

# Programmable DC Electronic Load

## MODEL 6310 Series

### Key Features:

- Max Power: 200W, 100W  $\times 2$ (Dual), 30W & 250W, 300W, 600W, 1200W
- Wide range 1-500V operating voltage

### Configuration:

- Up to 8 channels in one mainframe, fit for testing multiple output SMPS
- Parallel load modules up to 1200W for high current and power application
- Synchronization with multiple loads
- GPIB/RS-232C Interface

### Load Control:

- Flexible CC, CR, CV operation modes
- Dynamic loading with speed up to 20KHz
- Fast response of 0.32 mA/ $\mu$ S - 10A/ $\mu$ S slew rate
- Minimum input resistance allowing load to sink high current at low voltage
- Real time power supply load transient response simulation and output measurement
- User programmable 100 sequential front panel input status for user-friendly operating
- High/Low limits of testing parameters to test GO/NG

### Measurement:

- 15-bit precision voltage and current measurement with dual-range selection
- Remote sensing capability
- Short circuit test
- Self-test at power-on

### Regulatory Compliance:

- CE marking



## PROGRAMMABLE DC ELECTRONIC LOAD

Chroma Programmable DC Electronic Load 6310 series is suitable for the test and evaluation of multi-output AC/DC power supply, DC/DC converter, charger and power electronic components and good for application in areas such as research and development, production, and incoming inspection. The system is configured by plugging the user selectable load modules into the system mainframe, and operated using the keypad on the front panel of the instrument or the remote controlled instructions via RS-232C or GPIB interface.

The 6310 series offers 8 types of modular loads with power ranging from 30 watts to 1200 watts, current from 0.5mA to 240A, and voltage measurement from 0.5mV to 500V. Each load is isolated and floating, programmable in dual current range and measuring voltage range, and capable of synchronizing with other modules for control operation. The load can be operated in constant current, constant voltage, and constant resistance.

The 6310 series can simulate a wide range of dynamic loading applications. The loading waveform is programmable in slew rates, load levels, duration and conducting voltage. Furthermore, up to 100 sets of system operating status can be stored in EEPROM and recalled instantly for automated testing application.

Real time measurement of voltage and current is integrated into each 6310 load module using a 15-bit precision measurement circuit. The user can perform on line voltage measurement and adjustment, or simulate short circuit test using the simple keypad on the front panel. Additionally, the 6310 series offers an optional remote controller for automated production line.

The 6310 series has self-diagnosis routine to maintain instrumental performance all the time. It is also protected against OPP, OCP, OVP, OTP, and reverse polarity to guarantee quality and reliability for even the most demanding engineering testing and ATE application.



# Total Satisfaction

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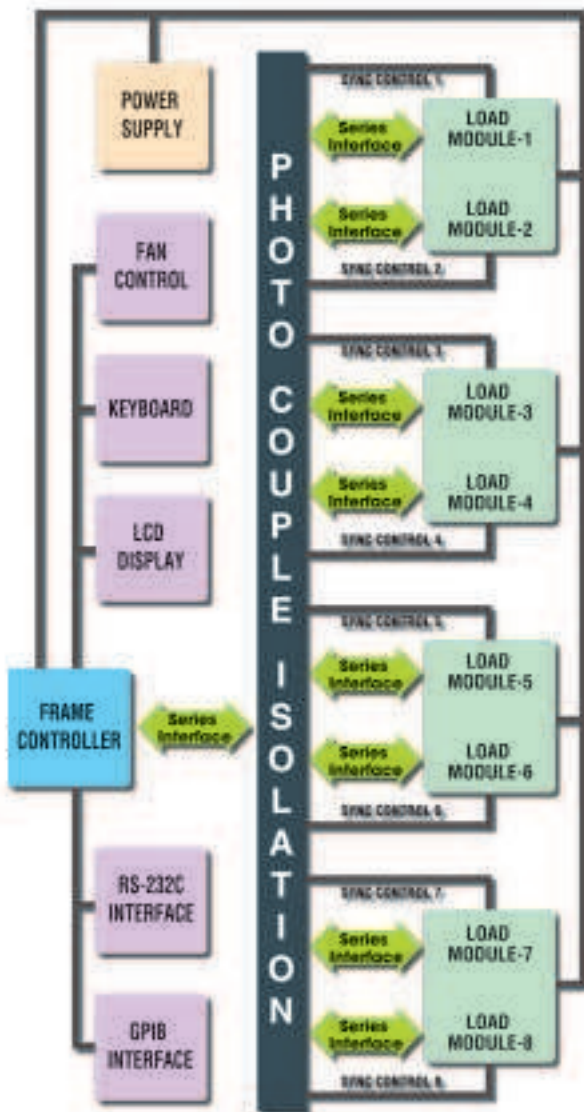
Get Quality, Versatility, Cost Performance,  
and Reliability All in One Package.



## 1. Versatile System Configuration

Chroma 6310 Programmable Electronic Load integrates microprocessing capability into each load module and mainframe as the system operates in parallel processing mode to optimize the speed and control among multiple load modules. All load modules are configured to work synchronously, and testing can be carried out simultaneously at multiple output to simulate real life application.

6310 SYSTEM BLOCK DIAGRAM



## 2. Modular Load Design

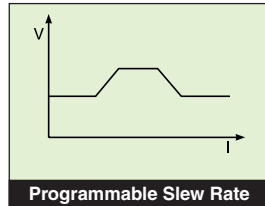
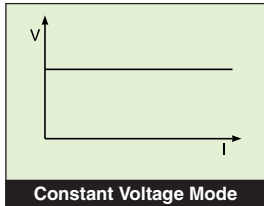
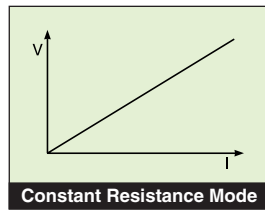
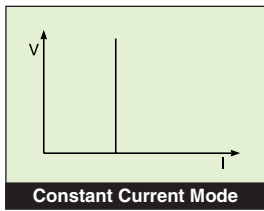
The Chroma 6314 1200W and 6312 600W electronic load mainframes accept the user-installable 6310 series load modules for easy system configuration and fit 19" instrument rack. The 6314 holds four 63102 load modules at most to offer 8-channel 100W input load with standard front-panel inputs. It fits for testing multiple output switch power supply. Additionally, GO/NG output port is useful for UUT's pass/fail judgement on automated production line. All modules on the 6314/6312 mainframe share a common GPIB address to synchronize and speed up the control of load modules and read-back of operating data.



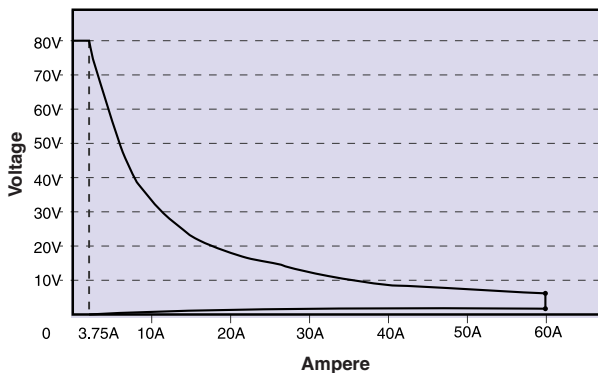
The 6310 family offers 8 types of load modules ranging from model 63101 with 200 watts power to model 63112 with 1200 watts power. Each model is designed with specific applications in mind. In the world, model 63102 and 63107 are the only dual-input load in one load module, capable of controlling loading up to 50A and measuring voltage up to that of 0.5mV, and well-suited for testing lower power, high precision DC/DC converter. Model 63105 and 63108 are designed to operate up to 500 V in high voltage testing application. Model 63112 sinks a maximum current of 240A, and is the most cost-effective in high power testing application.

## 3. Application of Specific Load Simulation

The 6310 load modules operate in constant current, constant resistance, or constant voltage to satisfy a wide range of test requirements. For example, the test of battery charger can be simulated easily by setting the load to operate in constant voltage mode.



Each load module is designed with state-of-the-art technology and connects all power MOSFET devices parallel to insure high accuracy load control with minimum drift of less than 0.1% +0.1% F.S. of the current setting. The FET technology accomplishes minimum input resistance and enables the load to sink high current even at very low voltage. For example, model 63103 is capable of sinking 60A at 1V output, and well-suited for testing the new 3V low voltage power supplies. Low voltage operation, down to zero volt, is possible at correspondingly reduced current level.

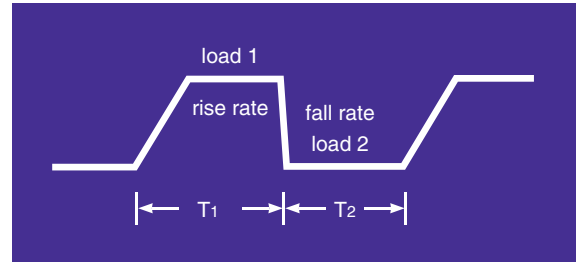


**MODEL 63103 INPUT CHARACTERISTICS**

The 6310 load module uses photo coupler for isolation between the output and control sections, thus each load is isolated and floating. The user can use multiple load modules independently to test multi-output power supplies, or parallel them in high power testing application.

#### 4. Dynamic Loading and Control

Modern electronic devices operate at very high speed, and perform well in the transient and dynamic response of power devices. To satisfy these testing applications, the 6310 loads offer high speed, programmable dynamic load simulation and control capability never achieved before. The figure below shows the programmable parameters of the 6310 load modules :



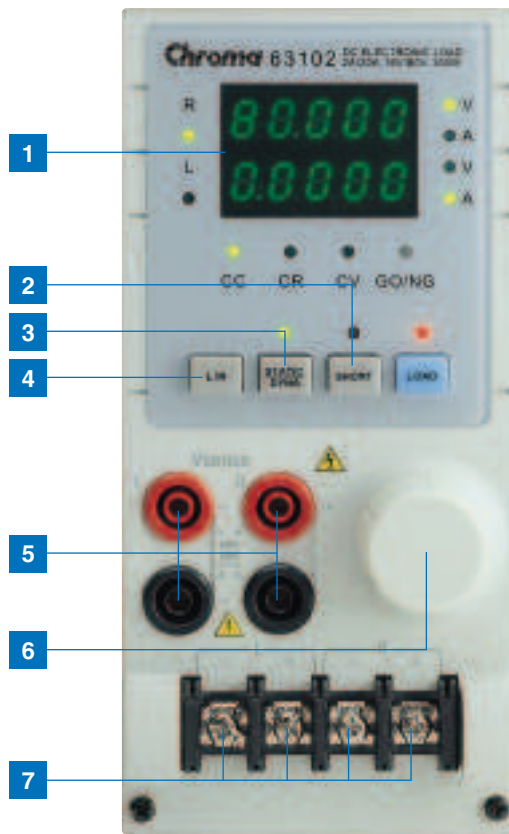
The programmable slew rate makes the simulation of transient load change demanded by the requirement of real life application possible. The 6310 internal waveform generator is capable of producing maximum slew rate at 10A/μS, and dynamic cycling up to 20KHz. Its dedicated remote load senses and controls circuit to guarantee minimum waveform distortion during continuous load changes.

#### 5. Powerful Measurements

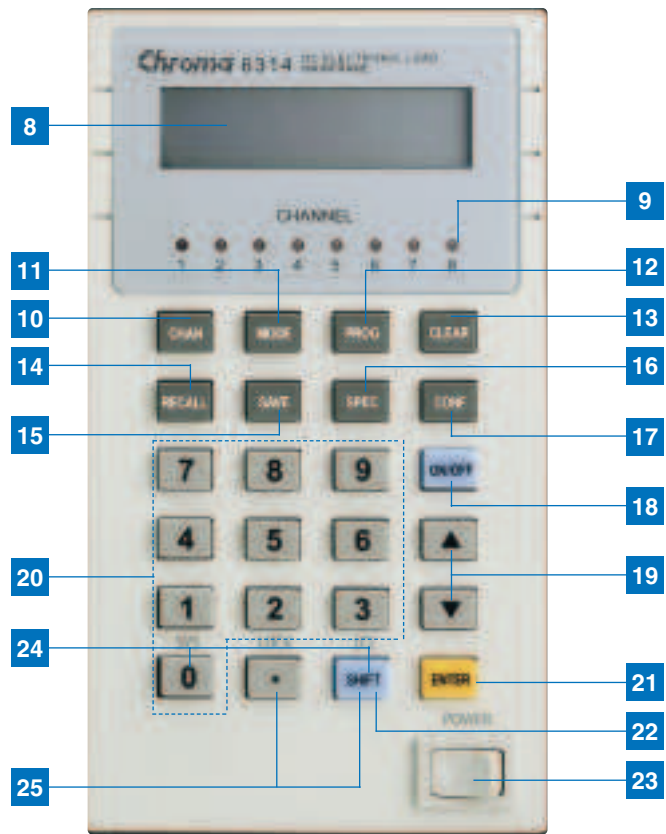
Each 6310 load module has integrated a 15-bit precision A/D converter for voltage measurement with an accuracy of 0.05% +0.05% full scale. The built-in resistive load current sensing circuit is capable of measuring current in an accuracy of 0.1%+0.1% full scale. Also, short circuit can be simulated.

All measurement is done using remote sensing to eliminate any error due to voltage drop along the measurement path.

The user can also select a full setting range of voltage and current measurement according to application requirements.



**Load Module**



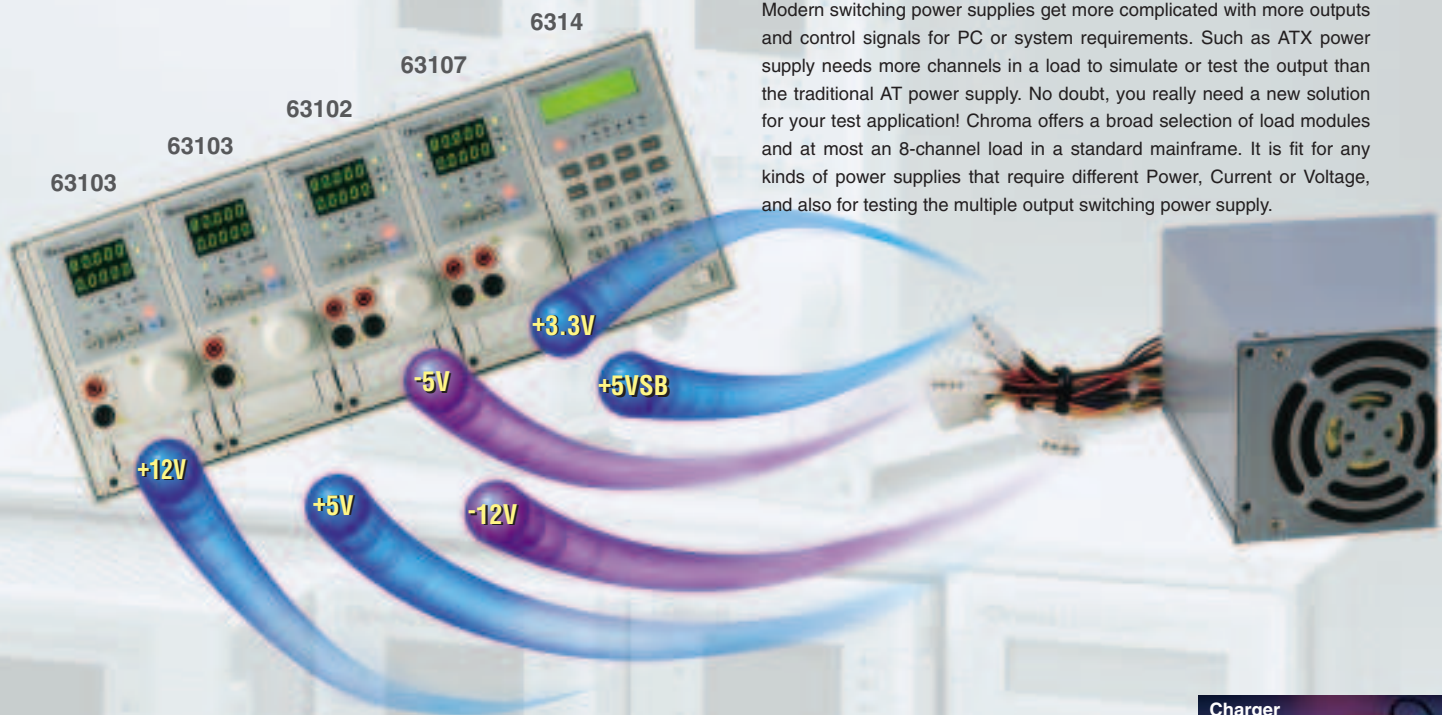
**Mainframe Controller**

- |  |  |
|--|--|
| <p><b>1</b> LED indicator</p> <p><b>2</b> SHORT key : To apply a short circuit across the input</p> <p><b>3</b> STATIC / DYNA key : To select static or dynamic test mode</p> <p><b>4</b> L / R key : To select left or right channel of input load (63102, 63107)<br/>A / B key : To select static A or B load (other models)</p> <p><b>5</b> V terminal : To measure the UUT's output voltage using remote sense</p> <p><b>6</b> Rotary knob : To adjust load setting continuously</p> <p><b>7</b> Load terminal</p> <p><b>8</b> LCD display</p> <p><b>9</b> LED indicator : To display the channel at which load is set</p> <p><b>10</b> CHAN key : To select input load channel</p> <p><b>11</b> MODE key : To select the operation mode of CC, CR, or CV</p> <p><b>12</b> PROG key : For program data setting</p> | <p><b>13</b> CLEAR key : Clear the currently edited data</p> <p><b>14</b> RECALL key : To recall the front panel input status from memory</p> <p><b>15</b> SAVE key : To save the front panel input status into memory</p> <p><b>16</b> SPEC key : To set up High/Low limits for GO/NG test</p> <p><b>17</b> CONF key : To set the configuration</p> <p><b>18</b> ON / OFF key : To enable or disable the load input</p> <p><b>19</b> Up / Down key : To select the next or previous display in edit mode</p> <p><b>20</b> Numeric Key : For data setting</p> <p><b>21</b> ENTER key : To confirm editing data on the instrument</p> <p><b>22</b> SHIFT key : As LOCAL Key when in remote mode</p> <p><b>23</b> Power switch</p> <p><b>24</b> SHIFT + 0 key : System function</p> <p><b>25</b> SHIFT + · key : Lock function</p> |
|--|--|

## A Multiple Selection for Multiple Output SPS Test Application

### Product Lineup

MODEL	Power	Operation Voltage	Current
63101	200W	1-80V	40A
63103	300W	1-80V	60A
63106	600W	1-80V	120A
63112	1200W	1-80V	240A
63102	100W X 2	1-80V	20A (Dual Channels)
63107	250W & 30W	1-80V	40A & 5A (Dual Channels)
63105	300W	2.5-500V	10A
63108	600W	2.5-500V	20A



Modern switching power supplies get more complicated with more outputs and control signals for PC or system requirements. Such as ATX power supply needs more channels in a load to simulate or test the output than the traditional AT power supply. No doubt, you really need a new solution for your test application! Chroma offers a broad selection of load modules and at most an 8-channel load in a standard mainframe. It is fit for any kinds of power supplies that require different Power, Current or Voltage, and also for testing the multiple output switching power supply.

A more efficient solution to testing the single output AC to DC or DC to DC converters by synchronization control with multiple loads for testing 8 UUTs at one time.



63102 x 4

**Testing 8 Units  
in one instant time**

**Charger**



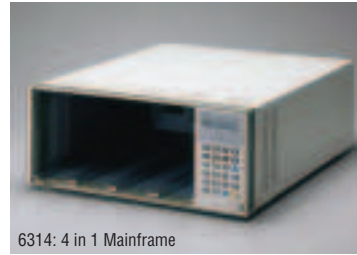
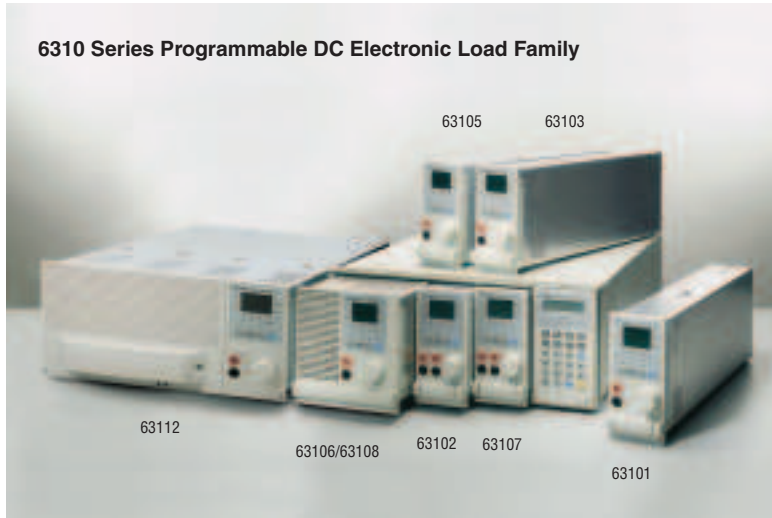
**Adapter**



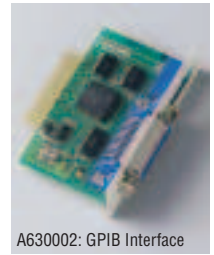
**Battery**



## 6310 Series Programmable DC Electronic Load Family



6314: 4 in 1 Mainframe



A630002: GPIB Interface



6312: 2 in 1 Mainframe



A631001: Remote Controller

## PROGRAMMABLE DC ELECTRONIC LOAD

### Specifications:

Model	63101		63105		63102(100Wx2)		63103	
Power	20W	200W	30W	300W	20W	100W	30W	300W
Current	0-4A	0-40A	0-1A	0-10A	0-2A	0-20A	0-6A	0-60A
Voltage	1-80V		2.5-500V		1-80V		1-80V	
Min. Operation Voltage (DC)	1.0V at 4A	1.0V at 40A	2V at 1A	2V at 10A	1.0V at 2A	1.0V at 20A	1.0V at 6A	1.0V at 60A
<b>Constant Current Mode</b>								
Range	0-4A	0-40A	0-1A	0-10A	0-2A	0-20A	0-6A	0-60A
Resolution	1mA	10mA	0.25mA	2.5mA	0.5mA	5mA	1.5mA	15mA
Accuracy	0.1%+0.1%F.S.	0.1%+0.2%F.S.	0.1%+0.1%F.S.	0.1%+0.2%F.S.	0.1%+0.1%F.S.	0.1%+0.2%F.S.	0.1%+0.1%F.S.	0.1%+0.2%F.S.
<b>Constant Resistance Mode</b>								
Range	0.0375Ω-150Ω (200W/16V) 1.875Ω-7.5kΩ (200W/80V)		1.25Ω-5kΩ (300W/125V) 50Ω-200kΩ (300W/500V)		0.075Ω-300Ω (100W/16V) 3.75Ω-15kΩ (100W/80V)		0.025Ω-100Ω (300W/16V) 1.25Ω-5kΩ (300W/80V)	
Resolution	12 bits		12 bits		12 bits		12 bits	
Accuracy	150Ω: 0.1% ± 0.2% 7.5kΩ: 0.01% ± 0.1%		5kΩ: 20m% ± 0.2% 200kΩ: 5m% ± 0.1%		300Ω: 0.1% ± 0.2% (0.075-30Ω) 15kΩ: 0.01% ± 0.1% (30-750Ω)		100Ω: 0.1% ± 0.2% (0.025-100Ω) 5kΩ: 0.01% ± 0.1% (10-5k)	
<b>Constant Voltage Mode</b>								
Range	1-80V		2-500V		1-80V		1-80V	
Resolution	20mV		125mV		20mV		20mV	
Accuracy	0.05% ± 0.1%F.S.		0.05% ± 0.1%F.S.		0.05% ± 0.1%F.S.		0.05% ± 0.1%F.S.	
<b>DYNAMIC MODE</b>								
<b>Dynamic Mode</b>								
T1 & T2	C.C. Mode 0.025mS-10mS/Res:1uS 1mS-30S/Res:1mS		C.C. Mode 0.025mS-10mS/Res:1uS 1mS-30S/Res:1mS		C.C. Mode 0.025mS-10mS/Res:1uS 1mS-30S/Res:1mS		C.C. Mode 0.025mS-10mS/Res:1uS 1mS-30S/Res:1mS	
Accuracy	1uS/1mS+100ppm		1uS/1mS+100ppm		1uS/1mS+100ppm		1uS/1mS+100ppm	
Slew Rate	0.64-160mA/μS	6.4-1600mA/μS	0.16-40mA/μS	1.6-400mA/μS	0.32-80mA/μS	3.2-800mA/μS	0.001-0.25A/μS	0.01-2.5A/μS
Resolution	0.64mA/μS	6.4mA/μS	0.16mA/μS	1.6mA/μS	0.32mA/μS	3.2mA/μS	0.001A/μS	0.01A/μS
Current	0-4A	0-40A	0-1A	0-10A	0-2A	0-20A	0-6A	0-60A
Resolution	1mA	10mA	0.25mA	2.5mA	0.5mA	5mA	1.5mA	15mA
Current Accuracy	0.4%F.S.		0.4%F.S.		0.4%F.S.		0.4%F.S.	
<b>MEASUREMENT SECTION</b>								
<b>Voltage Read Back</b>								
Range	0-16V	0-80V	0-125V	0-500V	0-16V	0-80V	0-16V	0-80V
Resolution	0.5mV	2.5mV	4mV	16mV	0.5mV	2.5mV	0.5mV	2.5mV
Accuracy	0.05% + 0.05%F.S.		0.05% + 0.05%F.S.		0.05% + 0.05%F.S.		0.05% + 0.05%F.S.	
<b>Current Read Back</b>								
Range	0-4A	0-40A	0-1A	0-10A	0-2A	0-20A	0-6A	0-60A
Resolution	0.125mA	1.25mA	0.032mA	0.320mA	0.0625mA	0.625mA	0.1875mA	1.875mA
Accuracy	0.1% + 0.1%F.S.		0.1% + 0.1%F.S.		0.1% + 0.1%F.S.		0.1% + 0.1%F.S.	
<b>PROTECTIVE SECTION</b>								
<b>Over Power Protection</b>								
	20.8W	208W	31.2W	312W	20.8W	104W	31.2W	312W
<b>Over Current Protection</b>								
	4.08A	40.8A	1.02A	10.2A	2.04A	20.4A	6.12A	61.2A
<b>Over Temperature Protection</b>								
	85°C		85°C		85°C		85°C	
<b>Over Voltage Protection</b>								
	81.6V		510V		81.6V		81.6V	
<b>GENERAL</b>								
<b>Short Circuit</b>								
Current	4.8/4A	48/40A	1.2/1A	12/10A	2.4/2A	24/20A	7.2/6A	72/60A
Resistance (CC,CV)	0.250Ω	0.025Ω	2.50Ω	0.25Ω	0.5Ω	0.05Ω	0.160Ω	0.016Ω
Resistance (CR)	1.875Ω	0.0375Ω	50Ω	1.25Ω	3.75Ω	0.075Ω	1.25Ω	0.025Ω
<b>Input Resistance (Load Off)</b>	100kΩ (Typical)		100kΩ (Typical)		100kΩ (Typical)		100kΩ (Typical)	
<b>Temperature Coefficient</b>	100PPM/°C (Typical)		100PPM/°C (Typical)		100PPM/°C (Typical)		100PPM/°C (Typical)	
<b>Power</b>	Supply from 6314 Mainframe		Supply from 6314 Mainframe		Supply from 6314 Mainframe		Supply from 6314 Mainframe	
<b>Dimensions (WxHxD)</b>	81 x 172 x 495 mm		81 x 172 x 495 mm		81 x 172 x 495 mm		81 x 172 x 495 mm	
<b>Weight</b>	4.2 Kg		4.2 Kg		4.2 Kg		4.2 Kg	
<b>Operating Range</b>	0-40°C		0-40°C		0-40°C		0-40°C	
<b>EMC &amp; Safety</b>	CE		CE		CE		CE	

# PROGRAMMABLE DC ELECTRONIC LOAD

## Specifications:

Model	63107(30W & 250W)			63106		63108		63112		
Power	30W	30W	250W	60W	600W	60W	600W	120W	1200W	
Current	0-5A	0-4A	0-40A	0-12A	0-120A	0-2A	0-20A	0-24A	0-240A	
Voltage	1-80V			1-80V		2.5-500V		1-80V		
Min. Operating Voltage (DC)	1.0V at 5A	1.0V at 4A	1.0V at 40A	1.0V at 12A	1.0V at 120A	2V at 2A	2V at 20A	1.0V at 24A	1.0V at 240A	
<b>Constant Current Mode</b>										
Range	0-5A	0-4A	0-40A	0-12A	0-120A	0-2A	0-20A	0-24A	0-240A	
Resolution	1.25mA	1mA	10mA	3mA	30mA	0.5mA	5mA	6mA	60mA	
Accuracy	0.1%+0.1%F.S.	0.1%+0.1%F.S.	0.1%+0.2%F.S.	0.1%+0.1%F.S.	0.1%+0.2%F.S.	0.1%+0.1%F.S.	0.1%+0.2%F.S.	0.1%+0.1%F.S.	0.1%+0.2%F.S.	
<b>Constant Resistance Mode</b>										
Range	0.3Ω-1.2kΩ(30W/16V) 15Ω-60kΩ(30W/80W)	0.0375Ω-150Ω(250W/16V) 1.875Ω-7.5kΩ(250W/80V)		12.5mΩ-50Ω(600W/16V) 0.625Ω-2.5kΩ(600W/80V)		0.625Ω-2.5kΩ(600W/125V) 25Ω-100kΩ(600W/500V)		6.25mΩ-25Ω(1200W) 0.3125Ω-1.25kΩ(1200W)		
Resolution	12 bits	12 bits		12 bits		12 bits		12 bits		
Accuracy	1.2kΩ: 0.1%+0.2% 60kΩ: 0.01%+0.1%	150Ω: 0.1%+0.2% 7.5kΩ: 0.01%+0.1%		50Ω: 0.1%+0.2% (0.0125-5Ω) 25kΩ: 0.01%+0.1% (5-125Ω)		25kΩ: 50m%+0.2% 100kΩ: 5m%+0.1%		25Ω: 0.1%+0.2% 1.25kΩ: 0.01%+0.1%		
<b>Constant Voltage Mode</b>										
Range	1-80V			1-80V		2-500V		1-80V		
Resolution	20mV			20mV		125mV		20mV		
Accuracy	0.05% ± 0.1%F.S.			0.05% ± 0.1%F.S.		0.05% ± 0.1%F.S.		0.05% ± 0.1%F.S.		
<b>DYNAMIC MODE</b>										
Dynamic Mode	C.C. Mode			C.C. Mode		C.C. Mode		C.C. Mode		
T1 & T2	0.025mS-10mS/Res:1uS 1mS-30S/Res:1mS			0.025mS-10mS/Res:1uS 1mS-30S/Res:1mS		0.025mS-10mS/Res:1uS 1mS-30S/Res:1mS		0.025mS-10mS/Res:1uS 1mS-30S/Res:1mS		
Accuracy	1uS/1mS+100ppm			1uS/1mS+100ppm		1uS/1mS+100ppm		1uS/1mS+100ppm		
Slew Rate	0.8-200mA/μS	0.64-160mA/μS	64-1600mA/μS	0.002-0.5A/μS	0.02-5A/μS	0.32-80mA/μS	3.2-800mA/μS	0.004-1A/μS	0.04-10A/μS	
Resolution	0.8mA/μS	0.64mA/μS	6.4mA/μS	0.002A/μS	0.02A/μS	0.32mA/μS	3.2mA/μS	0.004A/μS	0.04A/μS	
Current	0-5A	0-4A	0-40A	0-12A	0-120A	0-2A	0-20A	0-24A	0-240A	
Resolution	1.25mA	1mA	10mA	3mA	30mA	0.5mA	5mA	6mA	60mA	
Current Accuracy	0.4%F.S.			0.4%F.S.		0.4%F.S.		0.4%F.S.		
<b>MEASUREMENT SECTION</b>										
<b>Voltage Read Back</b>										
Range	0-16V	0-80V	0-16V	0-80V	0-16V	0-80V	0-125V	0-500V	0-16V	0-80V
Resolution	0.5mV	2.5mV	0.5mV	2.5mV	0.5mV	2.5mV	4mV	16mV	0.5mV	2.5mV
Accuracy	0.05% + 0.05%F.S.			0.05% + 0.05%F.S.		0.05% + 0.05%F.S.		0.05% + 0.05%F.S.		
<b>Current Read Back</b>										
Range	0-5A	0-4A	0-40A	0-12A	0-120A	0-2A	0-20A	0-24A	0-240A	
Resolution	0.15625mA	0.125mA	1.25mA	0.375mA	3.75mA	0.0625mA	0.625mA	0.75mA	7.5mA	
Accuracy	0.1% + 0.1%F.S.			0.1% + 0.1%F.S.		0.1% + 0.1%F.S.		0.15% + 0.2%F.S.		
<b>PROTECTIVE SECTION</b>										
Over Power Protection	.31.2W	.31.2W	.260W	.62.4W	.624W	.62.4W	.624W	.124.8W	.1248W	
Over Current Protection	.5.1A	.4.08A	.40.8A	.12.24A	.122.4A	.2.04A	.20.4A	.24.48A	.244.8A	
Over Temperature Protection	.85°C			.85°C		.85°C		.85°C		
Over Voltage Protection	.81.6V			.81.6V		.510V		.81.6V		
<b>GENERAL</b>										
<b>Short Circuit</b>										
Current	.6/5A	.4.8/4A	.48/40A	.4.4/12A	.144/120A	.2.4/2A	.24/20A	.28.8/24A	.288/240A	
Resistance (CC,CV)	.0.200Ω	.0.250Ω	.0.025Ω	.0.080Ω	.0.008Ω	.1.250Ω	.0.125Ω	.0.040Ω	.0.004Ω	
Resistance (CR)	.1.5Ω	.0.3Ω	.1.875Ω	.0.0375Ω	.0.625Ω	.0.0125Ω	.1.00Ω	.2.5Ω	.0.3125Ω	.0.00625Ω
Input Resistance (Load Off)	100kΩ (Typical)			100kΩ (Typical)		100kΩ (Typical)		100kΩ (Typical)		
Temperature Coefficient	100PPM/°C (Typical)			100PPM/°C (Typical)		100PPM/°C (Typical)		100PPM/°C (Typical)		
Power	Supply from 6314 Mainframe			Supply from 6314 Mainframe		Supply from 6314 Mainframe		Supply from 6314 Mainframe		
Dimensions (WxHxD)	81 x 172 x 495 mm			162 x 172 x 495 mm		162 x 172 x 495 mm		324 x 172 x 495 mm		
Weight	4.2 Kg			8.4Kg		8.4 Kg		16.8 Kg		
Operating Range	0-40°C			0-40°C		0-40°C		0-40°C		
EMC & Safety	CE			CE		CE		CE		

Notes: 1.operating temperature range is 0 °C to 40 °C. All specifications apply to 25 °C ± 5 °C, except as noted. All specifications are subject to change without notice.

**Mainframe:**  
Dimension (mm)  
Weight

**Model 6312**  
275(W)x177(H)x543(D)  
15kg

**Model 6314**  
439(W)x177(H)x543(D)  
22kg

## Ordering Information

6312: Mainframe for 2 Load Modules  
6314: Mainframe for 4 Load Modules  
63101: Load Module 40A/80V/200W  
63102: Load Module 20A/80V/100Wx2

63103: Load Module 60A/80V/300W  
63105: Load Module 10A/500V/300W  
63106: Load Module 120A/80V/600W  
63107: Load Module 4A&40A/80V/30W&250W

63108: Load Module 20A/500V/600W  
63112: Load Module 240A/80V/1200W  
A630002: GPIB Interface for Model 6314, 6312  
A631001: Remote Controller

Developed and Manufactured by :

**CHROMA ATE INC.**



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