



Solar Array Simulator

KEY FEATURES

- Voltage range : 0 ~600V&1000V
- 3U/15kW high power density module with easy master/slave parallel operation up to 150kW
- Fast transient response solar array simulation
- Simulation of multiple solar cell material's 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
- 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
- Data recorded via softpanel
- Standard USB / RS232 / RS485 interface
- Optional GPIB / Ethernet interface
- Real time analysis of PV inverter's MPPT tracking via softpanel
- Free graphic user interface - softpanel for operation
- Build-in dynamic MPPT test profile of EN50530, Sandia, CGC/GF004

The latest programmable solar array simulator power supply 62150H-600S&1000S released by Chroma provides simulation of Voc (open circuit voltage) up to 1000V and Isc (short circuit current) up to 25A. The 62150H 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.

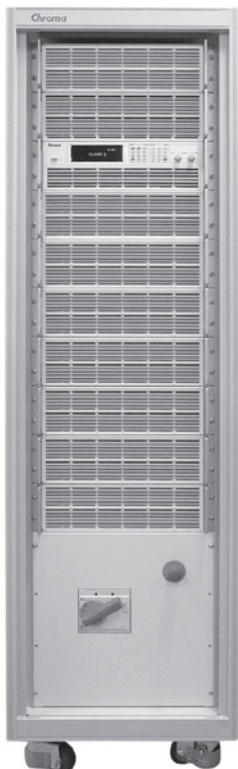
The 62150H-600S/1000S has many unique advantages including high speed & precision digitizing measurement circuits with a 100kHz A/D, 25kHz D/A controlled I-V curve and a digital filter mechanism. It can simulate an I-V curve accurately and response the mains ripple effect from the PV inverter. In addition, the built-in 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 62150H-600S/1000S 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 62150H-600S/1000S has a built-in 16 bit digital control and precision voltage & current measurement circuits with a voltage accuracy of 0.05%+0.05%FS 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 62150H-600S/1000S with a current range up to 25A and a voltage range up to 1000V offers a high power density envelope maximum of 15KW in a 3U package. It can easily parallel up to ten units in a Master/Slave configuration to provide 150kW with current sharing and synchronized control signals for commercial PV inverter (10kW – 100kW) testing. The 62000H 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 series DC power supplies are very easy to operate from the front panel keypad or from the remote controller via USB / RS232/ RS485/APG (standard) and GPIB & Ethernet (optional). Its compact size (3U) makes it ideal for both benchtop and standard racking.



Master/Slave Parallel Operation - 150kW

ORDERING INFORMATION

Power Rating	62000H 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
Options	A620024 : GPIB Interface for 62000H series (Factory installed)
	A620025 : Ethernet Interface for 62000H series (Factory installed)
	A620026 : 19" 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~1MW
	* A620030 : 19" Rack (41U) for 62000H series (380Vac input)

Note 1 : GPIB or Ethernet Interface (alternative) , please specified at time of order.

Note 2 : Call for more information regarding the customized solar array simulator of 150kW~1MW.

*Call for availability and more information



Parallelable Power Stage A620027/A620028

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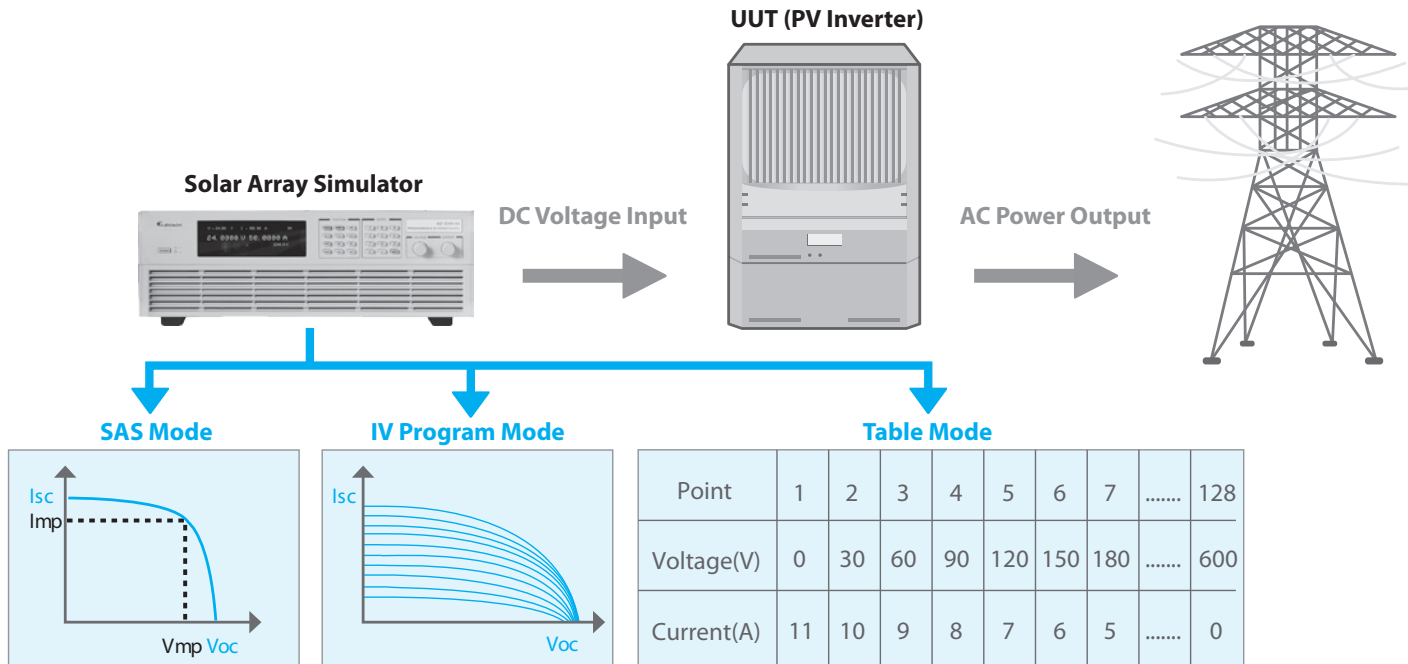
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Solar Array I-V Curve Simulation Power Supply

The Model 62150H-600S/1000S has a built in 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 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 testing:

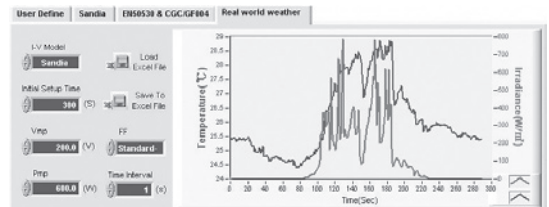
- Design and verify the maximum power tracking circuit and algorithm of the PV inverter
- Verify the high/low limit of operating input voltage allowed for the PV inverter.
- Verify the high/low limit of operating input voltage allowed for the inverter's maximum power point
- Verify the static maximum power point tracking efficiency of the 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 and CGC/GF004)
- 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 the I-V curve when the solar array is shaded by clouds or trees
- Simulate the I-V curve under the actual environmental temperatures within burn-in room to do inverter burn-in testing.

*Requires an extra power meter



Real World Waether 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, in order to simulate 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 rate and enable the user to perform MPPT tracking tests under the simulation of actual weather environments.



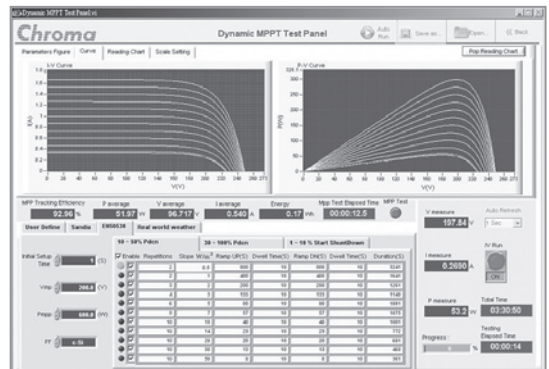
Real World Weather Simulation

Solar Array I-V Curve Simulation Softpanel

The model 62150H-600S/1000S 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 62150H-600S/1000S as well as the I-V & P-V curve for real-time testing. In addition it will display the MPPT status for the PV inverter. Readings and the report function with real-time monitoring using the softpanel are shown below.

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 & 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 model 62150H-600S/1000S 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.



Solar Array Simulation SoftPanel

*Fill Factor = (Imp*Vmp)/(Isc*Voc)



Battery Test & Automation Solution
 Photovoltaic Test & Automation Solution
 Semiconductor/IC Test Solution
 Laser Diode Test Solution
 LED/Lighting Test Solution
 FPD Test Solution
 Video & Color Test Solution
 Optical Inspection Solution
 Automated Test Solution
 Power Electronics Test Solution
 Passive Component Test Solution
 Electrical Safety Test Solution
 General Purpose Test Solution
 Thermoelectric Test & Control Solution
 PXI Test & Measurement Solution
 Manufacturing Execution Systems Solution

ELECTRICAL SPECIFICATIONS-WITH SOLAR ARRAY SIMULATION					
MODEL	62020H-150S *1	62050H-600S	62100H-600S	62150H-600S	62150H-1000S
Output Ratings					
Output Voltage	0-150V	0-600V	0-600V	0-600V	0-1000V
Output Current	0-40A	0-8.5A	0-17A	0-25A	0-15A
Output Power	2000W	5000W	10000W	15000W	15000W
Line Regulation					
Voltage	+/- 0.01% F.S.				
Current	+/- 0.05% F.S.				
Load Regulation					
Voltage	+/- 0.05% F.S.				
Current	+/- 0.1% F.S.				
Voltage Measurement					
Range	60V / 150V	120V / 600V	120V / 600V	120V / 600V	200V / 1000V
Accuracy	0.05% + 0.05%F.S.				
Current Measurement					
Range	16A / 40A	3.4A / 8.5A	6.8A / 17A	10A / 25A	6A / 15A
Accuracy	0.1% + 0.1%F.S.				
Output Noise&Ripple					
Voltage Noise(P-P)	150 mV	1500 mV	1500 mV	1500 mV	2550 mV
Voltage Ripple(rms)	15 mV	650 mV	650 mV	650 mV	1950 mV
Current Ripple(rms)	30 mA	150 mA	300 mA	450 mA	270mA
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	30ms	30ms	30ms	25ms
Rise Time: No Load	10ms	30ms	30ms	30ms	25ms
Fall Time: 50%F.S. CC Load	10ms	30ms	30ms	30ms	25ms
Fall Time: 10%F.S. CC Load	83ms	100ms	100ms	100ms	80ms
Fall Time: No Load	300ms	1.2s	1.2s	1.2s	3s
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
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
Minimum Transition Time	0.5ms				
Transient response time	200us	Recovers within 1ms to +/- 0.75% of steady-state output for a 50% to 100% or 100% to 50% load change(1A/us)			
Efficiency	0.87(Typical)				
Programming & Measurement Resolution					
Voltage (Front Panel)	10 mV	10 mV	10 mV	10 mV	100mV
Current (Front Panel)	1mA	1mA	1mA	1mA	1mA
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				
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. (Parallel: ten units)					
Auto Sequencing (I-V program)					
Number of program	10				
Number of sequence	100				
Dwell time Range	1s - 15,000S				
Trig. Source	Manual / Auto				

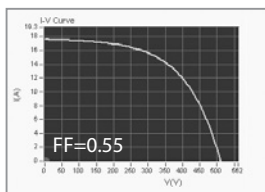
Note*1 : Preliminary specification for 62020H-150S

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

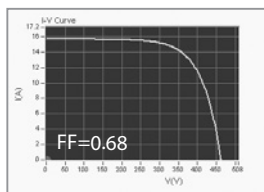
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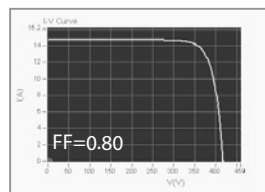
GENERAL SPECIFICATIONS						
MODEL	62020H-150S	62050H-600S	62100H-600S	62150H-600S	62150H-1000S	
Remote Interface						
Analog programming				Standard		
USB				Standard		
RS232				Standard		
RS485				Standard		
GPIB				Optional		
Ethernet				Optional		
System bus(CAN)				Standard for master/slave control		
GPIB Command Response Time						
Vout setting				GPIB send command to DC source receiver <20ms		
Measure V&I				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				
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				
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}				
AC Frequency range		47 ~ 63Hz				
Max Current (each phase)	200/220Vac	14A	39A	69A	93A	93A
	380/400Vac	--	22A	37A	50A	50A
General Specification						
Maximum Remote Sense Line Drop Compensation		2% of full scale voltage per line (4% total)				
Operating Temperature Range		0°C ~ 40°C				
Storage Temperature Range		-40°C ~ +85°C				
Dimension (HxWxD)	89 x 428 x 465 mm/ 3.5 x 16.85 x 16.73 inch	132.8 mm x 428 mm x 610 mm / 5.23 x 16.85 x 24.02 inch				
Weight	Approx. 13 kg / 28.63 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	
Approval	CE	CE	CE	CE	CE	



Thin-Film



Standard Crystalline Array



High-efficiency Crystalline

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Power Electronics Test Solution
Passive Component Test Solution
Electrical Safety Test Solution
General Purpose Test Solution
Thermoelectric Test & Control Solution
PXI Test & Measurement Solution
Manufacturing Execution Systems Solution