REGENERATIVE DC ELECTRONIC LOAD MODEL 63700 Series

Chroma 63700 Series Regenerative DC Electronic Loads are suitable for product reliability testing in various applications, including electric vehicle (EV) battery discharge, fuel cell discharge, high-power power supply aging, DC EV supply equipment (EVSE), unidirectional on-board chargers (OBC), fuel cell systems, energy storage systems (ESS), AC/DC and DC/DC power supply burn-in tests, and various power electronics applications..

These regenerative DC loads can simulate a wide range of load characteristics while also feeding energy back to the grid, providing an efficient and sustainable solution that reduces test environment temperatures, HVAC power consumption, and power conversion electricity costs.

The 63700 Series offers high power density within a compact 3U form factor, with power ratings reaching up to 18kW per unit and currents of up to 120A. Users can parallel up to 10 units* for a maximum power of 180kW and a maximum current of 1,200A. Voltage options include 600V, 1,200V, and 1,800V.

All models in the series come equipped with external signal control functionality*, allowing for the simulation of real current waveforms. Master/slave control enables parallel operation of identical 63700 units for synchronized dynamic loading. The system can store up to 256 programmable sequences*, which can be loaded at any time, reducing test duration and increasing throughput during automated testing.

Regarding measurement capabilities, the 63700 Series can perform real-time and precise voltage and current measurements. With the TFT touch display and rotary knob on the front panel, the 63700 Series offers convenient operation and setup. These units can also be controlled via LAN, USB, GPIB, or CAN.

Additionally, the 63700 Series features over-current, over-power, and over-temperature protection functions, as well as an over-voltage alarm mechanism, ensuring product reliability during testing. These attributes make it an ideal test solution for design verification and integration into automated test systems.

MODEL 63700 SERIES

Features

- Rated power: 6kW, 12kW, 18kW
- Voltage range: 600V, 1,200V, 1,800V
- Current range: Up to 120A
- High Power Density: 18kW @ 3U height
- Energy recovery efficiency: Up to 93%
- Operating modes: Constant Current, Constant Resistance, Constant Voltage, and Constant Power
- Master/Slave parallel control, up to 10 units in parallel*
- Synchronous dynamic control under static and dynamic Loads
- External load current simulation*
- 256 sequences directly programmable via the front panel*
- Highly accurate voltage and current measurement
- Measurement of Protection Points for voltage, current, and Maximum Power Point (Pmax) when DUT's over-current/over-load protection is activated
- Time measurement, battery discharge timing*
- Intelligent fan control
- Protection functions: Over-current (adjustable), over-temperature, over-power (adjustable) protection, over-voltage alarm
- Standard USB and LAN interfaces
- Optional GPIB or CAN interface

* Please contact our office for more information

Applications

- Product reliability testing
- Battery, fuel cell discharge
- High-power power supply aging
- Unidirectional on-board chargers, energy storage systems, DC/DC power supply burn in

Chroma
Advancing Excellence

Application

Chroma 63700 series of regenerative electronic loads achieve a maximum energy recovery efficiency of up to 93%. Furthermore, they feature high power density, effectively reducing their size and saving space. These loads are well-suited for long-term reliability testing applications across various power sources, including vehicle DC charging stations, unidirectional on-board chargers, automotive battery discharging, fuel cell discharging, and more. By connecting them in parallel, the 63700 series can reach a maximum power of 180kW, making it suitable for power requirements ranging from 5kW to 180kW.

DC EVSE Stability Testing

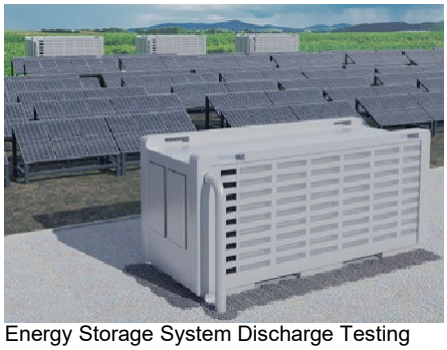
Single/Bidirectional Onboard Charger Stability Testing

EV Battery Discharge Testing*

* Requires external protection fixtures

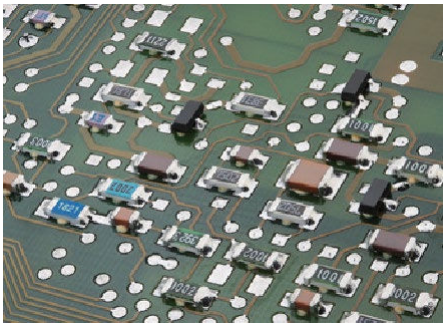
AC/DC & DC/DC Converter Life Cycle Testing

Server & Communication Power Supply Reliability Testing



Energy Storage System Discharge Testing

Fuel Cell Discharge Testing



Power Electronic Components Inspection or Reliability Testing

Solar Array Load Testing

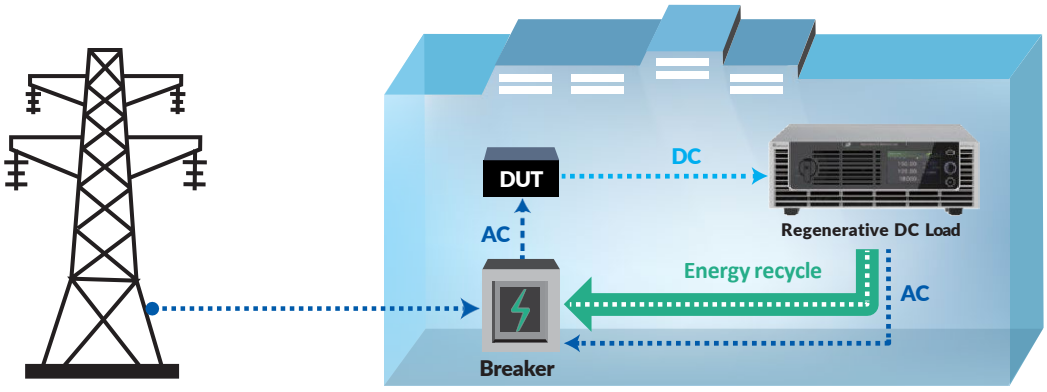
Regenerative Loads, Conventional Loads, and Resistive Loads

The main differences between regenerative loads, conventional loads, and resistive loads lie in the way they dissipate energy, the magnitude of current ripple, the slope of the current waveform, and power density. The key advantage of regenerative loads is their ability to feed consumed energy back to the power grid, reducing energy waste, and helping to decrease carbon emissions. Traditional loads have the advantage of low current ripple and fast current slew rate. Resistors, on the other hand, have the fastest response time but are larger in size, consume more energy, and have the lowest power density. Users can choose the appropriate load based on their specific testing needs. In general, regenerative loads are suitable for endurance testing, reliability testing, stress testing, and battery discharge testing of power supplies, where they can significantly reduce workplace temperatures and electricity expenses.

	Regenerative Load	Conventional Load	Resistive Load
Energy consumption	Recycled to grid	All dissipated as waste heat	All dissipated as waste heat
Current ripple	Large	Small	Proportional to DUT voltage
Current slew rate	Millisecond level	Microsecond level	Same as DUT's output voltage slew rate
Power density	High (~6kW/U)	Med ((~1.5kW/U)	Low (~0.65kW/U)

Energy Recovery

The 63700 series features energy recovery DC electronic loads that efficiently convert the consumed electrical energy into AC current and feed it back into the power grid, achieving an impressive efficiency of up to 93%. The reclaimed electrical energy can be utilized by other equipment within the facility, leading to savings in overall energy consumption and reduced carbon emissions, thereby lowering the environmental impact. This approach also effectively reduces the heat generated by the electronic loads during operation, subsequently decreasing air conditioning energy consumption and cutting electricity costs.



The following two examples illustrate a comparison of the differences between using a conventional electronic load and a regenerative electronic load.

Example 1: 1,000-hour reliability test with an 11kW On-Board Battery Charger (OBC)

The conventional electronic load consumes about 11,000kWh during the test. By contrast, the regenerative load consumes about 770kWh, saving as much as 10,230kWh.. This translates to about USD 1,759 worth of energy savings and 3.95 tons of reduced carbon emissions.

Power Consumption	CO_2 Emission
770 kWh	0.3 Ton

Based on typical US energy costs at $0.23kWh., in the above example, the annual electrical saving would be $0.23 x 36000kWh = $8,280 per year not including heat conditioning savings.

11kW OBC

Regen. Load 770 kW 1,000H

V.S.

Linear Load 11,000 kW 1,000H

Example 2: Production of a 30kW EV Charging Station Power Module. During the production process, the average output power of the module is 5kW. Production runs for 20 hours a day, 30 days per month.

When testing with a conventional electronic load, the annual energy consumption is approximately 36,000kWh, resulting in carbon emissions of around 13,932 kilograms.

With a regenerative load, the annual energy consumption is approximately 2,520kWh, resulting in carbon emissions of about 975 kilograms. This leads to a reduction of about 12.96 metric tons of carbon emissions.

Power Consumption	CO_2 Emission
2,520 kWh	0.975 Ton

Notes:
1.The regenerative load (63718-1200-40) has an efficiency of 93%.
2.A power consumption of 1kWh equals approximately 0.855 pounds (0.387 kilograms) of carbon emissions. (source: https://www.eia.gov/tools/faqs/faq.php?id=74&t=11)
3.These calculations only consider the power consumption of the electronic load and do not take into account other power consumption and costs.

4.5kW x 20hrs x 30days x 12 months = 36,000kWh ； 36,000kWh x 0.387kg = 13,932kg

5.0.35kW x 20hrs x 30days x 12months = 2,520kWh ； 2,520kWh x 0.387kg = 975kg

30kW EVSE Power Module

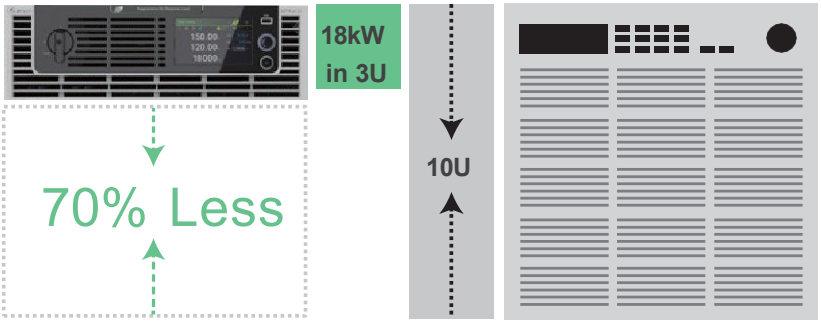
Regen. Load 2,352 kW／1year

V.S.

Linear Load 336,00 kW／1year

High Power Density

The 63700's exceptional power density enables a rated power of 18kW packaged in a 70% smaller form factor. This revolutionary design challenges the conventional notion of large and cumbersome high-power loads, offering a compact solution that saves valuable laboratory space.

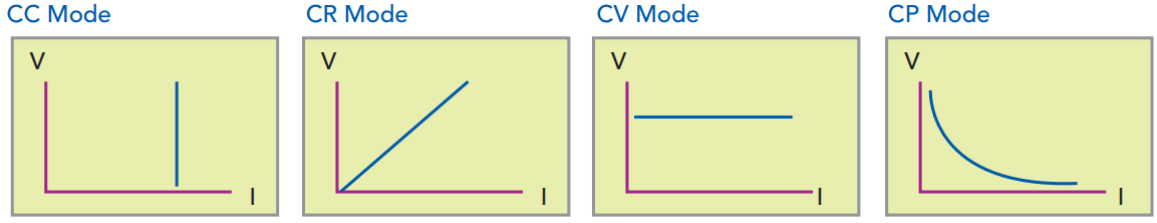


High Measurement Accuracy and Master-Slave Control

Chroma 63700 Series regenerative DC loads are equipped with a digital signal microprocessor for optimized speed and control performance. The high measurement accuracy of voltage (0.05%+0.05%F.S.) and current (0.1%+0.1%F.S.) ensures reliable and precise measurements. All models in the series can be operated manually or remotely. For higher-power test applications, users can parallel multiple units in a master-slave setup with synchronous loading to accurately simulate real-world load conditions.

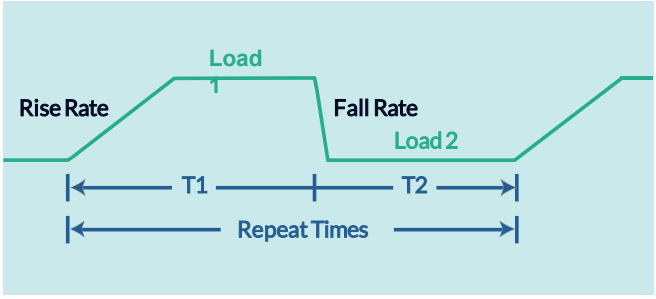
Basic Mode

The 63700 series offers constant voltage (CV), constant current (CC), constant resistance (CR), and constant power (CP) modes of operation to meet various test requirements. For example, in the CC and CR modes, when testing the voltage source DUT (Device Under Test), the load can be used to verify whether the DUT's output voltage remains stable under different load conditions. For On Board Charger (OBC), battery chargers or charging stations, when the charger operates in constant current mode, the 63700 uses constant voltage mode to simulate voltage fluctuations in the charging battery, ensuring the accuracy of the charging current at the set output voltage of the charger. When the test object is a battery, the electronic load can be set to constant current or constant power mode for discharging the battery. Many battery testing applications, power consumption, and other conditions can be tested using these two modes of the electronic load.



Dynamic Mode

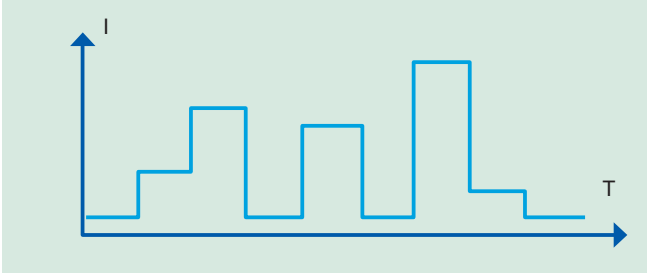
The 63700 Series offers a programmable Dynamic Load (Dynamic Current Load CCD) mode, as illustrated in the diagram on the right. The programmable parameters include setting the high/low current levels, T1/T2, rise rate/fall rate, and the number of executions. In addition to the mentioned basic parameters, users can also configure a repeat count for a specified duration, with a range of 1 to 65,535.



Programmable Load Sequences*

The 63700 Series comes pre-equipped with 256 programmable load sequences, allowing users to simulate a wide range of real-world load conditions. One of the examples of common applications for programmed load sequences is:

Battery discharge and other applications (such as laptops, electric cars, and electric scooters): Simulate different current waveforms of dynamic loads, providing dynamic current simulation with two or more current levels or one-shot load simulation.



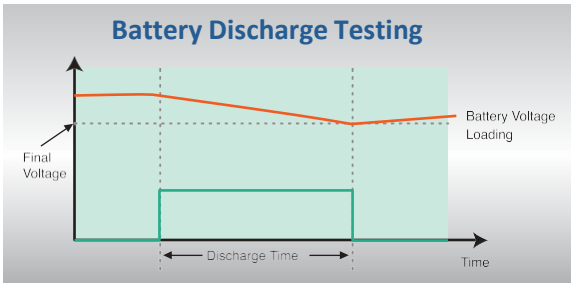
Battery Discharge Testing*

Batteries are typically shipped from the factory with a capacity maintained at around 30% to 50%. When the battery capacity exceeds a user-defined percentage during production, it needs to be discharged before shipping. The 63700 Series offers users three discharge test modes: constant current (CC), constant resistance (CR), and constant power (CP). By setting the cutoff voltage and stop time (1 second - 100,000 seconds), the load ensures proper termination of the load to prevent over-discharging and potential damage to the battery. In terms of measurement, the device can measure the discharge energy (WH), discharge capacity (AH), and total discharge time of the battery.

For example, when the Load ON button is pressed to initiate the load, the internal timer of the 63700 starts counting. The timer stops counting only when the battery voltage reaches the set cutoff voltage or when the Load OFF button is pressed to stop the load.

The battery discharge test function can also be used to perform discharge time testing for super capacitors and similar applications.

*This feature is not yet supported, please contact our office for more information.



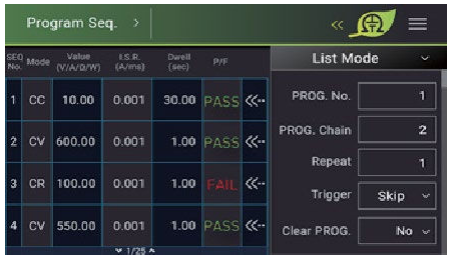
Sleep Mode

The 63700 regenerative load provides a sleep mode for optimal efficiency. When the load remains idle for longer than the user-set idle time, the 63700 will shut off the main power source (e.g., module power), retain the system power, and enter sleep mode.
In sleep mode, the operating interface will be in a semi-off state, as shown in the image below. Users can easily wake up the 63700 by touching the screen, pressing the ON button on the front panel, or using remote commands.

Intuitive Touchscreen UI

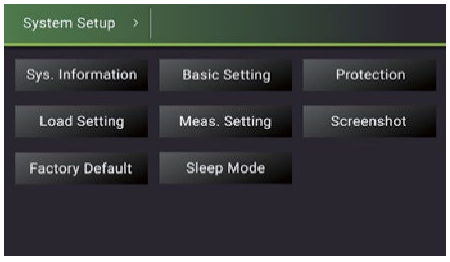
The device features a convenient 5” color touchscreen that simultaneously displays measurement values and settings. An extra physical control knob and load ON/OFF key allow for precise and quick fine-tuning. This combination of touch and analog control options ensures a seamless and intuitive user experience.

Constant Current

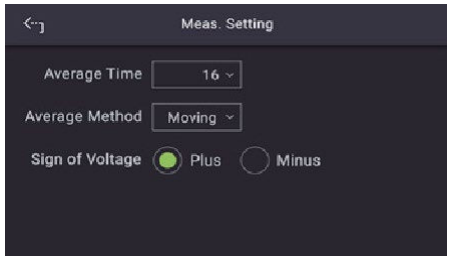


List Mode

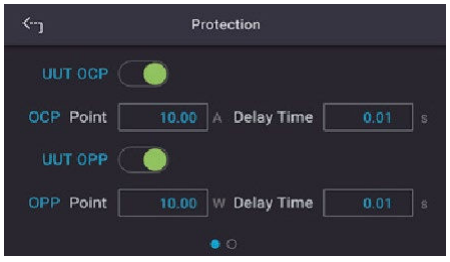
Battery Discharge



System Setup



Meas. Setting



Protection

Safety Mechanisms

The 63700 features an energy recovery function and has external protection mechanisms. When the 63700 detects AC input over voltage (OV) or under voltage (UV), abnormal frequency (Freq. Error), three-phase imbalance (Unbalance), or over current (OC), it will shut off the module power to ensure safe grid integration. Additionally, the 63700 has internal protection mechanisms such as over voltage alarm (OVA), over current protection (OCP), over power protection (OPP), over temperature protection (OTP), and under voltage protection (UVP). Once any of these internal protection mechanisms are triggered, the 63700 will stop loading.

Universal AC Power Range 200VAC~480VAC

The design of the 63700 regenerative load allows for AC power input from anywhere in the world, with an input range of three-phase 200~220Vac and 380~480Vac. Users can purchase the device without having to worry about compatibility with different power configurations in other regions.

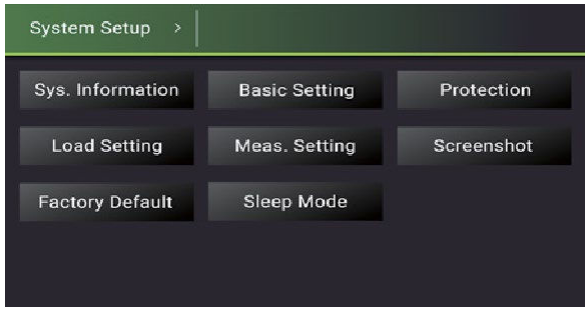
Interface

The 63700 regenerative load supports various communication interfaces for user control. It comes standard with USB and LAN, and optional GPIB for PC connectivity. Additionally, it features a CAN interface, commonly used in the automotive industry and compliant with CAN2.0 A&B specifications for 11-bit/29-bit frames. This interface allows for high-speed reading of voltage, current, and power parameters with a 10ms response time.

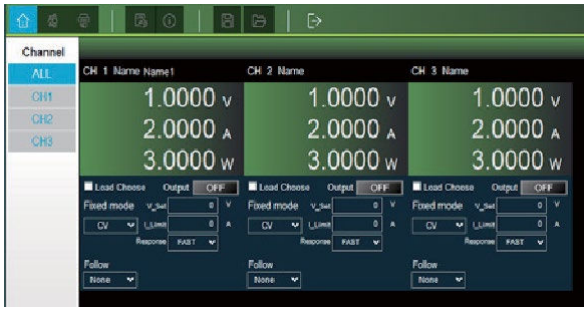
SoftPanel Software Interface

In addition to the front panel, the 63700 Series can also be controlled through Chroma's SoftPanel graphical software interface. This user-friendly interface includes an array of functions which help users get started quickly and operate the load conveniently. The 63700 Series features multiple interfaces such as GPIB, USB, and LAN, allowing users to choose the interface that best suits their needs when using a PC to operate the unit.

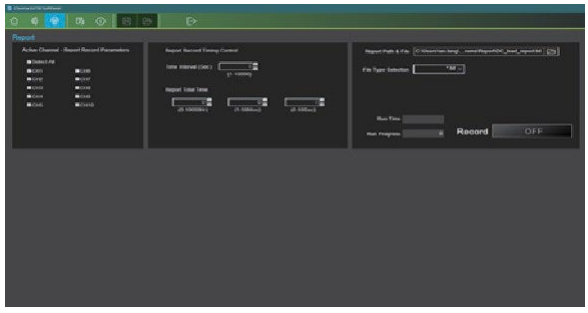
CC Mode



System Setup



All Setting



Report

Specification-1 (600V/1200V/1800V Models)

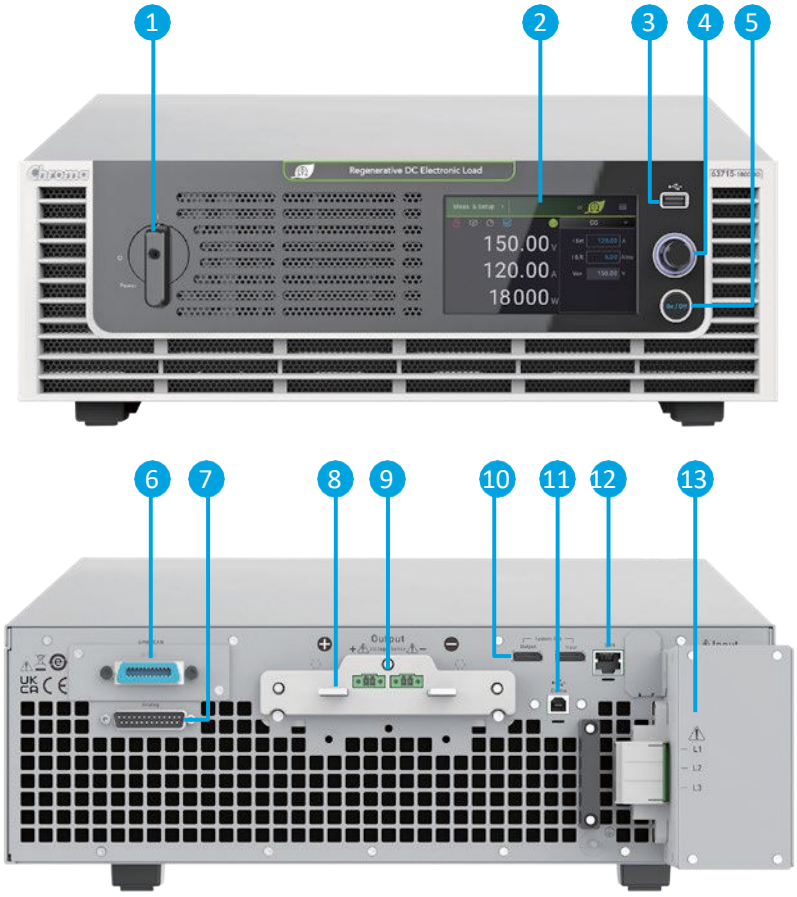
Models	63718-600-120	63718-1200-40	63718-1800-40
Voltage	600V	1,200V	1,800V
Current	120A	40A	40A
Power	18kW	18kW	18kW
Min. Operating Voltage	30V@120A	90V@40A	90V@40A
Min. Operating Current	0.6A	0.2A	0.2A
Static Mode			
Min. Operating Voltage	30V@120A	90V@40A	90V@40A
Constant Current Mode			
Range	0~120A	0~40A	0~40A
Resolution	10mA		
Accuracy	0.2%F.S.		
Ripple & Noise (rms)	<90mA	<30mA	<30mA
Constant Resistance Mode			
Range	0.05Ω~2,500Ω	2.25Ω~22,500Ω	0.45Ω~22,500Ω
Resolution	10mA/Vsense		
Accuracy	Vin/Rset*(0.2%)+0.2% IF.S.	Vin/Rset*(0.4%)+0.4% IF.S.	Vin/Rset*(0.2%)+0.2% IF.S.
Constant Voltage Mode			
Range	30~600V	90~1,200V	90~1800V
Resolution	10mV	100mV	100mV
Accuracy	0.1%F.S.		
Ripple (P-P)	420mV	1,260mV	1,260mV
Ripple (rms)	85mV	255mV	255mV
Constant Power Mode			
Range	0~18,000W	0~18,000W	0~18,000W
Resolution	0.4W	1W	1W
Accuracy	0.3%F.S.		

Specification-1 (600V/1200V/1800V Models)

Dynamic Mode				
T1 & T2		10ms~100s		
Resolution		1ms		
Accuracy		1ms+100ppm		
Slew Rate		10mA/ms-60A/ms	10mA/ms~20A/ms	10mA/ms~20A/ms
Resolution		10mA/ms		
Accuracy		1% ±2ms		
Min. Rise Time *7		2ms (Typical)		
Measurement				
Voltage readback				
Range		0~600V	0~1,200V	0~1,800V
Resolution		10mV	100mV	100mV
Accuracy		0.05%+0.05%F.S.		
Current Readback				
Range		0~120A	0~40A	0~40A
Resolution		10mA		
Accuracy		0.1%+0.1%F.S.		
Power Readback				
Range		0~18,000W		
Resolution		100mW		
Accuracy *5		0.3%F.S.	0.2%+0.2%F.S.	0.3%F.S.
Protection				
DC Side				
Over Current		Yes (Settable)		
Over Power		Yes (Settable)		
Over Temperature		Yes		
Over Voltage Alarm		Yes		
Reverse Alarm		Yes		
AC Side				
Voltage Range Error		Out of the voltage range		
Frequency Range Error		Out of the 47Hz~63Hz range		
Open Phase		When one of the three phases is missing		
Interface				
Front USB (Host)		Standard (Type A)		
Rear USB (Device)		Standard (Type B)		
GPIB		Optional		
LAN		Standard		
CAN		Optional		
System Bus		Master/Slave		
Input Specification				
Line Voltage (AC input voltage 3phase, 3wire + ground)		3Φ200Vac~220Vac ±10% 3Φ380Vac~480Vac ±10% (Output=12kW@200~220 Vac input,Output=18kW@380~480 Vac input) w/o Neutral		
AC Frequency		47~63Hz		
Power Factor		PF>0.97 @220Vac PF>0.95 @380Vac PF>0.92@480Vac		
General				
Temperature Coefficient		0.06% of Imax/℃		
Overshoot (@ Max. Slew rate)		5%		
Input Cap.		<945uF	<105uF	<105uF
Dimension (HxWxD)		132 x 428 x 671 mm / 5.20 x 16.85 x 26.41 inch		
Weight		45kg / 100lbs		
Operating Temperature		0~40℃		
Storage Temperature		-25~+70℃		
Power Regeneration Efficiency	AC 380Vac	Max. 92% (Typical)	Max. 93% (Typical)	Max. 92% (Typical)
	AC 480Vac	Max. 93% (Typical)	Max. 93% (Typical)	Max. 93% (Typical)
EMC & Safety		CE		

* All specifications are subject to change without notice.

Front and Rear Panel



1. Power switch
   AC power switch for the main load
2. TFT touch panel
   Displays settings and measurement data
3. USB HOST (not yet supported)
   Allows user to customize waveforms, program sequences, import data, update firmware, etc.
4. Pushable knob
   The rotary knob can be used to edit the settings on-screen. After editing, press the knob to confirm the values entered.
5. ON button
   When pressing the ON button, the light turns on to indicate LOAD ON, or turns off to indicate LOAD OFF.
6. Optional GPIB interface or CAN interface (they share the same slot)
7. Analog control interface
   Analog I/O control & monitoring voltage and current
8. Load positive/negative terminals
9. Remote voltage sensing terminals
10. System bus
    For master/slave data transfer
11. USB interface (standard)
12. LAN interface (standard)
13. AC input terminal

Ordering Information

* 63706-600-40 : Regenerative DC Load 600V/40A/6kW
* 63712-600-80 : Regenerative DC Load 600V/80A/12kW
  63718-600-120 : Regenerative DC Load 600V/120A/18kW
* 63712-1200-40 : Regenerative DC Load 1200V/40A/12kW
  63718-1200-40 : Regenerative DC Load 1200V/40A/18kW
  63718-1800-40 : Regenerative DC Load 1800V/40A/18kW
  A600009 : GPIB Cable (200cm)
  A600010 : GPIB Cable (60cm)
  A620039 : GPIB Interface
  A620045 : CAN Interface

*Please contact our office for more information on paralleling more than 3 units, program storage functionality, battery discharge functionality, and released unit models.