage phase angle/current phase angle) can be completely recorded and displayed.

## B. RICH MEASUREMENT PARAMETERS

| Measurement Items | Symbols |
|---|---|
| Voltage | Vrms, V+pk, V-pk, Vac*, Vdc*, Vmn* |
| Current | Irms, I+pk, I-pk, Iac*, 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 |
| Maximum Current Ratio | MCR |
| Integration | WP, WP+, WP-, q, q+, q-, Vac, Iac |

Note : "*" Only applicable to specific measurement modes for selection

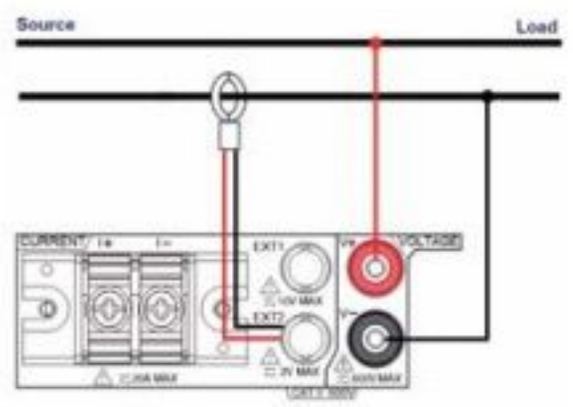



GPM-8310 provides a variety of measurement items and functions, including voltage, current, frequency, effective power, apparent power, reactive power, power factor, crest factor, total harmonic distortion, and can also measure the maximum current ratio. GPM-8310 is also equipped with the measurement function of power or current time integration for the DUT. Users set a period of time to perform instantaneous power integration at the set time period, and then divide by the time to obtain the average power of the DUT. In addition, when performing integration measurement, GPM-8310 supports automatic level-changing function for the power change of the DUT at different times in order to obtain the most complete integration result within the set time.

## C. SUPERB MEASUREMENT ASSISTANCE



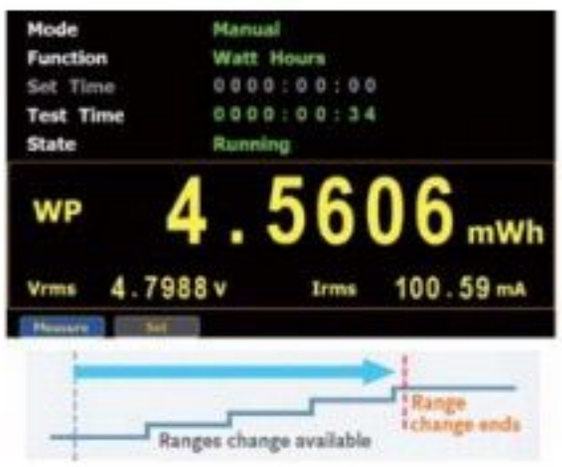

**Ratio Configuration**




**External Current Sensor Input**

With respect to the support of measurement assistance, the performance of GPM-8310 is outstanding. First of all, for the measurement of high voltage/high power, the setting of voltage ratio/power ratio is provided to restore the attenuated ratio to a true value. For the measurement of large current, other than the setting of current ratio, external current sensor terminals (EXT1/EXT2) can be utilized to connect with a voltage output type current transformer, making large current measurement more convenient. In addition, GPM-8310 provides 4 sets of panel settings for storage/recall and memory for storing 10,000 lots of measurement values. The measurement storage can log the measurement results based upon the update rate or a self-defined time interval to facilitate the subsequent analysis. The USB host on the front panel supports screen capture, measurement value storage, and GPM-8310 firmware update.

## D. FLEXIBLE LEVEL-CHANGING MECHANISM




**Automatic level-changing under the integration function**



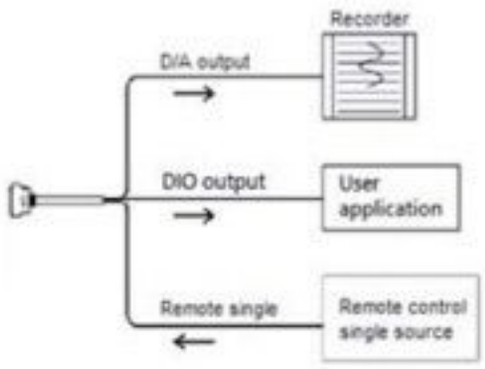

**Self-defined automatic level-changing mechanism**

GPM-8310 provides the measurement of the integration function under the automatic level-changing mode to allow users to fully calculate the total value of the power consumption of the DUT from the beginning to the end of the integration function. In addition, GPM-8310 also supports self-defined setting mechanism for level-changing. Users can select the required level to be changed to save time on level-changing and expedite the test.

## E. CONVENIENT AND PRACTICAL INTERFACE



**Practical Interface**




**DA4 Interface Mechanism**

GPM-8310 provides comprehensive and diverse communications interfaces including RS-232 / USB / LAN / GPIB, which are suitable for customers to write computer software for remote control and the collection of measurement results through commands. The optional Digital I/O (DA4) interface provides 3 different modes: the external control mode, the DA4 output mode and the self-defined output mode based on user settings. When the setting is in the external control mode, it allows users to activate, stop, trigger or reset the integration measurement function through external signals. When the setting is in the DA4 output mode, users can define 4 measurement parameter values from the 25 measurement parameters provided (even with the result of integration measurement) to produce outputs by a fixed level (full scale +5V) or a manual level (full scale ±5V) and receive results by collocating with a data recorder. When the setting is in the self-defined output mode, a communications interface is required to control the action of each defined pin through commands.

# Digital Power Meter



## GPM-8213

台灣精品 TAIWAN EXCELLENCE

CE | USB Device | LAN | RS-232 | GPIB

## FEATURES

- ☆ 4" TFT LCD
- ☆ Basic Accuracy : ±(0.1% of reading + 0.1% 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(Vrms/V+pk/V-pk), current (Irms/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: ±0.1%; level: ±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 | | Range |
| RATING VOLTAGE | | 600 Vrms |
| RATING CURRENT | | 20 Arms |
| IMPEDANCE(50/60Hz) | Voltage | 2.4 MΩ |
| | Current | 5mA~200mA : 500 mΩ |
| | Current | 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 | | Symbol |
| MEASUREMENT | Voltage | Vdc, Vrms, V+pk, V-pk |
| | Current | Idc, Irms, I+pk, I-pk |
| | Power | P, P+pk, P-pk, VA, Var |
| | Crest Factor | CFV, CFI |
| | Power Factor | PF |
| | Frequency | VHz, IHz |
| | Angle | Deg |
| | Total Harmonic Distortion | THDV, THDI |
| | Integration | Time, WP, WP+, WP-, q, q+, q- |
| DISPLAY DIGITS | | 5 digits |
| FREQUENCY BANDWIDTH | | DC, 45Hz~6kHz |
| AVERAGE | | 1, 2, 4, 8, 16, 32, 64 |
| PT RATE | | 1 ~ 9999.999 |
| CT RATE | | 1 ~ 9999.999 |
| DISPLAY MODE | Standard | 8 measurement Item |
| | Simple | 4 measurement Item |
| **VOLTAGE** | | |
| ITEM | | Range |
| RANGE | CF=3 | 15V, 30V, 60V, 150V, 300V, 600V |
| | CF=6 | 7.5V, 15V, 30V, 75V, 150V, 300V |
| CREST FACTOR | | 3 or 6 (selectable) |
| ACCURACY | Effective Range | 1% ~ 105% of range |
| | DC | ±(0.2% of reading+0.2% of range) |
| | 45Hz ≦ f ≦ 66Hz | ±(0.1% of reading+0.1% of range) |
| | 66Hz < f ≦ 1kHz | ±(0.1% of reading+0.2% of range) |
| | 1kHz < f ≦ 6kHz | ±3% of reading |
| | Filter(ON) | 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 |




GPM-8213

## Rear Panel



| SPECIFICATIONS | | |
|---|---|---|
| **CURRENT** | | |
| **ITEM** | | Range |
| **MEASUREMENT** | **CF=3** | 5mA,10mA,20mA,50mA,100mA,200mA,0.5A,1A,2A, 5A,10A,20A |
| | **CF=6** | 2.5mA,5mA,10mA,25mA,50mA,100mA,250mA,0.5A, 1A,2.5A,5A,10A |
| **CREST FACTOR** | | 3 or 6 (selectable) |
| **ACCURACY** | **Effective Range** | 1% ~ 105% of range |
| | **DC** | ±(0.2% of reading+0.2% of range) |
| | **45Hz≦f ≦66Hz** | ±(0.1% of reading+0.1% of range) |
| | **66Hz < f ≦1kHz** | ±(0.1% of reading+0.2% of range) |
| | **1kHz < f ≦6kHz** | ±3% of reading |
| | **Filter(ON)** | 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** | | Range |
| **ACCURACY** | **Effective Range** | 1% ~ 110% of range |
| | **DC** | ±(0.2% of reading+0.2% of range) |
| | **45Hz≦f ≦66Hz** | ±(0.1% of reading+0.1% of range) |
| | **66Hz < f ≦1kHz** | ±(0.1% of reading+0.3% of range) |
| | **1kHz < f ≦6kHz** | ±3% of reading |
| | **Filter(ON)** | Add 3% of reading@45Hz~66Hz |
| **TEMPERATURE EFFECT** | **5-18° C/28-40° C** | Add ±0.03% of reading/° C |
| **FREQUENCY** | | |
| **ITEM** | | Range |
| **MEASUREMENT** | **Filter(ON)** | 30.000 Hz~499.99 Hz |
| | **Filter(OFF)** | 30.000 Hz~9.9999 kHz |
| **PARAMETER** | | Voltage, Current |
| **EFFECTIVE RANGE** | | 10%~105% of voltage input |
| **ACCURACY** | | ±0.06% of reading |
| **INTEGRATION** | | |
| **ITEM** | | Range |
| **INTERGRATION** | **Accuracy** | ±(voltage or current accuracy+0.1% of reading) |
| **TIME** | **Range** | 0 hour 00 min ~ 9999 hour 59 min |
| | **Accuracy** | ±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 | | |
| **DIMENSIONS & WEIGHT** | | |
| 270(W) x 110(H) x 350(D) mm, Aapprox. 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**

**GPM-82G1** GPIB card (factory installed)

**OPTIONAL ACCESSORIES**

**GPM-001** Test Fixture (including GTL-210 x 2, GTL-213 x 1)
**GPM-001(EU)** Test Fixture (including GTL-210 x 2, GTL-213 x 1)
**GTL-209** Test Lead, Banana to Bare-wire, Approx. 1000mm
**GTL-210** Test Lead, Banana to Banana, Approx. 1000mm
**GTL-212** Test Lead, O-Type to Bare-wire, Approx. 1000mm
**GTL-213** Test Lead, O-Type to Banana, Approx. 1000mm
**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
**GTL-248** GPIB Cable, Approx. 2000mm
**GRA-422** Rack Mount Kit, 19" 2U size
**GRA-436** Rack Mount Kit, 19" 2U size for two sets

## GPM-001 Test Fixture/Test Fixture(EU)



## GTL-209 Test Lead



## GTL-210 Test Lead



## GTL-212 Test Lead



## GTL-213 Test Lead



# 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

### 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

**GAD-201G** Automatic Distortion Meter

ACCESSORIES :
User manual x 1 , Power cord x 1
Test lead GTL-103 x 1

### GTL-103 Test Lead

Banana-Alligator Heads
Approx. 1.2m



# A.C. Millivolt Meter



The GVT-427B/417B Series is a compact analog AC millivoltmeter ideal for low level voltage measurements with a remarkable 300μV full scale sensitivity. GVT-427B 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.

## GVT-427B (2CH)
## GVT-417B (1CH)

CE

## FEATURES

- ✲ 300 μV 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 μV – 100V of Full Scale in 12 ranges |
| Decibel Range | -70dB – +40dB in 12 ranges |
| Accuracy | ±3% of full scale |
| Operating Mode | GVT-427B : Ch1 and Ch2 separately or simultaneously at Ch1<br>GVT-417B : one Ch1 only |
| Frequency Response | 20Hz – 200kHz±3%,10Hz – 1MHz±10%<br>(reference 1 kHz) |
| Impedance | 1MΩ, approx, 40pF |
| **OUTPUT** | |
| Level | Approx. 0.1Vrms at full scale |
| Distortion | Less than 2% |
| **POWER SOURCE** | |
| AC 115V/230V ±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 CE Approved

# Isolated Output High Precision Current Shunt Meter



## PCS-1000I

CE | USB Device | GPIB

## 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 | Half Year 23 ℃ ± 5 ℃ | Temperature Coefficient/℃ |
|---|---|---|
| 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 | Half Year 23 ℃ ± 5 ℃ | Temperature Coefficient/℃ |
|---|---|---|---|
| 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 | Half Year 23 ℃ ± 5 ℃ DC Accuracy | Temperature Coefficient/℃ |
|---|---|---|
| 30.00000 mA | 0.1 + 0.05 | 0.001 |
| 300.0000 mA | 0.1 + 0.05 | 0.001 |
| 3.000000 A | 0.1 + 0.05 | 0.001 |
| 30.00000 A*1 | 0.1 + 0.05 | 0.001 |
| 300.0000 A*1 | 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 | Half Year 23 ℃ ± 5 ℃ | Temperature Coefficient/℃ |
|---|---|---|---|
| 200.0000 mV | 45Hz~2kHz | 0.5 + 0.05 | 0.005 + 0.005 |
| 2.000000 V | 2kHz~10kHz | 1.0 + 0.05 | 0.005 + 0.005 |
| 20.00000 V | 10kHz~20kHz | 2.0 + 0.10 | 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 | Half Year 23 ℃ ± 5 ℃ | Temperature Coefficient/℃ |
|---|---|---|---|
| 30.00000 mA | 45Hz~2kHz | 0.5 + 0.05 | 0.03 + 0.006 |
| 300.0000 mA | 2kHz~10kHz | 1.0 + 0.05 | 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 | Half Year 23℃±5℃ AC Accuracy | Temperature Coefficient/℃ |
|---|---|---|---|
| 30.00000 mA | 45Hz~2kHz<br>2kHz~10kHz | 0.2 + 0.05<br>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 : ±(% 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 ±10% |
| **Power Line Frequency** | 50/60 Hz |
| **Operating Environment** | Full accuracy for 0 ℃ ~ 55 ℃, Full accuracy to 80% R.H. at 40 ℃ |
| **Storage Environment** | -40 ℃ ~ 70 ℃ |
| **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 ℃~28 ℃, unless specified otherwise.)

Note: *1 The accuracy for 30A/300A levels must be increased by a power factor of 8 ppm/watt.

## PCS-001 Basic Accessory Kit



## ORDERING INFORMATION

**PCS-1000I** Isolated Output High Precision Current Shunt Meter

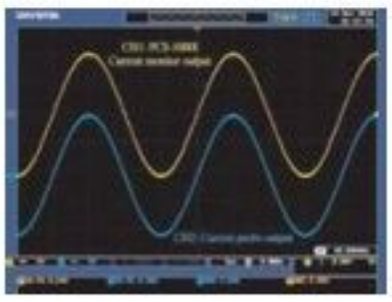
ACCESSORIES :

Quick Operation Guide, User Manual (CD) x 1, AC Power Cord x 1 (Region Dependant)

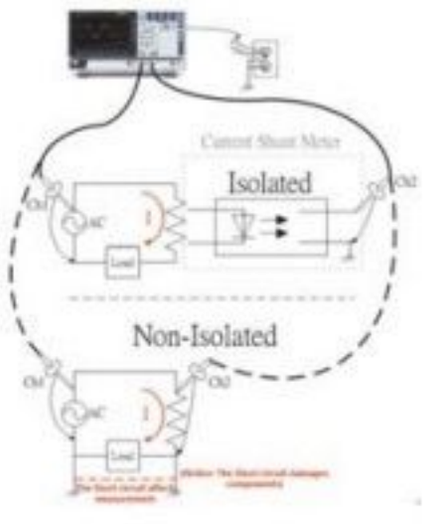
| | |
|---|---|
| **GTL-105A** | Alligator Clip Test Lead (3A Max) |
| **GTL-207A** | Banana Plug Test Lead |
| **GTL-240** | USB Cable |
| **PCS-001** | Basic Accessory Kit |

**OPTIONAL ACCESSORIES**

| | |
|---|---|
| **GRA-419-J** | Rack Mount Kit (JIS) |
| **GRA-419-E** | Rack Mount Kit (EIA) |



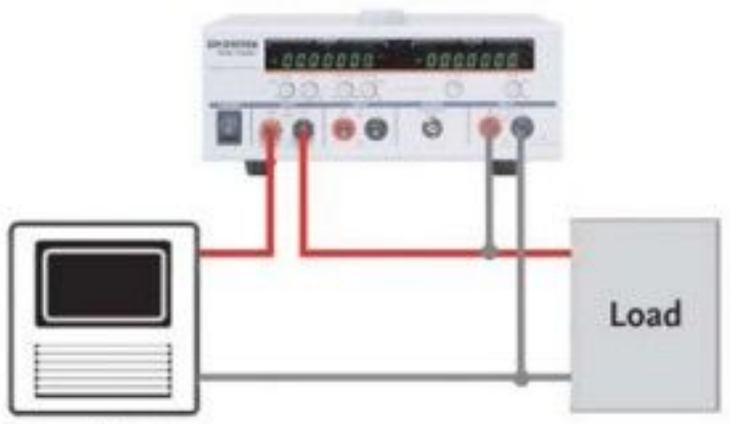
**PCS-1000I**
**VS. Current Probe for Measurement**




**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.

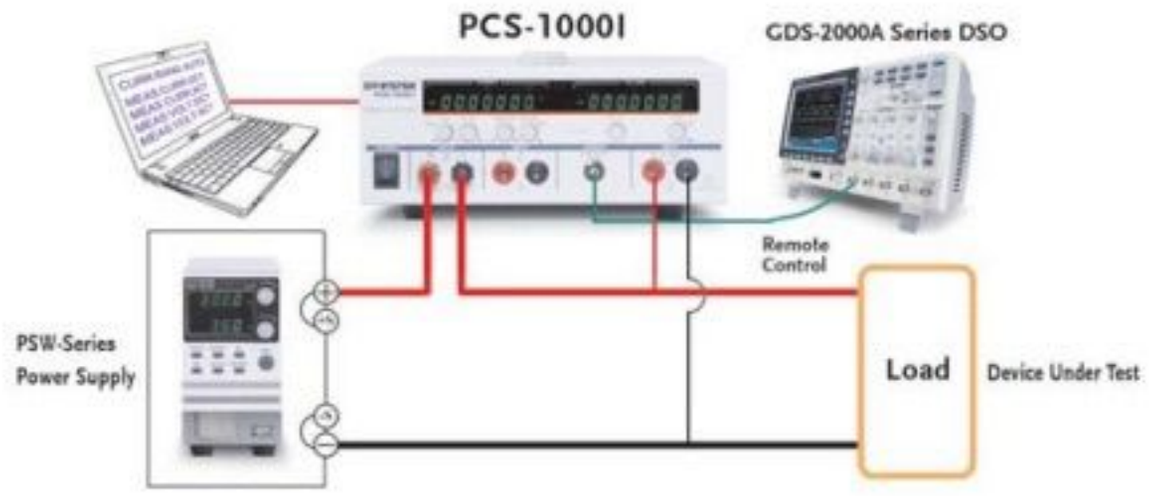
## B. FIVE SETS OF SHUNT RESISTORS TO SWITCH MEASUREMENT





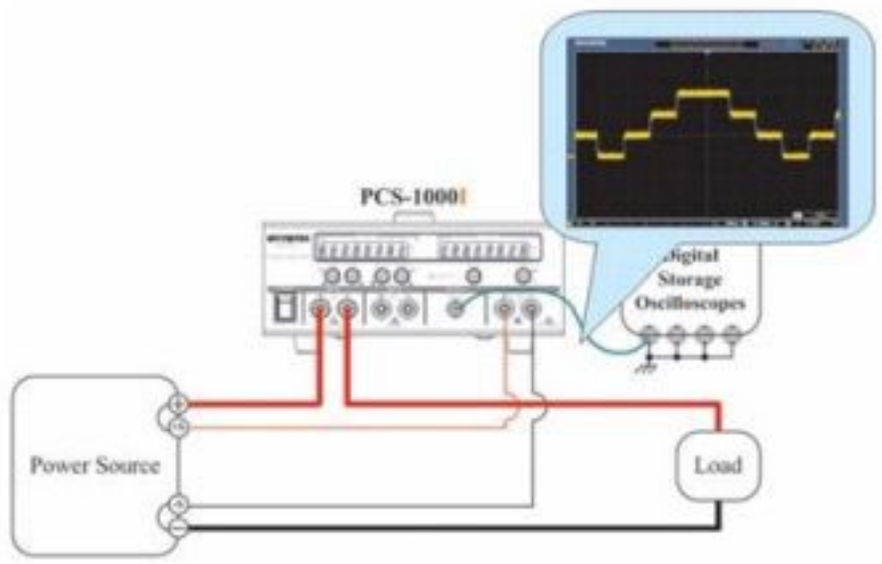

The switching measurement of five independent shunt resistors provides excellent resolution than that of a single shunt resistor. Under 30mA range, the resolution is 0.01uA, which is ideal for very small current measurement.

## 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

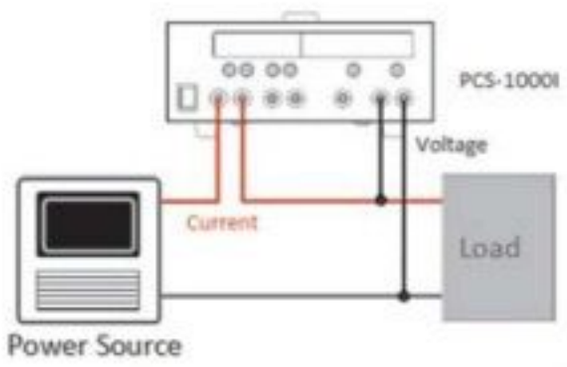


Press and hold Auto key, PCS-1000I will automatically select the maximum measurement resolution for users to save time in manual selection.

## F. CONNECTION COMPARISON

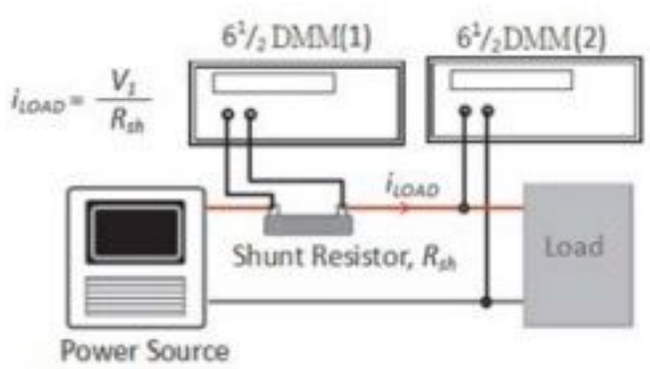
PCS-1000I can simultaneously measure current and voltage with 6 1/2 measurement resolution. The left diagram shows the connection method of simultaneous measurement. Compared with the test of conventional meters from other brands, PCS-1000I is simple in connection and there is no requirement of any additional instrument.

**PCS-1000i Conducts Simultaneous Voltage and Current Measurement**



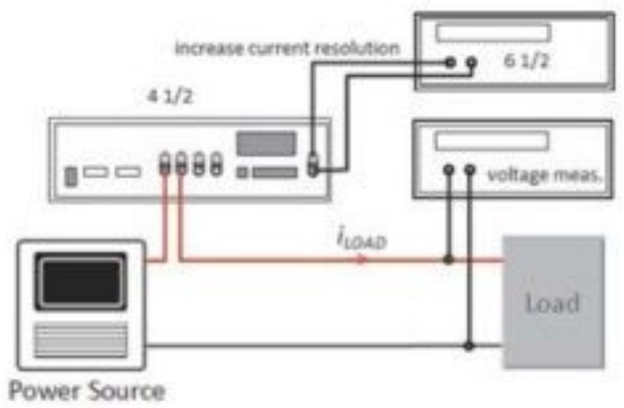

1. Only one PCS-1000I is needed to measure voltage and current
2. Easy connection
3. USB and GPIB communications on the rear panel can be used for data communication while connecting with a PC

**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

# 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-82G1 | GPIB card for GDM-8261A | GDM-8261A |
| GDM-82L1 | LAN card for GDM-8261A | GDM-8261A |
| GDM-83G1 | GPIB card for GDM-8342 (factory install) | GDM-8342 |
| GDM-90G1 | GPIB card for GDM-906X series | GDM-906X Series |
| GDM-SC1A | Scanner Card, 16+2 Channels | GDM-8261A/8255A |
| GDM-TL1 | Test Lead Set | All GDM-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. 2000mm | 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-10000 Series, GPT-9500 Series |
| GHT-116B | High Voltage Test Lead (Black only), Approx. 1500mm | GSB-01/02, All GPT-Series, GPT-9500 Series |
| GHT-116R | High Voltage Test Lead (Red only), Approx. 1500mm | GSB-01/02, All GPT-Series, GPT-9500 Series |
| GHT-117 | High Voltage Adapter Box | GPT-15003/15002/15001/12003/12002/12001, GPT-9903A/9902A/9901A, GPT-9803/9802/9801, GPT-9600 |
| GHT-117(EU) | High Voltage Adapter Box | GPT-15003/15002/15001/12003/12002/12001, GPT-9903A/9902A/9901A, GPT-9803/9802/9801, GPT-9600 |
| GHT-118 | High Voltage/Ground Bond Adapter Box | GPT-15004/12004/9904/9804 |
| GHT-118(EU) | High Voltage/Ground Bond Adapter Box | GPT-15004/12004/9904/9804 |
| 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-10000, GLC-9000 |
| GLC-02 | Foil Probe | GLC-10000, GLC-9000 |
| GLC-03 | Power Cord for EUT | GLC-10000 |
| GLC-04 | Input & Output Terminal Cover | GLC-10000 |
| GLC-10KG1 | GPIB Card | GLC-10000 |
| GOM-80G1 | GPIB card for GOM-804 (factory install) | GOM-804 |
| GPM-001 | Test Fixture (Universal or Europe type socket) | GPM-8310, GPM-8213 |
| GPM-82G1 | GPIB card for GPM-8213 (factory install) | GPM-8213 |
| GPM-002 | Terminal Cover | GPM-8320/8330 |
| GPM-DA4 | DA4 Interface (factory install) | GPM-8310 |
| GPM-DA12 | GPIB+DA12 Interface (including cable, GTL-214) | GPM-8320/8330 |
| GPT-10KG1 | GPIB card for GPT-10000 series | GPT-10000 Series |
| GPT-10KL1 | LAN card for GPT-10000 series | GPT-10000 Series |
| GPT-9KG1 | GPIB card for GPT-9900/9800 series and GCT-9040 | GPT-9900A/9900/9800 Series, GCT-9040 |
| GRA-417 | Rack Mount Kit, 19", 4U Size | GPT-9900A/9800/9600 Series, 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-8310/8213 |
| GRA-433 | Rack Mount Kit, 19", 4U Size | GPT-9904 |
| GRA-436 | Rack Mount Kit 19", 2U Size for two sets | GDM-906X Series, GDM-8261A/8255A, LCR-6000 Series, GBM-3000 Series, GPM-8213 |
| GRA-438 | Rack Mount Kit 19", 2U Size | GSB-01/02 |
| GRA-440 | Rack Mount Kit 19", 4U Size | GPT-10000 Series |
| GRA-445 | Rack Mount Kit 19", 4U Size | LCR-8200(A) Series |
| GRA-452 | Rack Mount Kit, 19" 3U Size | GPM-8320/8330 |
| GSC-014 | Soft Carrying Case for DMM Accessory | All GDM-Series |
| GTL-101 | Test Lead, BNC (P/M) to Alligator, Approx. 1100mm | 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-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-10000, GLC-9000, PCS-1000I |
| GTL-209 | Test Lead, Banana to Bare-wire, Approx. 1000mm | GPM-8310/8213, GPM-8320/8330 |
| GTL-210 | Test Lead, Banana to Banana, Approx. 1000mm | GPM-001 |
| GTL-212 | Test Lead, O-Type to Bare-wire, Approx. 1000mm | GPM-8310 |
| GTL-212A | Test Lead, O-Type to Bare-wire, Approx. 1000mm | GPM-8320/8330 |
| GTL-213 | Test Lead, O-Type to Banana, Approx. 1000mm | GPM-001 |
| GTL-214 | DA4 Cable, Approx. 1000mm | GPM-8310, GPM-8320/8330 |
| GTL-215 | G.B. Test Lead, U type to Alligator, Approx. 1000mm | GPT-15004/12004, GCT-9040, GPT-9904/9804 |
| 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-10000/9900A/9900/9800 Series, GLC-10000, GLC-9000, GOM-805/804, GBM-Series, GPM-8310/8213, GPM-8320/8330 |
| GTL-234 | RS-232C Cable, 9-pin F-F type, null modem for computer, Approx. 2000mm | GDM-906X Series, LCR-8200(A) Series |
| GTL-235 | Communication Cable, Approx. 700mm | GSB-01/02 |
| GTL-236 | RS-232C Cable, 9-pin F-M type, Approx. 2000mm | GPT-9500 Series |
| GTL-240 | USB Cable, USB 2.0 A-B type (L shape), Approx. 1200mm | GLC-10000, 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(A) Series, LCR-6000 Series, GPT-10000/9500 Series, GLC-10000, GLC-9000, GOM-805/804, GBM-Series, GPM-8310/8213, GPM-8320/8330 |
| GTL-247 | USB Cable, USB 1.1 A-A type, Approx. 1800mm | GDM-8261A/8255A, GPT-9900A/9900/9800 Series, GCT-9040 |

# ACCESSORIES

| MODEL | DESCRIPTION | APPLICABLE DEVICE |
|---|---|---|
| GTL-248 | GPIB Cable, Approx. 2000mm | GDM-906X Series, GDM-8261A/8342, LCR-8200(A) Series, GPT-10000/9900A/9900/9800 Series, GLC-10000, GLC-9000, GOM-805/804, GPM-8310/8213 |
| GTL-253 | USB Cable, USB 2.0 A-mini B type, Approx. 1400mm | LCR-900 Series |
| GTL-258 | GPIB Cable, 25-pin Micro-D Connector, Approx. 1900mm | GPM-8320/8330 |
| GTL-264 | Signal I/O Converted Cable, 15-pin Male to 9-pin Female. Approx. 200mm | GPT-10000 Series |
| 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(A) Series, LCR-6000 Series |
| LCR-05A | 50MHz Test Fixture for Axial & Radial Leaded Components (including STD-LOAD kit) | LCR-8200(A) Series |
| LCR-06B | Test Lead with Kelvin clip (4 wire type), Approx. 750mm | LCR-8200(A) Series, LCR-6000 Series |
| LCR-07 | Test Lead with Alligator clip (2 wire type), Approx. 750mm | LCR-8200(A) Series, LCR-6000 Series |
| LCR-08 | Test Fixture (Tweezers) for SMD/Chip Components, Approx. 750mm | LCR-8200(A) Series, LCR-6000 Series |
| LCR-10A | 50MHz Test Fixture for Bottom Electrode Components (including STD-LOAD kit) | LCR-8200(A) Series |
| LCR-12 | Test Lead with Kelvin clip (4 wire type), Approx. 600mm | LCR-8200(A) Series |
| LCR-15 | Test Fixture for SMD/Chip components | LCR-8200(A) Series, LCR-6000 Series |
| LCR-15A | 50MHz Test Fixture for SMD/Chip components (including STD-LOAD kit) | LCR-8200(A) Series |
| LCR-16 | DC Bias Voltage Box (+/- 45V) | LCR-6000 Series |
| LCR-17 | DC Bias Current Box (+/- 2.5A) | LCR-6000 Series |
| LCR-DB1 | External DC Bias Voltage Box (+/- 200V) | LCR-8200(A) Series |
| PCS-001 | Basic Accessory Kit | PCS-1000I |
| PT-100 | Temperature Probe, Approx. 1500mm | GOM-805/804 |

# ACCESSORIES

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



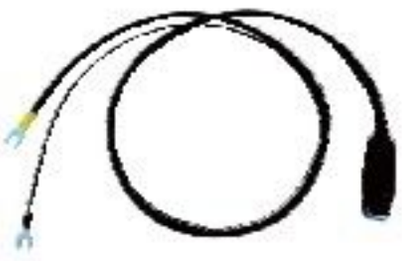
GLC-01



GLC-02



# ACCESSORIES

| | | |
|---|---|---|
| GPM-001<br>  | GPM-001 (EU)<br>  | GSC-014<br>  |
| GTL-101<br>  | GTL-103<br>  | GTL-105A<br>  |
| GTL-108A<br>  | GTL-115<br>  | GTL-116B<br>  |
| GTL-116R<br>  | GTL-117<br>  | GTL-132<br>  |
| GTL-205A<br>  | GTL-207A<br>  | GTL-209<br>  |
| GTL-210<br>  | GTL-212/212A<br>  | GTL-213<br>  |
| GTL-214<br>  | GTL-215<br>  | GTL-217<br>  |

# ACCESSORIES

| | | |
|---|---|---|
| GTL-308  | GTL-309  | GTL-232  |
| GTL-234  | GTL-235  | GTL-236  |
| GTL-240  | GTL-246  | GTL-247  |
| GTL-248  | GTL-250  | GTL-253  |
| LCR-DB1  | PT-100  | GDM-82G1  |
| GDM-82L1  | GDM-90G1  | GPT-9KG1  |
| GPT-10KG1  | GPT-10KL1  | GTL-264  |

# ACCESSORIES

**GTL-258**



**GLC-03**



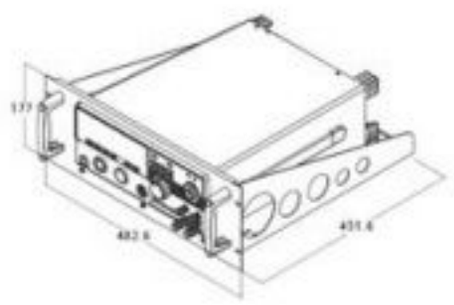
**GLC-04**



**GRA-417 Rack Mount Kit**

For : GPT-9900A/9800/9600 Series, GCT-9040

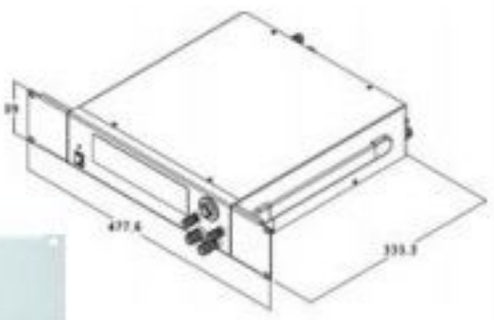




**GRA-438 Rack Mount Kit**

For : GSB-01/02

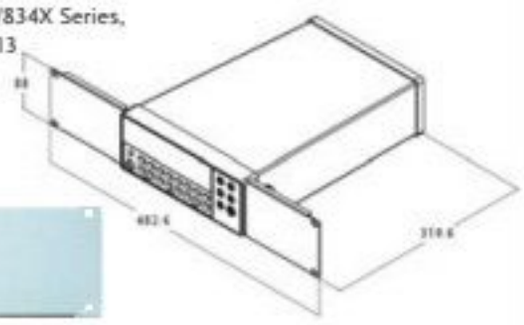




**GRA-422 Rack Mount Kit**

For : GDM-906X Series, GDM-8261A/8255A/8351/834X Series,
LCR-6000 Series, GBM-Series, GPM-8310/8213

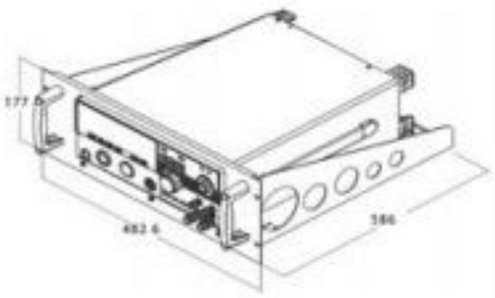




**GRA-433 Rack Mount Kit**

For : GPT-9904

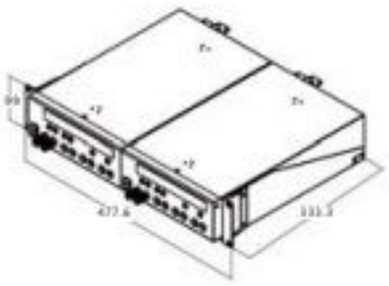




**GRA-419 EIA Rack Mount Kit**

For : PCS-1000I

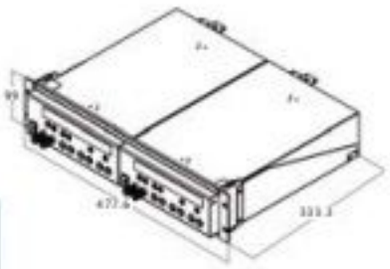




**GRA-419 JIS Rack Mount Kit**

For : PCS-1000I

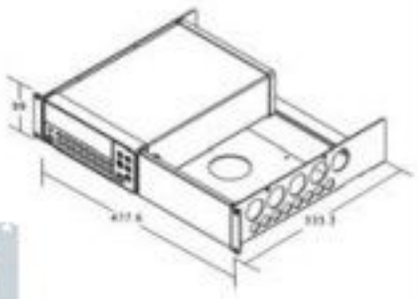




**GRA-436 Rack Mount Kit**

For : GDM-906X Series, GDM-8261A, GDM-8255A,
LCR-6000 Series, GBM-3000 Series, GPM-8213

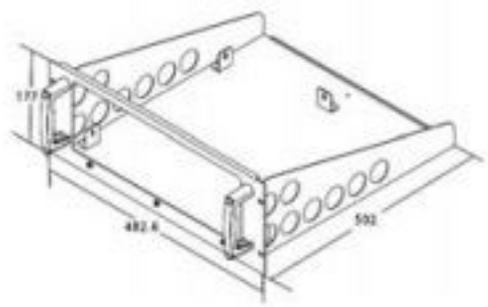




**GRA-440 Rack Mount Kit**

For : GPT-10000 Series

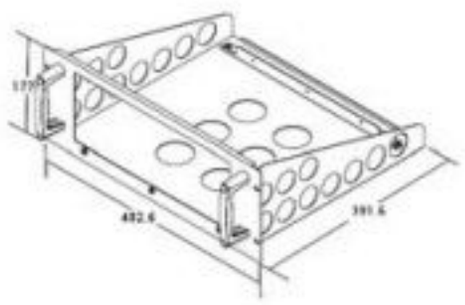




**GRA-445 Rack Mount Kit**

For : LCR-8200(A) Series

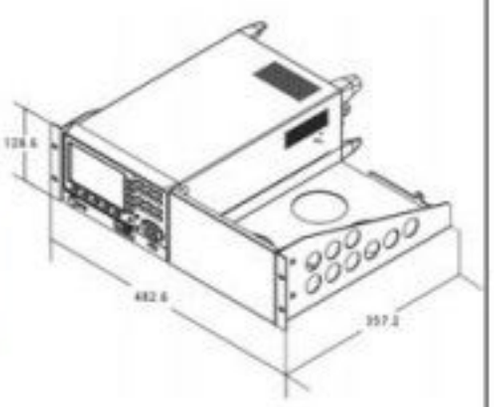




**GRA-452 Rack Mount Kit**

For : GPM-8320/8330





# ACCESSORIES

| FIXTURE MODEL | DESCRIPTION | CONNECTION | DUT PACKAGE | APPLICATION |
|---|---|---|---|---|
| **LCR-05**  | Test fixture for measuring axial and radial lead components<br>Frequency: DC to 1MHz<br>Max. Voltage: +/- 35V | 4 Wire | Axial & radial lead components | Suitable for axial & radial lead type<br>L, C, R |
| **LCR-05A**  | Test Fixture for axial & radial leaded components<br>Frequency: DC to 30MHz<br>Max. Voltage: +/- 45V<br>(Including SHORT Bar and STD LOAD) | 4 Wire | Axial & radial lead components | Suitable for axial & radial lead type<br>L, C, R |
| **LCR-06B**  | Kelvin clip test lead<br>Frequency: DC to 1MHz<br>Max. Voltage: +/- 45V | 4 Wire<br>(Kelvin clip) | Odd-shaped components | Suitable for low R or high C |
| **LCR-07**  | Test leads for conventional component measurement.<br>Frequency: DC to 1MHz<br>Max. Voltage: +/- 35V | 2 Wire<br>(Alligator clip) | Conventional component for in-circuit, board-mounted components | Suitable for low C or high R |
| **LCR-08**  | SMD/chip tweezers<br>Frequency: DC to 1MHz<br>Max. Voltage: +/- 35V | 4 Wire<br>(SMD/chip tweezers) | SMD components | Suitable for SMD type L, C, R |
| **LCR-10A**  | Test Fixture for bottom electrode components<br>Frequency: DC to 30MHz<br>Max. Voltage: +/- 45V | 4 Wire<br>(SMD/chip tweezers) | SMD/chip components | Range:0402 to 2512<br>(Including SHORT Bar and STD LOAD) |
| **LCR-12**  | Kelvin clip test lead<br>Frequency : DC to 10MHz<br>Max. Voltage : +/- 35V<br>Approx. 0.6m | Kelvin clip test lead | | |
| **LCR-15**  | SMD/chip test fixture<br>Frequency: DC to 10MHz<br>Max. Voltage: +/- 45V | 4 Wire<br>(SMD/chip test fixture) | SMD/chip components | Suitable for SMD<br>Range:0201 to 1812 |
| **LCR-15A**  | Test Fixture for SMD/Chip components<br>Frequency: DC – 30MHz<br>Max. Voltage: +/- 45V | 4 Wire<br>(SMD/chip test fixture) | SMD/chip components | Range: 0201 to 1812<br>(Including STD LOAD) |
| **LCR-16**  | External DC Bias voltage box<br>Frequency: 40Hz to 1MHz<br>Max. Voltage: +/- 45V | | | |
| **LCR-17**  | External DC Bias Current Box<br>Frequency: 40Hz to 1MHz<br>Max. Current: +/- 2.5A | | | |

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2018

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Global Headquarters

**GOOD WILL INSTRUMENT CO., LTD.**

No.7-1, Jhongsing Road, Tucheng Dist., New Taipei City 236, Taiwan
**T** +886-2-2268-0389 **F** +886-2-2268-0639
E-mail: marketing@goodwill.com.tw

China Subsidiary

**GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.**

No. 521, Zhujiang Road, Snd, Suzhou Jiangsu 215011 China
**T** +86-512-6661-7177 **F** +86-512-6661-7277

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**GOOD WILL INSTRUMENT (SEA) SDN. BHD.**

No. 1-3-18, Elit Avenue, Jalan Mayang Pasir 3,
11950 Bayan Baru, Penang, Malaysia
**T** +604-6111122 **F** +604-6115225

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De Run 5427A, 5504DG Veldhoven, THE NETHERLANDS
**T** +31(0)40-2557790 **F** +31(0)40-2541194

U.S.A. Subsidiary

**INSTEK AMERICA CORP.**

5198 Brooks Street Montclair, CA 91763, U.S.A.
**T** +1-909-399-3535 **F** +1-909-399-0819

Japan Subsidiary

**TEXIO TECHNOLOGY CORPORATION.**

7F Towa Fudosan Shin Yokohama Bldg., 2-18-13 Shin Yokohama, Kohoku-ku, Yokohama, Kanagawa, 222-0033 Japan
**T** +81-45-620-2305 **F** +81-45-534-7181

Korea Subsidiary

**GOOD WILL INSTRUMENT KOREA CO., LTD.**

Room No.503, Gyeonginro 775 (Mullae-Dong 3Ga, Ace Hightech-City B/D 1Dong), Yeongduengpo-Gu, Seoul 150093, Korea.
**T** +82-2-3439-2205 **F** +82-2-3439-2207

India Subsidiary

**GW INSTEK INDIA LLP.**

No.2707/B&C, 1st Floor UNNATHI Building, E-Block, Sahakara Nagar, Bengaluru-560 092. India
**T** +91-80-6811-0600 **F** +91-80-6811-0626


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