



PROGRAMMABLE DC POWER SUPPLY (SOLAR ARRAY SIMULATION) MODEL 62000H-S SERIES

The latest programmable solar array simulator power supply 62000H-S Series released by Chroma provide simulation of Voc (open circuit voltage) up to 1800V and Isc (short circuit current) up to 30A. The 62000H-S provides an industry leading power density in a small 3U high package. The solar array simulator is highly stable and has a fast transient response design, which are both advantageous to MPPT performance evaluation on PV inverter devices.

The 62000H-S Series has many unique advantages including high speed & precision digitizing measurement circuits with a 100kHz A/D, 25kHz D/A controlled I-V curve and a digital filter mechanism. It can simulate an I-V curve accurately and response the mains ripple effect from the PV inverter. In addition, the built-in EN50530/Sandia SAS I-V model in the standalone unit can easily program the Voc, Isc, Vmp, and Imp parameters for I-V curve simulation, without a PC controller.

The real solar array is influenced by various weather conditions such as irradiation, temperature, rain and shade by trees or clouds, which will affect the I-V curve output. The 62000H-S Series is capable of storing up to 100 I-V curves into the simulator memory, with a programmed time interval range of 1-15,000 seconds. It can simulate the I-V curve from the early morning to nightfall for PV inverter testing or dynamic I-V curve transient testing.

The 62000H-S Series has a built-in 16 bit digital control and precision voltage & current measurement circuits with a voltage accuracy of 0.05% + 0.05% F.S. and a current accuracy of 0.1% + 0.1% F.S. It is ideal for real time MPPT analysis and tracking monitoring for PV inverters through our softpanel. The user can also enable the data recording function on the softpanel during the static MPPT performance test.

When high power solar array simulation is required, it is common to connect two or more power modules in parallel. The 62000H-S Series with a current range up to 30A and a voltage range up to 1800V offers a high power density envelope maximum of 18kW in a 3U package. It can easily parallel up to 16 units in a Master/Slave configuration to provide 288kW with current sharing and synchronized control signals for commercial utility PV inverter (10kW~100kW) testing. The 62000H-S Series supplies have a smart Master/Slave control mode that makes the parallel operation fast and simple. In this mode, the master scales values and downloads data to slave units so that the programming is as simple as using a standalone unit.

The 62000H-S Series DC power supplies are very easy to operate from the front panel keypad or from the remote controller via Ethernet/USB/RS232/RS485/GPIB/APG. Its compact size (3U) makes it ideal for both benchtop and standard racking.

MODEL 62000H-S SERIES

KEY FEATURES

- Voltage range : 0 ~150V/600V/1000V/1800V
- AC input voltage range : 200/220Vac, 380/400Vac , 440/480Vac
- 3U/18kW high power density module with easy master/slave parallel operation
- Fast transient response solar array simulation
- Simulation of multiple solar cell material I-V characteristic (fill factor)
- Simulation of dynamic irradiation intensity and temperature level from clear day to cloud cover conditions
- Shadowed I-V curve output simulation (up to 4096 data points)
- Low leakage current (< 3mA)
- Precision V & I measurements
- Auto I-V program: 100 I-V curves & Dwell time 1-15,000s
- Static & dynamic MPPT efficiency test (accumulated energy methods)
- Data recorded via softpanel
- Support Ethernet / USB / RS232 / RS485 / GPIB / APG interfaces
- Real time analysis of PV inverter's MPPT tracking via softpanel
- Real world weather simulation fast I-V curve update rate : 1s
- Support up to ten-channel SAS control for multi-MPPT testing
- Built-in dynamic MPPT test profile of EN50530, Sandia, CGC/GF004, CGC/GF035 and NB/T 32004

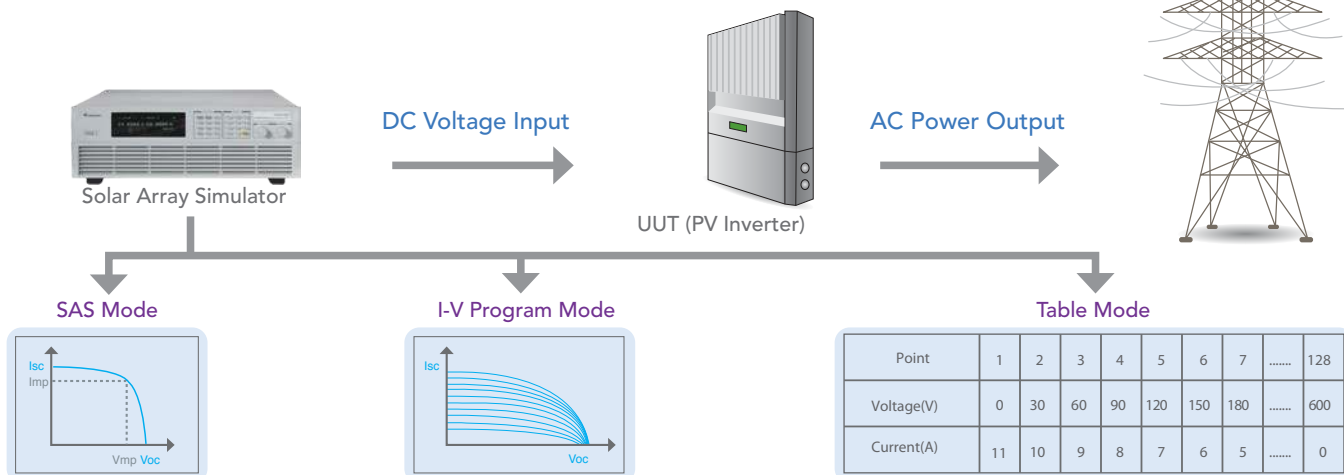


Chroma

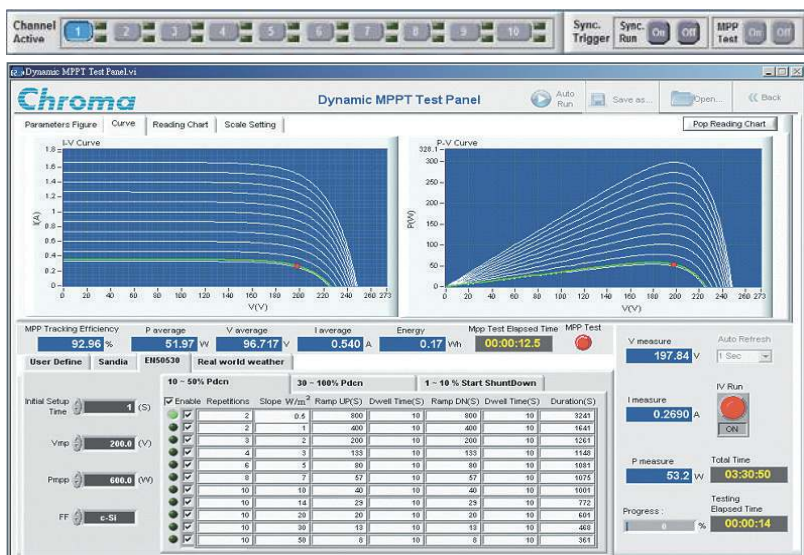
SOLAR ARRAY I-V CURVE SIMULATION POWER SUPPLY

The 62000H-S Series has a built-in EN50530 and Sandia's SAS model that can easily program the Voc, Isc, Vmp, Imp parameters to simulate different solar cell materials I-V characteristic outputs with fast response time. Moreover, the TABLE mode is capable of saving a 128~4096 point array of user programmed voltages and currents via a remote interface. It can easily create a shadowed I-V curve and the I-V PROGRAM mode can save up to 100 I-V curves and dwell time intervals (1-15,000s) in memory. These advantages provide steady repetitive control conditions required for PV Inverter design as well as for verification testing. The solar array simulator is ideal for the following tests:

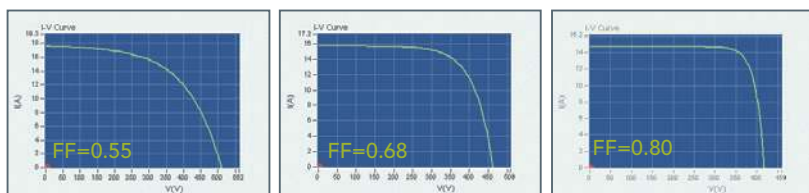
- Design and verify the maximum power tracking circuit and algorithm of PV inverter
 - Verify the high/low limit of operating input voltage allowed for PV inverter
 - Verify the high/low limit of operating input voltage allowed for the inverter's maximum power point
 - Verify the static maximum power point tracking efficiency of PV inverter
 - Measure and verify the overall efficiency & conversion efficiency of PV inverter *
 - Verify the maximum power point tracking performance of the inverter for dynamic curves. (EN50530, Sandia, CGC/GF004, CGC/GF035, NB/T 32004 standard)
 - Verify the maximum power point tracking performance of the inverter under different time period conditions spanning from morning to nightfall
 - Verify the maximum power point tracking mechanism of the inverter for I-V curve when the solar array is shaded by clouds or trees
 - Simulate the I-V curve under the actual environmental temperatures in a burn-in room for inverter burn-in test
- *Requires an extra power meter.



SOLAR ARRAY I-V CURVE SIMULATION SOFTPANEL



Solar Array Simulation Softpanel



Thin-Film

Standard Crystalline Array

High-efficiency Crystalline

The 62000H-S Series includes a graphical user interface software through remote digital interface (USB / GPIB / Ethernet / RS232) control. The user can easily program the I-V curve of the 62000H-S Series as well as the I-V & P-V curves for real-time testing. In addition it will display the MPPT status for PV inverter. Readings and the report function with real-time monitoring using the softpanel are shown left.

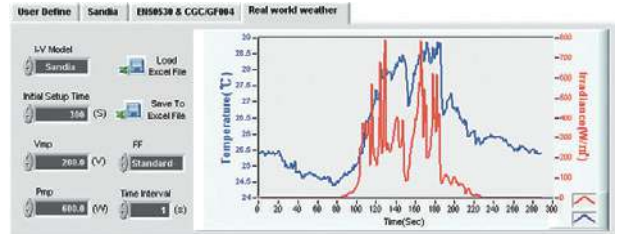
SIMULATES DIFFERENT SOLAR CELL MATERIALS I-V CHARACTERISTIC (FILL FACTOR)

The purpose of the PV inverter is to convert the dc voltage (from solar array) to the ac power (utility). The better a PV inverter can adapt to the various irradiation and temperature conditions of sun, the more power that can be fed into the utility grid over time. So, the MPPT performance is a very important factor for PV generation system. The 62000H-S Series is capable of simulating different types of standard crystalline, multi-crystalline and thin-film fill factor* parameters to verify the MPPT tracking algorithm mechanism and efficiency.

$$* \text{Fill Factor} = (I_{mp} * V_{mp}) / (I_{sc} * V_{oc})$$

REAL WORLD WEATHER SIMULATION

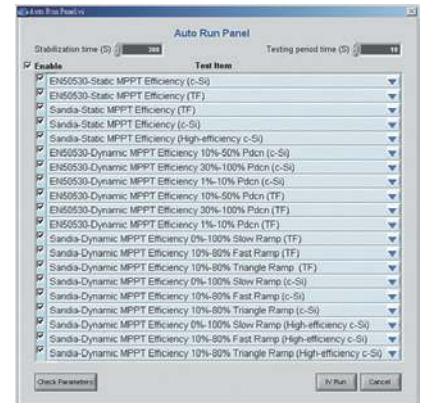
The real world weather simulation function allows the user to import real conditions of irradiation and temperature profiles of a whole day from excel file to softpanel simulating the irradiation intensity and temperature level from early morning to nightfall. It can also set the interval time resolution to 1s for I-V curve update and enable the user to perform MPPT tracking tests under the simulation of actual weather environments.



AUTO RUN FUNCTION OF STATIC & DYNAMIC MPPT TESTING

In order to easily test the static & dynamic MPPT performance of standard EN50530 & Sandia for PV inverters, the softpanel has an auto run function, which the user only has to set the Vmin, Vnom, Vmax, Pmax, stabilization time & test period parameters and test items of EN50530 and Sandia, then the softpanel can run tests automatically and generate reports after finished.

| EN50530 Dynamic MPPT Efficiency Test Report (30%~100%) | | | | | | | | |
|--|------------------------|-------------|----------------|-------------|-----------------|--------------------------|-----------------------|--------------|
| From-to W/m ² | Delta W/m ² | | Pmp Value (W) | Vnom (V) | c-Si technology | Waiting time setting (S) | | |
| 300-1000 | 700 | | 2000.00 | 350.00 | | 300 | | |
| #number | Slope W/m ² | Ramp UP (S) | Dwell time (S) | Ramp DN (S) | Dwell time (S) | Duration (S) | MPPT Efficiency (%) | |
| 10 | 10.0 | 70 | 10 | 70 | 10 | 1900 | 99.89 | |
| 10 | 14.0 | 50 | 10 | 50 | 10 | 1500 | 99.90 | |
| 10 | 20.0 | 35 | 10 | 35 | 10 | 1200 | 99.87 | |
| 10 | 30.0 | 23 | 10 | 23 | 10 | 967 | 99.84 | |
| 10 | 50.0 | 14 | 10 | 14 | 10 | 780 | 99.86 | |
| 10 | 100.0 | 7 | 10 | 7 | 10 | 640 | 99.71 | |
| | | | | | | Total | 6987 s | 99.84 |
| | | | | | | | 01 : 56 : 27 h | |



| EN50530 Static MPPT Efficiency Test Report | | | | | | | | | |
|--|------------------------------|----------------------|--------|--------|--------|--------|--------|--------|--------|
| MPPT voltage of the simulated I/U characteristic of the PV generator | Simulated I/U characteristic | Pmp Value(W)=1000.00 | | | | | | | |
| | | 0.050 | 0.100 | 0.200 | 0.250 | 0.300 | 0.500 | 0.750 | 1.000 |
| Umin = 200.0 | c-Si | 99.510 | 98.703 | 99.589 | 99.728 | 99.533 | 99.868 | 99.930 | 99.908 |
| Unom = 300.0 | c-Si | 99.478 | 99.609 | 99.661 | 99.702 | 99.791 | 99.896 | 99.837 | 99.848 |
| Umax = 400.0 | c-Si | 99.452 | 99.040 | 99.701 | 99.036 | 99.779 | 99.751 | 99.908 | 99.936 |

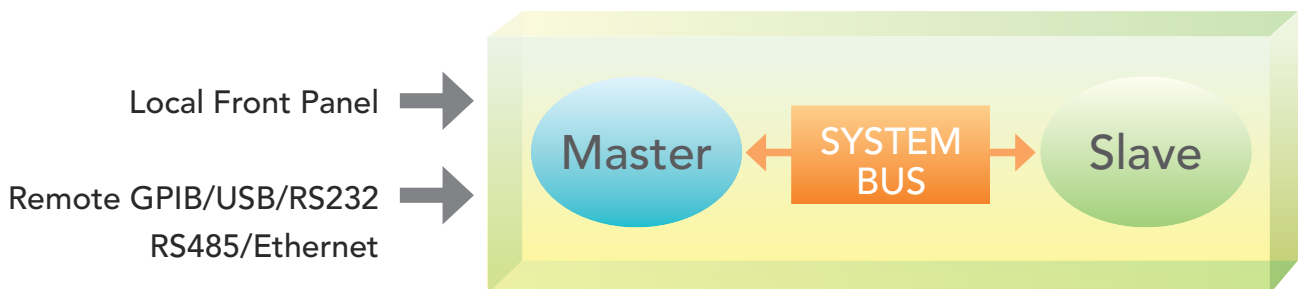
REPORT FUNCTION

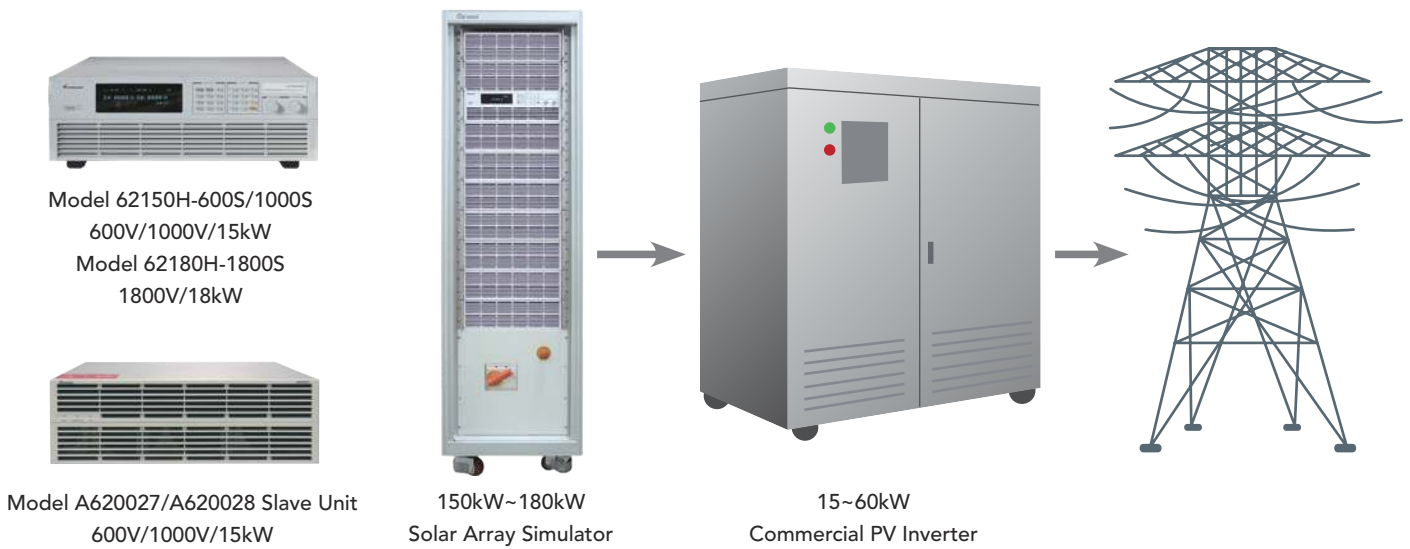
The softpanel also provides data recording capabilities, which include voltage, current, power, energy and MPPT efficiency, and the corresponding parameter sampling time (1s~10000s) for recording process. The report can be utilized for R&D design characteristics verification, QA verification and production quality control.



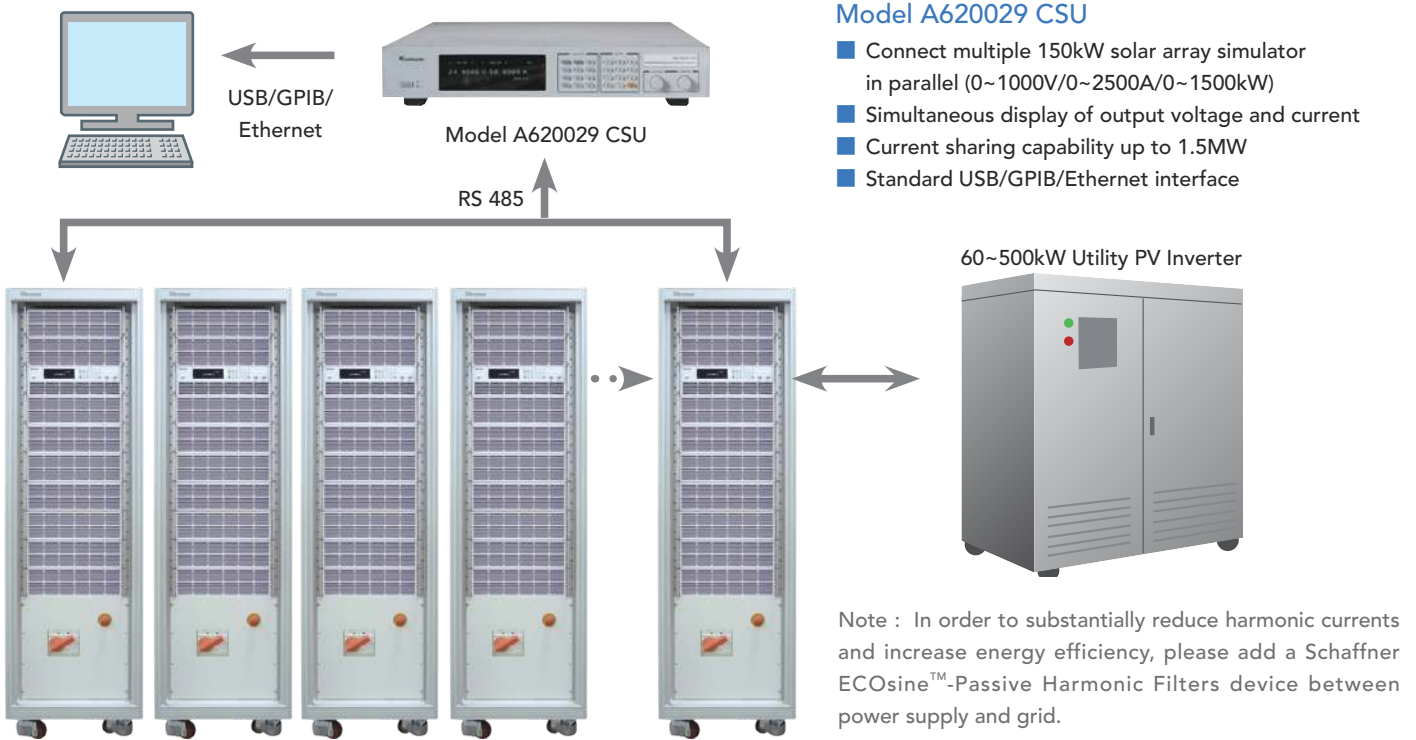
MASTER / SLAVE PARALLEL OPERATION UP TO 288KW

When high power is required, it is common to connect two or more power supplies in parallel. The 62000H-S Series power supplies have a smart master / slave control mode making the parallel operation fast and simple. In this mode, the master scales values and downloads data to slave units with a high speed sync signal process and automatic current sharing control.





CUSTOMIZATION SOLAR ARRAY SIMULATOR UP TO 1500KW



ORDERING INFORMATION

| Power Rating | 62000H-S Series Programmable DC Power Supply |
|--------------|---|
| 2kW | 62020H-150S : Programmable DC Power Supply 150V/40A/2kW with Solar Array Simulation |
| 5kW | 62050H-600S : Programmable DC Power Supply 600V/8.5A/5kW with Solar Array Simulation |
| 10kW | 62100H-600S : Programmable DC Power Supply 600V/17A/10kW with Solar Array Simulation |
| 15kW | 62150H-600S : Programmable DC Power Supply 600V/25A/15kW with Solar Array Simulation |
| | 62150H-1000S : Programmable DC Power Supply 1000V/15A/15kW with Solar Array Simulation |
| 18kW | 62180H-1800S : Programmable DC Power Supply 1800V/30A/18kW with Solar Array Simulation *2 |
| Options | A620024 : GPIB Interface for 2kW/5kW/10kW/15kW models (Factory installed) |
| | A620039 : GPIB Interface for 18kW models |
| | A620025 : Ethernet Interface for 62000H series (Factory installed) |
| | A620026 : Rack Mounting kit for 62000H series |
| | A620027 : Parallelable Power Stage 15kW for 62150H-600S |
| | A620028 : Parallelable Power Stage 15kW for 62150H-1000S |
| | A620029 : Control and Supervisor Unit for 150kW~1.5MW |
| | A620030 : 19" Rack (41U) for 62000H-S Series (380Vac input) |
| | B620000 : 19" Rack Mounting Kit 2U for 62020H-150S |



Model 62020H-150S



Model 62180H-1800S



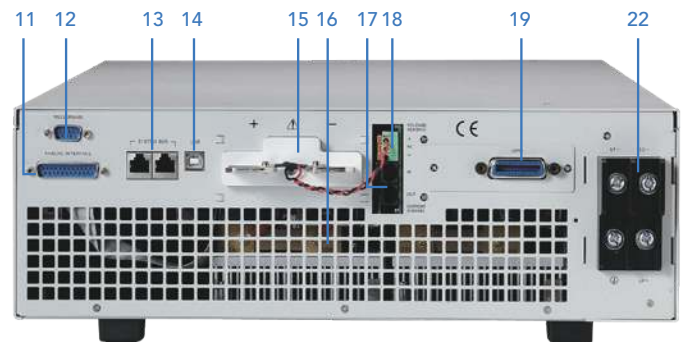
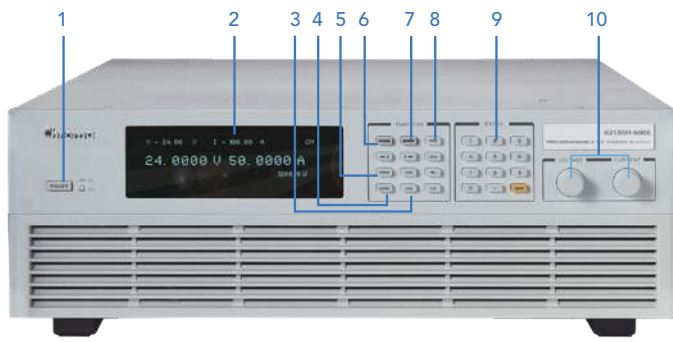
A620027/A620028

Note *1 : Call for more information regarding the customized solar array simulator of 150kW~1.5MW.

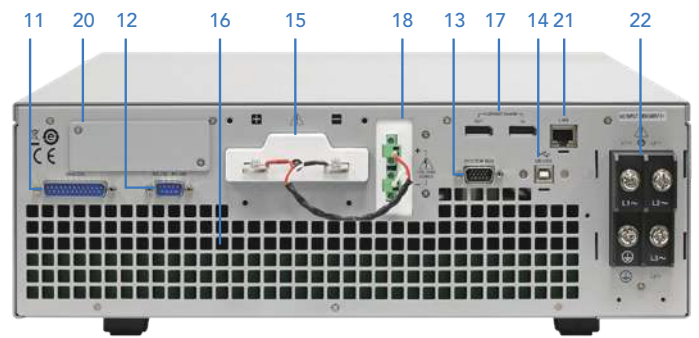
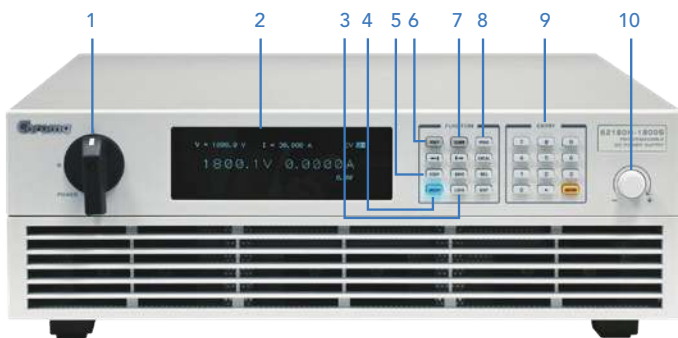
Note *2 : Call for availability of 200/220Vac and 440/480Vac line voltage.

PANEL DESCRIPTION

5KW/10KW/15KW MODEL



18KW MODEL



1. POWER Switch
2. VFD Display
Display setting, readings and operating status
3. LOCK Key
Lock all settings
4. OUTPUT Key
Enable or disable the output
5. CONFIG Key
Set the system configuration
6. VOLTAGE Key
Set the output voltage
7. CURRENT Key
Set the output current
8. PROG Key
Program the sequence
9. NUMERIC Key
Set the data
10. ROTARY Key
Adjust the V&I and set the parameter

11. Analog programming interface
For analog level to program and monitor output voltage & current
12. RS-232 or RS-485 Interface (alternative)
13. System Bus
For master/slave parallel and series control
14. USB Interface
15. OUTPUT Terminal
Connect the output cable to a UUT
16. System Fan
With fan speed control
17. Current Sharing Terminal
Connect the cable to slave unit
18. Sense Terminal
Connect the UUT for voltage compensation
19. GPIB or ETHERNET Interface
(Option for 2kW/5kW/10kW/15kW models)
20. GPIB Interface (Option for 18kW model)
21. Ethernet Interface (Standard for 18kW model)
22. AC Input Terminal

ELECTRICAL SPECIFICATIONS-WITH SOLAR ARRAY SIMULATION

| Model | 62020H-150S | 62050H-600S | 62100H-600S | 62150H-600S | 62150H-1000S | 62180H-1800S |
|---|---|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Output Ratings | | | | | | |
| Output Voltage | 0 ~ 150V | 0 ~ 600V | 0 ~ 600V | 0 ~ 600V | 0 ~ 1000V | 0 ~ 1800V *5 |
| Output Current | 0 ~ 40A | 0 ~ 8.5A | 0 ~ 17A | 0 ~ 25A | 0 ~ 15A | 0 ~ 30A |
| Output Power | 2000W | 5000W | 10000W | 15000W | 15000W | 18000W |
| Line Regulation | | | | | | |
| Voltage | | | | | | ± 0.01% F.S. |
| Current | | | | | | ± 0.05% F.S. |
| Load Regulation | | | | | | |
| Voltage | | | | | | ± 0.05% F.S. |
| Current | | | | | | ± 0.2% F.S. |
| Voltage Measurement | | | | | | |
| Range | 60V / 150V | 120V / 600V | 120V / 600V | 120V / 600V | 200V / 1000V | 1100V / 1800V |
| Accuracy | 0.05% + 0.05%F.S. | | | | | |
| Current Measurement | | | | | | |
| Range | 16A / 40A | 3.4A / 8.5A | 6.8A / 17A | 10A / 25A | 6A / 15A | 15A / 30A |
| Accuracy | 0.1% + 0.1%F.S. | | | | | |
| Output Noise&Ripple | | | | | | |
| Voltage Noise(P-P) | 450 mV | 1500 mV | 1500 mV | 1500 mV | 2550 mV | 3500 mV |
| Voltage Ripple(rms) | 65 mV | 650 mV | 650 mV | 650 mV | 1950 mV | 750 mV |
| Current Ripple(rms) | 80 mA | 150 mA | 300 mA | 450 mA | 270mA | 250mA |
| OVP Adjustment Range | | | | | | |
| Range | 0 ~ 110% programmable from front panel, remote digital inputs. | | | | | |
| Accuracy | ± 1% of full-scale output | | | | | |
| Programming Response Time | | | | | | |
| Rise Time: 50%F.S. CC Load | 10ms (6.66A loading) | 30ms | 30ms | 30ms | 25ms | 90ms |
| Rise Time: No Load | 10ms | 30ms | 30ms | 30ms | 25ms | 90ms |
| Fall Time: 50%F.S. CC Load | 10ms (6.66A loading) | 30ms | 30ms | 30ms | 25ms | 90ms |
| Fall Time: 10%F.S. CC Load | 83ms (1.33A loading) | 100ms | 100ms | 100ms | 80ms | 625ms |
| Fall Time: No Load | 300ms | 1.2s | 1.2s | 1.2s | 3s | 2.5s |
| Slew Rate Control | | | | | | |
| Voltage Slew Rate Range | 0.001V/ms ~ 15V/ms | 0.001V/ms ~ 20V/ms | 0.001V/ms ~ 20V/ms | 0.001V/ms ~ 20V/ms | 0.001V/ms ~ 40V/ms | 0.001V/ms ~ 20V/ms |
| Current Slew Rate Range | 0.001A/ms ~ 1A/ms, or INF | 0.001A/ms ~ 0.1A/ms, or INF | 0.001A/ms ~ 0.1A/ms, or INF | 0.001A/ms ~ 0.1A/ms, or INF | 0.001A/ms ~ 0.1A/ms, or INF | 0.001A/ms ~ 0.1A/ms, or INF |
| Minimum Transition Time | 0.5ms | | | | | |
| Transient response time | Recovers within 1ms to ± 0.75% of steady-state output for a 50% to 100% or 100% to 50% load change (1A/us) | | | | | 1.5ms *4 |
| Efficiency | 0.77(Typical) | 0.87(Typical) | | | | 0.9(Typical) |
| Programming & Measurement Resolution | | | | | | |
| Voltage (Front Panel) | 10 mV | 10 mV | 10 mV | 10 mV | 100mV | 100mV |
| Current (Front Panel) | 1mA | 1mA | 1mA | 1mA | 1mA | 10mA |
| Voltage (Digital Interface) | 0.002% of Vmax | | | | | |
| Current (Digital Interface) | 0.002% of Imax | | | | | |
| Voltage (Analog Interface) | 0.04% of Vmax | | | | | |
| Current (Analog Interface) | 0.04% of Imax | | | | | |
| Programming Accuracy | | | | | | |
| Voltage (Front Panel and Digital Interface) | 0.1% of Vmax | | | | | |
| Current (Front Panel and Digital Interface) | 0.3% of Imax | | | | | 0.2% of Imax |
| Voltage (Analog Interface) | 0.2% of Vmax | | | | | |
| Current (Analog Interface) | 0.3% of Imax | | | | | |
| Parallel Operation*2 | Master / Slave control via CAN for 10 units up to 150kW *1 (Parallel: ten units) | | | | | up to 288kW *3 |
| Auto Sequencing (I-V program) | | | | | | |
| Number of program | 10 | | | | | |
| Number of sequence | 100 | | | | | |
| Dwell time Range | 1s ~ 15,000S | | | | | |
| Trig. Source | Manual / Auto | | | | | |

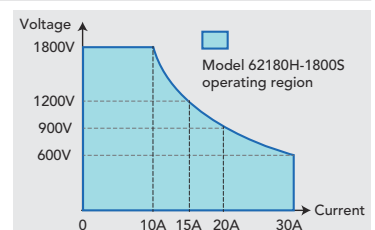
Note*1 : Max. Power is 20kW for 62020H-150S.

Note*2 : There is parallel mode for DC power supply when the I-V curve function is enabled.

Note*3 : For higher power > 288kW, please call for availability.

Note*4 : Recovers within 1.5ms to ± 1.5% of steady-state output for a 50% to 75% or 75% to 50% load change (0.1A/ms)

Note*5 : The high voltage wide-range output design is suitable for 1500V string PV inverter testing.



GENERAL SPECIFICATIONS

| Model | 62020H-150S | 62050H-600S | 62100H-600S | 62150H-600S | 62150H-1000S | 62180H-1800S |
|--|---|---|----------------------------|----------------------------|----------------------------|--|
| Remote Interface | | | | | | |
| Analog programming | Standard | | | | | |
| USB | Standard | | | | | |
| RS232 | Standard | | | | | |
| RS485 | Standard | | | | | |
| GPIB | Optional | | | | | |
| System bus(CAN) | Standard for master/slave control | | | | | |
| Ethernet | Optional | | | | | Standard |
| GPIB Command Response Time | | | | | | |
| Vout setting | GPIB send command to DC source receiver <20ms | | | | | |
| Measure V&l | Under GPIB command using Measure <25ms | | | | | |
| Analog Interface (I/O) * | | | | | | |
| Voltage and Current Programming Inputs (I/P) | 0-10Vdc / 0 ~ 5Vdc / 0 ~ 5k ohm / 4 ~ 20 mA of F.S. | | | | | |
| Voltage and Current monitor output (O/P) | 0 ~ 10Vdc / 0 ~ 5Vdc / 4 ~ 20mA of F.S. | | | | | |
| External ON/OFF (I/P) | TTL : Active Low or High (Selective) | | | | | |
| DC_ON Signal (O/P) | Level by user define (Time delay = 1 ms at voltage slew rate of 10V/ms.) | | | | | |
| CV or CC mode Indicator (O/P) | TTL Level High=CV mode ; TTL Level Low= CC mode | | | | | |
| OTP Indicator (O/P) | TTL : Active Low | | | | | |
| System Fault indicator(O/P) | TTL : Active Low | | | | | |
| Auxiliary power supply(O/P) | Nominal supply voltage : 12Vdc / Maximum current sink capability : 10mA | | | | | |
| Safety interlock(I/P) | Time accuracy: <100ms | | | | | |
| Remote inhibit(I/P) | TTL : Active Low | | | | | |
| Auto Sequencing(List Mode) | | | | | | |
| Number of program | 10 | | | | | |
| Number of sequence | 100 | | | | | |
| Dwell time Range | 5ms ~ 15000S | | | | | 1ms ~ 15000S |
| Trig. Source | Manual / Auto / External | | | | | |
| Auto Sequencing (Step Mode) | | | | | | |
| Start voltage | 0 to Full scale | | | | | |
| End voltage | 0 to Full scale | | | | | |
| Run time | 10ms ~ 99hours | | | | | 1ms ~ 99hours |
| Input Specification | | | | | | |
| AC Input Volatage 3Phase, 3Wire+Ground | 1Ø 200~220Vac ± 10% V _{LN} | 3Ø 200~220Vac ± 10% V _{LL} ; 3Ø 380~400Vac ± 10% V _{LL} ; 3Ø 440~480Vac ± 10% V _{LL} | | | | 3Ø 380~400Vac ± 10% V _{LL} |
| AC Frequency range | 47 ~ 63Hz | | | | | |
| Max Current (each phase) | 200/220Vac | 15.2A | 39A | 69A | 93A | 93A |
| | 380/400Vac | -- | 22A | 37A | 50A | 50A |
| | 440/480Vac | -- | 19A | 32A | 44A | 44A |
| General Specification | | | | | | |
| Maximum Remote Sense Line Drop Compensation | 2% of full scale voltage per line (4% total) | | | | | 1% of full scale voltage per line (2% total) |
| Operating Temperature Range | 0°C ~ 40°C | | | | | |
| Storage Temperature Range | -40°C ~ +85°C | | | | | -25°C~+70°C |
| Dimension (HxWxD) | 89x428x465 mm/ 3.5x16.85x16.73 inch | 132.8 x 428 x 610 mm / 5.23 x 16.85 x 24.02 inch | | | | 132.8x428x660 mm/ 5.23x16.85x25.99 inch |
| Weight | Approx. 17 kg/37.44 lbs | Approx. 23 kg/55.70 lbs | Approx. 29 kg/63.88 lbs | Approx. 35 kg/77.09 lbs | Approx. 35 kg/77.09 lbs | Approx. 40 kg/88.19 lbs |
| Approval | CE | | | | | |

All specifications are subject to change without notice.
Note * : None APG interface for A620027/A620028

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Search Keyword

62000H-S

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