

# Programmable DC Electronic Load Model No. 6310 Series

Model No.



## DC Electronic Load Model 6310 Series

### KEY FEATURES

- Max Power: 200W, 100W x 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
- Standard GPIB/RS-232 Interface

### Load Control

- Flexible CC, CR, CV operation modes
- Dynamic loading with speed up to 20KHz
- Fast response of 0.32 mA/μS - 10A/μS 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

### Soft Panel :



Main Operation Menu



Dynamic Simulation



OCP Testing



Battery Pack Testing



Battery Discharge Testing

Chroma Model 6310 series Economic DC Electronic Load 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-232 or GPIB interface.

The 6310 family offers 8 types of modular loads with power ranging from 100 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 electronic load family can simulate a wide range of dynamic loading applications. The loading waveform is user 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, 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 offers an optional remote controller for automated production line.

The 6310 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.

## 1. Versatile System Configuration

Chroma Model 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.

## 2. Modular Load Design

The Chroma 6314 and 6312 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 40A and measuring voltage up to that of 80V, 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.



Semiconductor Test Equipment

LOD Module Test Equipment

Video Test Equipment

Optical Inspection Instruments

Power Supply Test Equipment

Passive Component Test Instruments

Electrical Safety Test Instruments

General Purpose Test Instruments

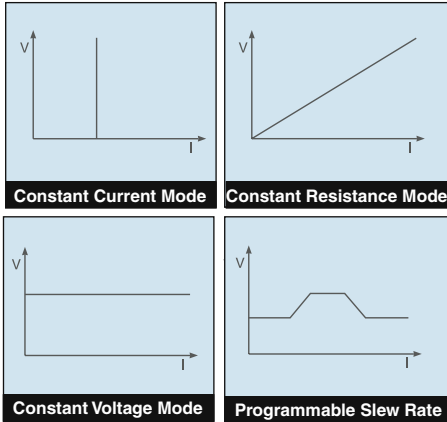
LED Test Equipment

PXI Instruments and Systems

• Continued on next page →

### 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.

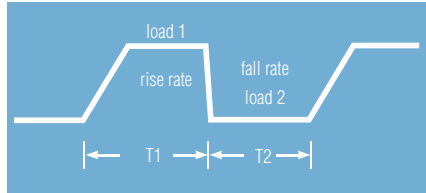


Each load module is designed with state-of-the-art technology and connects all power MOSFET devices parallel to insure high accuracy load control with minimum drift of less than 0.1% +0.1% F.S. of the current setting. The FET technology accomplishes minimum input resistance and enables the load to sink 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 3.3V low voltage power supplies. Low voltage operation, down to zero volt, is possible at correspondingly reduced current level.

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 :



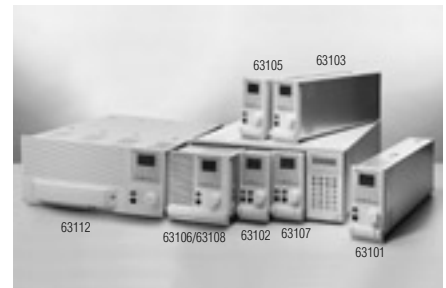
The programmable slew rate makes the simulation of transient load change demanded by the requirement of real life application possible. The 6310 internal waveform generator is capable of producing maximum slew rate at 10A/μs, and dynamic cycling up to 20KHz. Its dedicated remote load senses and controls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

### 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 channels
- 63103 :** Load Module 60A/80V/300W
- 63105 :** Load Module 10A/500V/300W
- 63106 :** Load Module 120A/80V/600W
- 63107 :** Load Module 5A&40A/80V/30W&250W
- 63108 :** Load Module 20A/500V/600W
- 63112 :** Load Module 240A/80V/1200W
- A630002 :** GPIB Interface for Model 6304/6314/6334/ 6340 Mainframe
- A631001 :** Remote Controller
- A631002 :** Test Fixture
- A631004 :** Softpanel for 6310/6330 series



### 6310 Series DC Electronic Load Family



**6314:** Mainframe for 4 Load modules

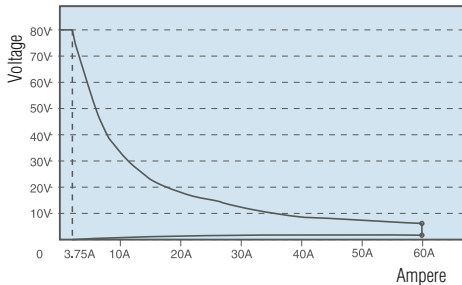
**A630002:** GPIB Interface



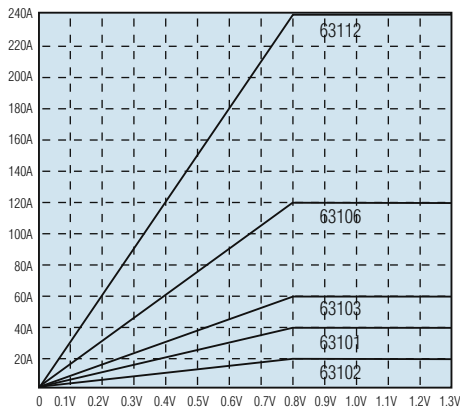
**6312 :** Mainframe for 2 Load modules

**A631001:** Remote Controller

### MODEL 63103 INPUT CHARACTERISTICS



### LOW VOLTAGE CHARACTERISTICS (TYPICAL) OF 63101/63102/63103/63106/63112



Note: All specifications are measured at load input terminals. (Ambient Temperature of +25°C)

# Programmable DC Electronic Load 6310 Series

Model No.

SPECIFICATIONS - 1								
Model	63101		63102(100Wx2)		63103		63105	
<b>Power</b>	20W	200W	20W	100W	30W	300W	30W	300W
<b>Current</b>	0-4A	0-40A	0-2A	0-20A	0-6A	0-60A	0-1A	0-10A
<b>Voltage</b>	0-80V		0-80V		0-80V		0-500V	
<b>Min. Operation Voltage(DC)</b> **	0.5V @ 2A	0.5V @ 20A	0.5V @ 1A	0.5V @ 10A	0.5V @ 3A	0.5V @ 30A	1.0V @ 0.5A	1.0V @ 5A
	1.0V @ 4A	1.0V @ 40A	1.0V @ 2A	1.0V @ 20A	1.0V @ 6A	1.0V @ 60A	2.0V @ 1A	2.0V @ 10A
<b>Constant Current Mode</b>								
<b>Range</b>	0-4A	0-40A	0-2A	0-20A	0-6A	0-60A	0-1A	0-10A
<b>Resolution</b>	1mA	10mA	0.5mA	5mA	1.5mA	15mA	0.25mA	2.5mA
<b>Accuracy</b>	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>								
<b>Range</b>	0.0375 Ω - 150 Ω (200W/16V) 1.875 Ω - 7.5k Ω (200W/80V)		0.075 Ω - 300 Ω (100W/16V) 3.75 Ω - 15k Ω (100W/80V)		0.025 Ω - 100 Ω (300W/16V) 1.25 Ω - 5k Ω (300W/80V)		1.25 Ω - 5 Ω (300W/125V) 50 Ω - 200k Ω (300W/500V)	
<b>Resolution</b>	12 bits		12 bits		12 bits		12 bits	
<b>Accuracy</b>	150 Ω : 0.1% + 0.2%		300 Ω : 0.1% + 0.2%		100 Ω : 0.1% + 0.2%		5k Ω : 20m% + 0.2%	
	7.5k Ω : 0.01% + 0.1%		15k Ω : 0.01% + 0.1%		5k Ω : 0.01% + 0.1%		200k Ω : 5m% + 0.1%	
<b>Constant Voltage Mode</b>								
<b>Range</b>	0-80V		0-80V		0-80V		0-500V	
<b>Resolution</b>	20mV		20mV		20mV		125mV	
<b>Accuracy</b>	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>	C.C. Mode		C.C. Mode		C.C. Mode		C.C. Mode	
T1 & T2	0.025mS-10mS/Res:1μS 1mS-30S/Res:1mS		0.025mS-10mS/Res:1μS 1mS-30S/Res:1mS		0.025mS-10mS/Res:1μS 1mS-30S/Res:1mS		0.025mS-10mS/Res:1μS 1mS-30S/Res:1mS	
<b>Accuracy</b>	1μS/1mS+100ppm		1μS/1mS+100ppm		1μS/1mS+100ppm		1μS/1mS+100ppm	
<b>Slew Rate</b>	0.64-160mA/μS	6.4-1600mA/μS	0.32-80mA/μS	3.2-800mA/μS	0.001-0.25A/μS	0.01-2.5A/μS	0.16-40mA/μS	1.6-400mA/μS
<b>Resolution</b>	0.64mA/μS	6.4mA/μS	0.32mA/μS	3.2mA/μS	0.001A/μS	0.01A/μS	0.16mA/μS	1.6mA/μS
<b>Min. Rise Time</b>	10μs (typical)		10μs (typical)		10μs (typical)		24μs (typical)	
<b>Current</b>	0-4A	0-40A	0-2A	0-20A	0-6A	0-60A	0-1A	0-10A
<b>Resolution</b>	1mA	10mA	0.5mA	5mA	1.5mA	15mA	0.25mA	2.5mA
<b>Current Accuracy</b>	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>								
<b>Range</b>	0-16V	0-80V	0-16V	0-80V	0-16V	0-80V	0-125V	0-500V
<b>Resolution</b>	0.5mV	2.5mV	0.5mV	2.5mV	0.5mV	2.5mV	4mV	16mV
<b>Accuracy</b>	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>								
<b>Range</b>	0-4A	0-40A	0-2A	0-20A	0-6A	0-60A	0-1A	0-10A
<b>Resolution</b>	0.125mA	1.25mA	0.0625mA	0.625mA	0.1875mA	1.875mA	0.032mA	0.320mA
<b>Accuracy</b>	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	≅ 20.8W	≅ 104W	≅ 31.2W	≅ 312W	≅ 31.2W	≅ 312W
<b>Over Current Protection</b>	≅ 4.08A	≅ 40.8A	≅ 2.04A	≅ 20.4A	≅ 6.12A	≅ 61.2A	≅ 1.02A	≅ 10.2A
<b>Over Temperature Protection</b>	≅ 85°C		≅ 85°C		≅ 85°C		≅ 85°C	
<b>Over Voltage Protection</b>	≅ 81.6V		≅ 81.6V		≅ 81.6V		≅ 510V/127.5V	
<b>General</b>								
<b>Short Circuit</b>								
<b>Current</b>	-	≅ 40A	-	≅ 20A	-	≅ 60A	-	≅ 10A
<b>Voltage (CV)</b>	-	0V	-	0V	-	0V	-	0V
<b>Resistance (CR)</b>	-	≅ 0.0375 Ω	-	≅ 0.075 Ω	-	≅ 0.025 Ω	-	≅ 1.25 Ω
<b>Input Resistance (Load Off)</b>	100k Ω (Typical)		100k Ω (Typical)		100k Ω (Typical)		100k Ω (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	

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SPECIFICATIONS - 2										
Model	63106		63107(30W & 250W)			63108		63112		
<b>Power</b>	60W	600W	30W	30W	250W	60W	600W	120W	1200W	
<b>Current</b>	0-12A	0-120A	0-5A	0-4A	0-40A	0-2A	0-20A	0-24A	0-240A	
<b>Voltage</b>	0-80V		0-80V			0-500V		0-80V		
<b>Min. Operation Voltage (DC)</b> <sup>1</sup>	0.5V @ 6A	0.5V @ 60A	0.5V @ 2.5A	0.5V @ 2A	0.5V @ 20A	1V @ 1A	1V @ 10A	0.5V @ 12A	0.5V @ 120A	
	1.0V @ 12A	1.0V @ 120A	1.0V @ 5A	1.0V @ 4A	1.0V @ 40A	2V @ 2A	2V @ 20A	1.0V @ 24A	1.0V @ 240A	
<b>Constant Current Mode</b>										
<b>Range</b>	0-12A	0-120A	0-5A	0-4A	0-40A	0-2A	0-20A	0-24A	0-2400A	
<b>Resolution</b>	3mA	30mA	1.25mA	1mA	10mA	0.5mA	5mA	6mA	60mA	
<b>Accuracy</b>	0.1%+0.1%F.S.	0.1%+0.2%F.S.	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.	
<b>Constant Resistance Mode</b>										
<b>Range</b>	12.5mΩ - 50Ω (600W/16V) 0.625Ω - 2.5kΩ (600W/80V)		0.3Ω - 1.2kΩ (30W/16V) 15Ω - 60kΩ (30W/80V)		0.0375Ω - 150Ω (250W/16V) 1.875Ω - 7.5kΩ (250W/80V)		0.625Ω - 2.5kΩ (600W/125V) 25Ω - 100kΩ (600W/500V)		6.25mΩ - 25Ω (1200W/16V) 0.3125Ω - 1.25kΩ (1200W/80V)	
<b>Resolution</b>	12 bits		12 bits		12 bits		12 bits		12 bits	
<b>Accuracy</b>	50Ω : 0.4% + 0.5% 2.5kΩ : 0.04% + 0.2%		1.2kΩ : 0.1% + 0.2% 60kΩ : 0.01% + 0.1%		150Ω : 0.1% + 0.2% 7.5kΩ : 0.01% + 0.1%		25kΩ : 50m% + 0.2% 100kΩ : 5m% + 0.1%		25Ω : 0.8% + 0.8% 1.25kΩ : 0.08% + 0.2%	
<b>Constant Voltage Mode</b>										
<b>Range</b>	0-80V		0-80V			0-500V		0-80V		
<b>Resolution</b>	20mV		20mV			125mV		20mV		
<b>Accuracy</b>	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>	C.C. Mode		C.C. Mode			C.C. Mode		C.C. Mode		
T1 & T2	0.025mS-10mS/Res:1μS 1mS-30S/Res:1mS		0.025mS-10mS/Res:1μS 1mS-30S/Res:1mS			0.025mS-10mS/Res:1μS 1mS-30S/Res:1mS		0.025mS-10mS/Res:1μS 1mS-30S/Res:1mS		
<b>Accuracy</b>	1μS/1mS+100ppm		1μS/1mS+100ppm			1μS/1mS+100ppm		1μS/1mS+100ppm		
<b>Slew Rate</b>	0.002-0.5A/μS	0.02-5A/μS	0.8-200mA/μS	0.64-160mA/μS	64-1600mA/μS	0.32-80mA/μS	3.2-800mA/μS	0.004-1A/μS	0.04-10A/μS	
<b>Resolution</b>	0.002A/μS	0.02A/μS	0.8mA/μS	0.64mA/μS	64mA/μS	0.32mA/μS	3.2mA/μS	0.004A/μS	0.04A/μS	
<b>Min. Rise Time</b>	10μs (typical)		10μs (typical)			24μs (typical)		10μs (typical)		
<b>Current</b>	0-12A	0-120A	0-5A	0-4A	0-40A	0-2A	0-20A	0-24A	0-240A	
<b>Resolution</b>	3mA	30mA	1.25mA	1mA	10mA	0.5mA	5mA	6mA	60mA	
<b>Current Accuracy</b>	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>										
<b>Range</b>	0-16V	0-80V	0-16V	0-80V	0-16V	0-80V	0-125V	0-500V	0-16V	0-80V
<b>Resolution</b>	0.5mV	2.5mV	0.5mV	2.5mV	0.5mV	2.5mV	4mV	16mV	0.5mV	2.5mV
<b>Accuracy</b>	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>										
<b>Range</b>	0-12A	0-120A	0-5A	0-4A	0-40A	0-12A	0-20A	0-24A	0-240A	
<b>Resolution</b>	0.375mA	3.75mA	0.15625mA	0.125mA	1.25mA	0.375mA	0.625mA	0.75mA	7.5mA	
<b>Accuracy</b>	0.1% + 0.1%F.S.		0.1% + 0.1%F.S.			0.1% + 0.1%F.S.		0.15% + 0.15%F.S.		
<b>Protective Section</b>										
<b>Over Power Protection</b>	≅ 62.4W	≅ 624W	≅ 31.2W	≅ 31.2W	≅ 260W	≅ 62.4W	≅ 624W	≅ 124.8W	≅ 1248W	
<b>Over Current Protection</b>	≅ 12.24A	≅ 122.4A	≅ 5.1A	≅ 4.08A	≅ 40.8A	≅ 2.04A	≅ 20.4A	≅ 24.48A	≅ 244.8A	
<b>Over Temperature Protection</b>	≅ 85°C		≅ 85°C			≅ 85°C		≅ 85°C		
<b>Over Voltage Protection</b>	≅ 81.6V		≅ 81.6V			≅ 510V		≅ 81.6V		
<b>General</b>										
<b>Short Circuit</b>										
<b>Current</b>	-	≅ 120A	-	-	≅ 40A	-	≅ 20A	-	≅ 240A	
<b>Voltage (CV)</b>	-	0V	-	-	0V	-	0V	-	0V	
<b>Resistance (CR)</b>	-	≅ 0.0125Ω	-	-	≅ 0.0375Ω	-	≅ 0.625Ω	-	≅ 0.00625Ω	
<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>	162 x 172 x 495 mm		81 x 172 x 495 mm			162 x 172 x 495 mm		324 x 172 x 495 mm		
<b>Weight</b>	8.4 Kg		4.2 Kg			8.4 Kg		16.8 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		

**Note \*1 :**

Low Voltage operation, under one volt, is possible at correspondingly reduced current level.

Operating temperature range is 0°C to 40°C.

All specifications apply for 25°C ± 5°C, except as noted.